Hermosa Project
Aquifer Protection Permit OTHER Amendment Application
P-512235

SANTA CRUZ COUNTY, ARIZONA

Prepared for:

ARIZONA MINERALS, INC.
2210 E. Ft. Lowell
Tucson, AZ 85719

Prepared by:

CLEAR CREEK ASSOCIATES, LLC
221 N. Court Avenue
Tucson, AZ 85719

May 29, 2020

2210 E Fort Lowell Rd
Tucson, AZ 85719
Tel: 520-485-1300

May 29, 2020

Mr. Vimal Chauhan
Project Manager
Groundwater Aquifer Protection Permit Unit
Arizona Department of Environmental Quality
1110 West Washington St.
Phoenix, AZ 85007

Re: Aquifer Protection Permit Other Amendment P-512235
Hermosa Project Trench Camp

Dear Mr. Chauhan:

Enclosed please find Arizona Minerals, Inc.'s (AMI) Other amendment application for APP No. P-512235.

The reason for this amendment is to:

- Update the treatment design for the water treatment plant. Additional treatment technology was added to the permitted plant when it was constructed, and AMI intends to add other treatment technologies to enhance the performance of the plant.
- Allow for additional solids from the WTP (i.e. filter cake) and solids from cutting of exploration core to be deposited in the tailings storage facility (TSF). Filter cake is currently permitted in the TSF. However the WTP upgrades will generate additional volumes of filter cake. Allowing placement of these materials on the TSF will have no effect on discharge for the TSF given the relatively small volume of the materials and the prescriptive BADCT used in the TSF construction.
- Make some administrative changes to the permit.

If you have any questions or need additional information, please do not hesitate to contact me at (520) 485-1300 or brent.musslewhite@south32.net.

Sincerely,

Musslewhite, Brent (South32)
Digitally signed by Musslewhite, Brent (South32)
Date: 2020.05.28 09:34:13 -07'00'

Brent Musslewhite
Director, Environment and Permitting

Encl.

GENERAL INFORMATION

1. Application to obtain [A.R.S. 49-241]:

New APP no

Amendment to a current APP Inventory No. P-512235 LTF No. 71251

Description of all amendment requests and justification included in Report Section/Appendix Sec 2 Sec. 5 Att C

A copy of the current permit, annotated with any inconsistencies between the permit requirements and the existing facilities or operation, included in Report Section/Appendix Attachment C

NOTE: ADEQ can provide the permit in WORD file format upon request.

2. Applicant/Permittee Name [A.A.C. R18-1-503(1)] (see Definitions):

Company/Government/Entity Name: (RESPONSIBLE FOR ALL PERMIT CONDITIONS)

Arizona Minerals, Inc.

3. Applicant/Permittee - Certification Statement [A.A.C. R18-9-A201(B)(7)]:

I certify under penalty of law that this Aquifer Protection Permit application and all attachments were prepared under my direction or authorization and all information is, to the best of my knowledge, true, accurate and complete. I also certify that the APP discharging facilities described in this form is or will be designed, constructed, operated, and/or closed in accordance with the terms and conditions the Aquifer Protection Permit and applicable requirements of Arizona Revised Statutes Title 49, Chapter 2, and Arizona Administrative Code Title 18, Chapter 9 regarding aquifer protection permits. I am aware that there are significant penalties for submitting false information, including permit revocation as wells as the possibility of fine and imprisonment for knowing violations.

Authorized person signature:

Name: Brent Musslewhite

Title: Director - Environment and Permitting

Signature Musslewhite, Brent (South32) Digitally signed by Musslewhite, Brent (South32) Date: 2020.05.28 09:23:08 -07'00'

Date: May 29, 2020

4. Applicant/Permittee Address

Mailing Address: 2210 East Fort Lowell Road, Tucson, AZ 85719

Billing Address: same

Email Address: Brent.Musslewhite@south32.net

Phone Number: 520-485-1300

5. **Authorized Agent [A.A.C. R18-1-503(3)] (Optional, see Definitions):**

Name: NA

Firm Name

Mailing Address:

Email Address:

Phone Number:

6. **Facility Information [A.A.C. R18-1-503(2), A.A.C. R18-9-201(B)(1)]**

Name: Hermosa Project - Trench Camp Property

Address: 749 Harshaw Road

County: Santa Cruz

Latitude: 31 ° 27 ' 59.4 " Longitude: 110 ° 43 ' 35.8 "

Coordinate System used for Latitude and Longitude: ☐ NAD27 ☑ NAD83

Township 22S Range 16E Section: 32 T22S, R16E, sec 32 and T23S R16E; unsurveyed sections 3 and 4

Driving directions from a major intersection:

7. **Facility Notices of Violation, Consent Orders or Compliance Orders in the last 2 years [A.A.C. R18-9-A202(A)(11), included in Report Section/Appendix** Section 2.3

8. **Facility Owner**

Company/Government/Entity Name: Arizona Minerals, Inc.

Contact Person Name Brent Musslewhite

Mailing Address: 2210 E. Fort Lowell Road, Tucson, AZ 85719

Email Address: Brent.Musslewhite@south32.net

Phone Number: 520-485-1300

9. **Contact Person for Facility Emergencies [A.A.C. R18-9-A202(A)(11)]**

Name: Brent Musslewhite Title: Director--Environment and Permitting

Mailing Address: 2210 E. Fort Lowell Road, Tucson, AZ 85719

Email Address: Brent.Musslewhite@south32.net

Phone Numbers landline: 520-485-1300 mobile phone: 505-801-2977

10. Contact Person(s) for Permit Compliance Schedule Items Notifications (Optional)
ADEQ has developed a tool to track compliance schedule items (CSIs) 30 and 5 days before they are due, and 5 days after they become overdue. The person(s) identified, will receive email notifications in addition to the Applicant/Permittee.

Name(s): Sarah Richman

Email Address(es): sarah.richman@south32.net

11. Landowner

Company/Government/Entity Name: Arizona Minerals Inc.

Contact Person Name Brent Musslewhite

Mailing Address: 2210 E. Fort Lowell Road, Tucson, AZ 85719

Email Address: Brent.Musslewhite@south32.net

Phone Number: 520-485-1300

12. Expected operational life of the Facility [A.A.C. R18-9-A201(B)(1)]
(Start date) 1/8/2018 (Close Date) 2048

13. Facility discharge or influent per day in gallons [A.A.C. R18-14-104, A.R.S. 49-242]: 172,000 **(gallons)**

14. All other federal or state environmental permits issued to the Applicant for the Facility or site, including type and identification number [A.A.C. R18-9-A201(B)(1)], included in Report Section/~~Appendix~~ 10

15. Are you required to file a certificate of disclosure according to A.R.S. §49-109?

☐ Yes, attached in Report Section/Appendix _____

☑ No, not required

16. Evidence that the facility complies with applicable municipal or county zoning ordinances, codes and regulations [A.A.C. R18-9-A201(B)(3)], included in Report Section/Appendix_____

The proposed activities at the Property are in compliance with zoning laws. ARS 11-812 (county code provisions) does not allow county codes to "Prevent, restrict or otherwise regulate the use or occupation of land or improvements for railroad, mining, metallurgical, grazing or general agricultural purposes, if the tract concerned is five or more contiguous commercial acres."

17. Evidence of technical capability to carry out the terms of the permit (design, construction, and operation) including licenses, certifications, training, and work experience [A.A.C. R18-9-A202(B)] Attached in Report Section/~~Appendix~~ 2.10

Cost Estimates and Financial Assurance Demonstration [A.A.C. R18-9-A201(B)(5) and R18-9-A203]

Is this application for:

1) A new permit? YES___ NO x

2) Significant Amendment? YES___ NO x

NOTE: Updated cost estimates may be required for a significant amendment as defined by rule if required to address incremental changes in the cost estimate that result from the significant amendment, A.R.S. § 49-243(N)(2)(b).

3) Other Amendment for permit transfer? YES___ NO x

4) Cost Estimate/Financial Demonstration update? YES___ NO x

5) Estimate/Financial Demonstration at the direction of ADEQ? YES___ NO x

6) A permit that has not been amended in the last five years? YES___ NO x

If you answered "YES" to ANY of the above questions, provide updated cost estimates and a financial assurance demonstration. If you answered "NO" to ALL of the above questions, skip this section and continue to the "Technical Information" Section.

18. Cost Estimates provided in Report Section/Appendix _____

Closure costs and a financial demonstration are required even if the Applicant does not intend to close the facility in the near future. The closure and post-closure cost estimates must be based on the closure and post-closure plan/strategy (required by Application Item 32, below). Please see checklists for closure plans/strategies and cost estimate on the ADEQ website: http://www.azdeq.gov/node/542

NOTE: Cost estimates must be derived by an engineer, controller or accountant. Except as exempted by A.R.S. § 32-144.A.7 (employees of mining companies), professional documents, such as reports, plans and specifications, are to be signed by an Arizona registered engineer or geologist (A.R.S. § 32-125). Cost estimates prepared by an engineer, design documents and engineering analysis must be signed and sealed by an Arizona Registered Professional Engineer, and must not include labels such as "Draft", "Preliminary", or "Not for Construction" per A.R.S. § 32-101(B)(10 and 11) and 32-125.

Provide the cost estimates in the spaces provided below and attach supporting documentation for the cost estimates.

a. Construction $ NA
b. Operation $ NA
c. Maintenance $ NA
d. Closure $ NA
e. Post-Closure $ NA

19. Financial Assurance Demonstration for either (a) non-government or (b) government:
Indicate which financial assurance demonstration will be provided to cover the cost of Closure and Post-closure. It is preferable to wait for ADEQ to review and approve the cost estimates prior to submitting the finalized financial demonstration required by Item 19; simply indicating the type of demonstration is adequate for submittal of the application. Please see the ADEQ website for financial assurance mechanism templates and instructions at http://azdeq.gov/financial-responsibility-options-apps
Provide information based on whether the Applicant/Permittee is a non-government or government entity:

a. A non-government entity:
   i. Financial Assurance Mechanism selected Select ________________
   ii. Details of any financial mechanism held by another government agency for the purpose of closure and post-closure activities described in the closure plan/strategy, provided in Report Section/Appendix _____
   iii. A letter on Company letterhead signed by the Chief Financial Officer, as required by A.A.C. R18-9-A203, is attached in Report Section/Appendix _____
b. A government entity:
   i. A statement that indicates how the entity is capable of meeting the costs listed in the Cost Estimate section above is included in Report Section/Appendix _____

APPLICATION TECHNICAL INFORMATION

20. Facility description, including the following information, is provided in Report Section/~~Appendix~~ 2.11

a. A general description of what the facility does.
b. When operations began or are estimated to begin.
c. A general description of the facility process as it relates to the discharge, including:
   i. Operating, proposed and closed discharging facilities, or activities that discharge,
   ii. source(s) of wastewaters/waste, and
   iii. facility or location where the wastewater/waste is discharged.
   NOTE: see the Definitions section for "discharging facility" and "discharge"

21. Process flow diagram that shows the activity producing the discharge (e.g. wastewater treatment, cooling, manufacturing), including the pertinent elements that affect the quality of the discharge, is included as Report Section/Appendix A

22. List the discharging facilities and activities that discharge in the table below. Indicate whether they are currently operating/existing, are proposed as new, or are to be closed as part of this permit application, and provide their location [A.R.S. 49-241]. Additional facilities listed in Report Section/Appendix NA

Facility or Activity Name (e.g. Evaporation Pond 1)	Existing, Proposed or to be closed	Latitude	Longitude
Lined Tailing Storage facility	existing	31 ° 27 ' 59.4 "	110 ° 43 ' 35.8 "
Underdrain Collection Pond	existing	31 ° 27 ' 59 "	110 ° 43 ' 39.2 "
AZPDES Outfall 1	existing	31 ° 28 ' 15 "	110 ° 43 ' 43.43 "

23. Map(s) [A.A.C. R18-9-A202(A)(1)], included in Report Section/Appendix Figures Section
Include the following:

1) North arrow all figures
2) Scale all figures
3) Topography with sufficient resolution and legible elevations of contours for the facility Figure 2 and Attachments A/B
4) Facility location figures 1 and 3
5) Property line(s) and use of adjacent property Figure 2 of original application
6) Overlay of State or Federal land Figure 2 of original application
7) All known water wells within 1/2 mile of property boundary Figure 9 and Table 3 of original application
8) Labeled with ADWR Well Number, latitude and longitude Figure 9 and table 3 of original application
9) Provide the uses and well construction details of the water wells, if known, water level elevations in the wells, and highlight/identify the nearest downgradient well. Tabulation of this data to prevent excessive labeling on the site plan itself is preferred.) Table 3 of original application

24. Site Plan [A.A.C. R18-9-A202(A)(2), (4) and (8), A.R.S. 49-244], included in Report Section/Appendix Figures Section

Include the following:

1) North arrow figures 1-4
2) Scale figures 1-4
3) Property lines figures 1-4
4) Structures NA
5) Water wells Figure 9 and Table 3 in original application
6) Injection Wells none
7) Drywells and their uses none
8) Topography Figure 2
9) All known borings exploratory borings are plugged and abandoned
10) 100-year floodplain (FEMA Flood Insurance Rate Map (FIRM) 100-year showing floodplain boundary preferred) ZONE D per original application
11) Surface water bodies Harshaw Creek (ephemeral) and Alum Gulch (intermittent)
12) Surface water flow direction(s) Figure 3
13) Groundwater flow direction(s) Figure 3 and Figure 10 in original APP Application
14) Pollutant Management Area (PMA) Figure 4

NOTE: In cases where the site is very large, there are multiple PMAs or there is an excessive amount of information that would make the site plan indecipherable, it may be clearer to provide site plans for discrete areas or provide a separate site plan with the PMA, DIA and POC wells.

15) Discharge Impact Area (DIA). Figure 4

Also, include the following with the latitude and longitude:

1) Discharging facilities/discharge locations and existing and proposed Point of Compliance (POC) locations and/or wells Section 2.11 and Section 6
2) Tabulation of this data to prevent excessive labeling on the site plan itself is preferred.
   a. ***For open pit mine facilities***, show the delineation of the passive containment capture zone (PCCZ) and the open pit boundary, if relying on this for BADCT.
   b. ***For Sewage Treatment Facilities*** include effluent sampling and effluent discharge location(s) with latitude and longitude, and setback distance(s) measured from the treatment and disposal components within the sewage treatment facility to the nearest property line of an adjacent dwelling, workplace, or private property.

- **Is this application for a Sewage Treatment Facility (STF)? YES___ NO x__**
- **If you answered "YES" to the question above, skip items #25 through 27, and proceed to item #28.**

25. Characterization of discharge [A.A.C. R18-9-A202(A)(4)], included in Report Section/Appendix A and B

For all non-STF facilities: provide characterization of discharge to include a summary of known past and proposed facility discharge activities. Provide estimated discharge characteristics or results of actual discharge characterization, and quantities/flow rate. Tabulated data is preferred with laboratory results included as an appendix.

Professional Document Requirements

Please note that, except as exempted by A.R.S. § 32-144.A.7 (employees of mining companies), professional documents, such as reports, plans and specifications, are to be signed by an Arizona registered engineer or geologist (A.R.S. § 32-125). Cost estimates prepared by an engineer, design documents and engineering analysis must be signed and sealed by an Arizona Registered Professional Engineer, and must not include labels such as "Draft", "Preliminary", or "Not for Construction" per A.R.S. § 32-101(B)(10 and 11) and 32-125.

The following application sections are typically considered professional documents: Application Items 26 through 32 (Design Documents, BADCT Description, Hydrogeologic Study, Demonstration of Compliance with AWQS at POC, Monitoring Proposal, Contingency Plan, and Closure/Post-closure Plan/Strategy) and Item 35, 36 and 39 for Sewage Treatment Facilities (Design Report, Engineering Plans and Specifications, and Sludge Treatment facilities).

26. Design Documents [A.A.C. R18-9-A202(A)(3)], included in Report Section/Appendix A&B

For all non-STF facilities: provide facility design documents, proposed or as-built, indicating the configuration or other engineered elements of the facility affecting discharge. Drawings must be legible with readable font sizes and include sufficient detail to indicate the key design features. When formal as-built plans are not available, provide documentation sufficient to allow evaluation of those elements of the facility affecting discharge, following the demonstration requirements of A.R.S. 49-243(B).
Provide construction specifications and a quality control/quality assurance plan for new facilities.

27. Best Available Demonstrated Control Technology "BADCT" Description[5] [A.A.C. R18-9-A202(A)(5)], included in Report Section/Appendix Sections 3 and 4, and Attachments A and B

For all non-STF facilities: provide design information pertaining to all discharging facilities including all calculations/analyses to demonstrate that all facilities are designed per BADCT guidance or rule.

Examples include: facility sizing, stability analyses, water balance, freeboard calculations, liner leakage rate calculations

For further specifics, please see the Mining and Industrial APP Engineering Substantive Checklist on the ADEQ website: http://www.azdeq.gov/node/542.

28. Hydrogeologic Study or justification that a limited study or no study is required [A.A.C. R18-9-A202(A)(8)], included in Report Section/Appendix See Sec. 5 of original APP Application

For further specifics, please see the Hydrology Substantive Review Checklist on the ADEQ website: http://www.azdeq.gov/node/542. due to TSF being constructed using prescriptive BADCT and AZPDES discharge meeting all surface and groundwater standards, limited hydro study was conducted.

29. Demonstration of Compliance with AWQS at POCs [A.A.C. R18-9-A202(A)(6)], included in Report Section/~~Appendix~~ 6

For further specifics, please see the Hydrology Substantive Review Checklist on the ADEQ website: http://www.azdeq.gov/node/542.

30. Monitoring Proposal [A.A.C. R18-9-A202(A)(9)], included in Report Section/~~Appendix~~ 7

A detailed proposal indicating the alert levels, discharge limitations, monitoring requirements, compliance schedules, and temporary cessation or plans that the Applicant will use to satisfy the requirements of A.R.S. Title 49, Chapter 2, Article 3 and Articles 1 and 2 of Chapter 9. Include as applicable, discharge and groundwater monitoring and operational/inspections. Indicate sampling point(s) with latitude and longitude (e.g. effluent, discharge, groundwater monitoring or other sampling points)

31. Contingency Plan [A.A.C. R18-9-A202(A)(7) and R18-9-A204], included in Report Section/~~Appendix~~ 8

32. Closure and Post-closure Plan/Strategy [A.A.C. R18-9-A202(A)(10)], included in Report Section/Appendix NA

For further specifics, please see the Closure and Post-closure Plan/Strategy and Cost Estimate Checklist on the ADEQ website http://www.azdeq.gov/node/542

Sewage Treatment Facility Applications ONLY (Items 33 through 39)

33. For Sewage Treatment Facilities (STFs), indicate the effluent disposal method(s) to be utilized and the disposal capacity for each method [A.A.C. R18-9-B202]:

Disposal Method	Flow capacity (gal/day)
☐ Beneficial reuse under a Recycled Water Permit	
☐ Surface impoundment primarily for evaporation	
☐ Surface impoundment primarily for recharge to groundwater	
☐ Discharge to a Water of the U.S. under a Clean Water Act Permit (NPDES/AZPDES)	
☐ Vadose zone injection wells	
☐ Injection wells directly into groundwater	
☐ Land application for disposal; not reuse	
☐ Other, describe: ___________	

34. **Documentation that the Sewage Treatment Facility is in conformance with the Area-wide 208 Quality Management Plan for Sewage Treatment Facilities [A.A.C. R18-9-A201(B)(6)].**
    Included in Report Section/Appendix _____

For further information on the 208 requirements, please see the ADEQ website http://www.azdeq.gov/208-review

35. **Sewage Treatment Facility Design Report [A.A.C. R18-9-B202], attached in Report Section/Appendix _____**
    Include information pertaining to all discharging facilities including all calculations/analysis to demonstrate that all facilities are designed per BADCT treatment performance requirements in rule. In addition, include facility sizing, stability analyses, water balance, freeboard calculations, and liner leakage rate calculations. An Arizona registered engineer shall seal the design report.
    For further specifics please see the WWTP engineering review checklist on the ADEQ website http://www.azdeq.gov/node/542.

36. **Sewage Treatment Facility Engineering Plans and Specifications [A.A.C. R18-9-B203], included in Report Section/Appendix _____**
    The documents may include manufacturer's specifications and cut sheets and shall be sealed by an Arizona registered engineer.

37. **Sewage Treatment Facility Recycled Water classification [A.A.C. R18-11, Article 3]:** Select

38. **Sewage Treatment Facility Set-back map [A.A.C. R18-9-B201(I)], included in Report Section/Appendix _____**

39. **Sewage Treatment Facility sludge treatment and disposal description [A.A.C. R18-9-B202]. Included in Report Section/Appendix _____**
    If treatment or disposal at the facility includes discharging facilities, include the Design and BADCT information required by Items 26 and 27 above. Example of a discharging facility is a sludge drying bed.

END OF APPLICATION FORM

TABLE OF CONTENTS

FIGURES

REGISTERED GEOLOGIST
CERTIFICATE NO.
44511
ALISON H.
JONES
Date Signed 5/29/2020
ARIZONA, U. S. A.
Expires 06/30/ 2021

ATTACHMENTS

Attachment A: Water Treatment Plant Upgrades and Modifications by M3 Engineering

Attachment B: Newfields Engineer of Record Memorandum re: Stability Analysis for Placement of Water Treatment Plant Solids and Core Cutting Solids Characterization in TSF.

Attachment C: Aquifer Protection Permit Redline

ACRONYMS AND ABBREVIATIONS

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AL	Alert Level
AMI	Arizona Minerals Inc.
APP	Aquifer Protection Permit
AQL	Aquifer Quality Limit
A.R.S.	Arizona Revised Statutes
AWQS	Aquifer Water Quality Standard
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
Clear Creek	Clear Creek Associates, LLC
DIA	Discharge Impact Area
ERC	Emergency Response Coordinator
ft	feet
ft/day	feet per day
gpm/ft	gallons per day per foot
gpm	gallons per minute
m	meter
NOV	Notice of Violation
mg/L	milligrams per liter
PAG	Potentially Acid Generating
PMA	Pollutant Management Area
POC	Point of Compliance
RO	Reverse Osmosis
TSF	tailing storage facility
UCP	Underdrain Collection Pond
VRP	Voluntary Remediation Program
WTP	Water Treatment Plant
μg/l	microgram per liter

1 INTRODUCTION

1.1 APP Background

Arizona Minerals, Inc. (AMI) is the applicant to the Arizona Department of Environmental Quality (ADEQ) for an "other" amendment to Aquifer Protection Permit (APP) P-512235. The initial permit application was submitted in June 2017. The permit was issued in January 2018 and amended in April 2019.

A water treatment plant (WTP) was constructed to treat water from the January Adit and the Underdrain Collection Pond (UCP) that collects underflow from the tailings storage facility (TSF). The UCP also is permitted to contain mine workings water, exploration decline water, and stormwater. The WTP was determined to be the best available demonstrated control technology (BADCT) for the discharge of the treated water to Alum Gulch. The discharge is also permitted discharge under the Arizona Pollutant Discharge Elimination System (AZPDES) no. AZ0026387.

1.2 Amendment Objectives

The purpose of this "other" amendment is to:

- Update the BADCT (treatment design) for the WTP. An additional treatment technology was added to the permitted plant when it was constructed, and AMI intends to add other treatment technologies to enhance the performance of the WTP (i.e., further reduce potential discharge of pollutants).
- Allow for additional solids from the WTP (i.e. filter cake) and solids from cutting of exploration core to be deposited in the tailings storage facility (TSF). Allowing placement of these materials on the TSF is expected to have no effect on discharge for the TSF given the relatively small volume of the materials and the prescriptive BADCT used in the TSF construction.

2 PROJECT INFORMATION

2.1 Project Location

The project location is unchanged from the original (2017) APP application (Figure 1). The Trench Camp, Norton, and January Mine claims (Property) are part of the Hermosa Project, which is located approximately 5 miles south of the Town of Patagonia, Arizona (Figure 2). The property is in T22S, 16E Sec 32 and T23S, R16E unsurveyed sections 4 and 5, Gila and Salt River Meridian, in Santa Cruz County, Arizona. AMI acquired the January, Trench Camp, and Norton claims in early 2016 from ASARCO, LLC. Both the January and the Norton mine claims are recognized under a single property designation by the Santa Cruz County Recorder, having been assigned parcel number 105-50-001B (Figure 2, Santa Cruz County Assessor Map Book 105, Page 50). The Trench Camp and Josephine Mine claims have been assigned parcel numbers 105-50-001A and 105-49-003. The U.S. Forest Service manages the surrounding adjacent lands, as part of the Coronado National Forest.

2.2 Project Background

Information regarding site history, geology, hydrology, hydrogeology, land uses, wells, and materials characterization was provided in the initial APP application and remains accurate.

2.3 Facility Compliance History

There are no outstanding compliance issues. Notices of Violation (NOVs) have been issued to AMI in the past for the following:

- ADEQ issued an NOV on April 10, 2019 to AMI alleging (1) inadequate and insufficient control measures to manage on-site erosion, sediment and stormwater runoff, (2) a failure to minimize erosion and sedimentation according to the multi-sector general permit (MSGP), and (3) failure to control discharge as necessary to not cause or contribute to an exceedance of an applicable water quality standard. After AMI responded, ADEQ closed the NOV based upon a determination that Arizona Minerals met the “Documenting Compliance” provisions of the NOV.
- On February 2, 2019, AMI received an NOV alleging deficiencies in the stormwater pollution prevention plan (SWPPP) and inaccurate information in the NOI associated with the (MSGP). ADEQ closed the NOV based on a determination that AMI met the “Documenting Compliance” provisions of the NOV.

2.4 Applicant and Permittee

Arizona Minerals, Inc., 2210 E. Ft. Lowell, Tucson, AZ 85719.

2.5 Landowners

Arizona Minerals, Inc. Same address as above.

2.6 Facility's Emergency Contact Person

Primary Contact – Emergency Response Coordinator (ERC):
Contact Name: Brent Musslewhite
Job Title: Director, Environment and Permitting
Address: 2210 East Fort Lowell Road Tucson, Arizona 85719
Office Number: 520-485-1300
Cell Number: 505-801-2977
Email: Brent.Musslewhite@south32.net

Secondary Contacts – Back up for ERC:
Contact Name: Sarah Richman
Job Title: Principal, Environment and Permitting
Address: 2210 East Fort Lowell Road Tucson, Arizona 85719
Office Number: 520-485-1300
Cell Number: 805-617-9300
Email: Sarah.Richman@south32.net

Contact Name: Kara Haas
Title: Principal, Environment
Address: 749 Harshaw Road, Patagonia, AZ 85624
Email: Kara.haas@south32.net
Cell Number: 505-947-1738

2.7 Physical Address

749 Harshaw Road, Patagonia, AZ 85624

2.8 Legal Description

The Property consists of parcel numbers 105-50-001A (253.23 acres), 105-50-001B (41.23 acres), and 105-49-003 (14.3 acres) as shown on Figure 2.

2.9 Zoning

Mining activities are not subject to local zoning requirements. A.R.S. § 11-812(A)(2) does not allow zoning codes to "Prevent, restrict or otherwise regulate the use or occupation of land or improvements for railroad, mining, metallurgical, grazing or general agricultural purposes, if the tract concerned is five or more contiguous commercial acres."

2.10 Technical Capability

2.10.1 Arizona Minerals, Inc.

- Brent Musslewhite. Director, Environment & Permitting, has over 26 years experience in environmental, permitting and remediation projects associated with mining. He received a BS in Soil Science in 1994 and MS in Soil Science in 2002.
- Sarah Richman. Principal, Environment & Permitting, has over 7 years of permitting experience with 5 years focused on mining in Arizona. She received a MS in Environmental Science and Management in 2013.
- Dennis Bailey. Hermosa Site Engineering Manager, has over 30 years of engineering experience, in the design, development, and construction of mining industrial facilities. He received a BS degree in Mechanical Engineering in 1989 and an MBA in 2000.
- Kara Haas. Principal, Environment, has over 17 years of environmental experience, and has worked on a variety of projects including environmental permitting, compliance and reclamation at mining sites. She received a BS degree in Geology in 2000 and a MS degree in Hydrogeology in 2002.

2.10.2 Clear Creek Associates, LLC

As the hydrogeological consultant on the Project, Clear Creek LLC, is registered with the Arizona Board of Technical Registration to perform work that falls within the statutory definition of Geological practice. The Clear Creek team includes the following individuals:

- Douglas Bartlett, R.G. Arizona Registered Geologist No. 25059. Principal Hydrogeologist for Clear Creek. Mr. Bartlett has over 30 years of technical experience. He received a BS degree in Geology in 1977 and an MS degree in Geology in 1984.
- Alison Jones, R.G. Arizona Registered Geologist No. 44511. She is a Senior Hydrogeologist at Clear Creek where she manages mining support and environmental projects. She has over 25 years of technical experience. Ms. Jones received a BS degree in Geology in 1979 and an MS degree in Geology in 1983.
- James Norris, R.G. Arizona Registered Geologist No 30842. Mr. Norris is a Senior Associate for Clear Creek where he manages water supply, mining support and other projects. He has over 40 years of technical experience. Mr. Norris received a BS degree in Geology in 1976, an MS in Geosciences in 1981, and an MS in Hydrology in 1989.

2.10.3 NewFields

As the engineering consultant for the Tailings Storage Facility and Underdrain Collection Pond on the Project, NewFields personnel are registered Professional Civil Engineers capable of performing civil design work. The NewFields team includes the following individual:

- Craig Thompson, P.E. Registered PE in Arizona (License No. 63431) and Colorado (License No. 49559). Project Engineer for NewFields. Over 9 years of engineering experience. Received a BS degree in Civil Engineering in 2009.

2.10.4 Forte Dynamics

Forte Dynamics is serving as a subject matter expert regarding water treatment technologies on this project.

- Jeffrey Winterton is a Senior Metallurgical Engineer at Forte Dynamics. He is a Registered Professional Engineer and a Registered Member of The Society for Mining, Metallurgy and Exploration. He is a Senior Metallurgical Engineer at Forte Dynamics. Jeff has worked in the mining and metals industry since 2001 and has experience in aspects ranging from process operation and optimization to detailed project design and commissioning. He received a BS in Metallurgical engineering from the University of Utah and an MS and PhD from the University of California, Berkeley. He has authored and presented several technical papers throughout his career.

2.10.5 BQE

BQE provided the engineering design for the WTP upgrades.

- David Kratochvil is President and CEO of BQE Water. He is a professional engineer registered in British Columbia, Canada (license # 24214) and has over 25 years of experience in mine water management and treatment including permitting, treatment options assessment, bench/pilot testing, engineering design, plant commissioning, and long term operations. David holds a doctorate degree in chemical engineering from the McGill University in Montreal, is a named co-inventor on four patents issued by the US and Canadian patent offices, and is the author of more than 40 peer reviewed technical papers published globally.

2.10.6 M3 Engineering

M3 Engineering is providing engineering services for AMI's process team.

- Fiona L. Jordan, Ph.D. has nearly 20 years of experience in Environmental Science, nine of which are as a Piping Designer at M3 Engineering and Technology (M3). Dr. Jordan's main focus at M3 is in water supply, treatment and distribution systems. She has also written standard operating procedures and construction specifications aimed at ensuring compliance with regulatory standards and has experience commissioning water treatment plants. Prior to her tenure at M3, Dr. Jordan specialized in the development and implementation of remediation strategies for contaminated sites. This included conducting site & environmental assessments, feasibility studies, and technical reviews. She has written various Sampling and Analysis Plans (SAPs), Quality Assurance Project Plans, Groundwater Monitoring Reports and Health and Safety Plans for DOE, EPA and local and state authorities. Dr. Jordan designed and implemented several pilot studies specializing in microbial activity in porous media which have been published in peer-reviewed journals.

- Robert Davidson, P.E. is a Registered Professional Engineer in Arizona (License No. 64339), California (License No. 34311), New Mexico (License No. 26038), Nevada (License No. 19984), Texas (License No. 126543), Georgia (License No. PE044293), and Florida (License No. 89313). He is Senior Mechanical Engineer for M3 Engineering. Mr. Davidson has over 15 years of engineering experience and works on a variety of projects including mineral comminution and beneficiation processes and equipment, material handling systems, pumping and piping systems, and HVAC and plumbing systems. He received a BS degree in Mechanical Engineering in 2005, from the University of Arizona.

2.11 Permitted Discharging Facilities

APP-permitted facilities will not change as a result of this amendment application. The permitted discharging facilities are:

Facility	Latitude	Longitude
Lined Tailing Storage Facility (TSF)	31° 27’ 59.4”N	110° 43’ 35.8” W
Underdrain Collection Pond	31° 27’ 59” N	110° 43’ 39.2” W
AZPDES Outfall 001	31° 28’ 15” N	110° 43’43” W

2.12 Financial Capability

The proposed changes to the APP for this amendment do not change the closure or post-closure costs. A performance surety bond as a financial capability mechanism is in place for this permit. No changes to closure or post-closure cost estimates are required by this amendment.

3 BADCT--AZPDES OUTFALL 001

APP requires that discharges be controlled using BADCT. Discharges to Alum Gulch are required to meet Aquifer Water Quality Standards (AWQSs) specified in the APP and the applicable discharge surface water quality standards that are specified in an AZPDES permit (no. AZ0026387). Since installation and commissioning in September 2018, the WTP has operated on an as-needed basis to treat water. There have been no discharges to date to Alum Gulch; treated water has been used on site for dust suppression and other construction uses. Detailed information regarding the WTP is provided in Attachment A of this application document.

3.1 Current Configuration of WTP

The existing WTP, as constructed to date, differs in the following aspects from the design presented in the 2017 APP Application:

1. The permitted reaction (or crystallization) tank, flocculation tank and clarifier or settling tank all make up a single large unit (the MULTIFLO^{TM}) that is compartmentalized into each of these process units. This is not a substantive change from the permitted configuration.
2. Clarified overflow is routed to a new Ultrafiltration Unit skid. This unit was added to the treatment train to clear suspended solids and particulates which may carry over from the clarifier.
3. Neutralized water flows by gravity to a set of Moving Bed Biofilm Reactor (MBBR) tanks. Although ammonia is not currently present in the raw influent water from the January Adit or the UCP, these tanks were installed for the treatment should levels build up in either source water during exploration activities. This is an additional discharge reduction component beyond those specified in the APP.

Collectively, these changes result in the WTP providing greater reduction in pollutant loads in the discharge.

3.2 Proposed Upgrades to WTP

Operation of the WTP has allowed AMI to evaluate effectiveness of the treatment train and identify how it can be optimized. Specifically, AMI has identified a need for additional treatment for arsenic, selenium, and sulfate. Although not needed to comply with APP discharge limitations, the additional treatment will provide greater confidence that the WTP effluent will routinely meet AZPDES permit limits in the event of discharge to Alum Gulch. Additional testing and pilot studies have been conducted to evaluate how to upgrade the WTP (as documented in Attachment A). Based on these studies, AMI proposes the following BADCT upgrades for the WTP:

- Membrane filtration of WTP treated effluent, coupled with brine desaturation and sulfate precipitation, reject volume reduction, and sulfate reduction. As discussed in Section 3 of Attachment A, water hardness and gypsum saturation are likely to cause failure of Whole Effluent Toxicity (WET) testing. Membrane filtration will address this concern.

- Electroreduction (ERC) of the desaturated brine stream to reduce selenate concentrations in the final effluent stream.

The purpose of the membrane filtration upgrade is to concentrate sulfate and salts into a brine stream. Sulfate levels in the brine stream will be desaturated with lime, polymer and coagulant to form gypsum, which is precipitated along with other hydroxide and carbonate salts in a clarifier. The heavier sludge generated in the clarifier is directed towards the underflow with approximately ten percent of the sludge pumped to the sludge holding tank for dewatering at the existing filter press. The remaining sludge underflow is recycled back to the reaction tank to seed the precipitation of gypsum. Soluble sulfate and other salts in the overflow of the clarifier are diluted with clean permeate to lower the water hardness and TDS (including sulfate) levels and allow for the release of more treated water to the final effluent tank. Filter cake volumes are anticipated to increase from the current filter cake volume of 147 cubic feet per day to 265 cubic feet per day. More information is provided in Section 3 of Attachment A.

Selenium levels in the clarifier overflow will be reduced in an ERC circuit. Selenium as selenate in the desaturated brine stream is reduced to selenium in nitrogen-blanketed electrocells and precipitated out of solution as an inorganic iron oxyhydroxide. The precipitated selenium is separated from clean desaturated brine in a series of clarifying/reaction tanks. The selenium-laden solids in the underflow of the ERC clarifiers/reaction tanks are then conveyed to the sludge holding tanks and dewatered using the existing filter press. Bench tests show that the selenium laden solids will pass the Toxicity Characteristic Leaching Procedure (TCLP) test. Selenium-free desaturated brine is then blended with nanofiltration permeate, at a blend ratio to meet the desired pH, TDS (and sulfate) and Electrical Conductivity. More information is provided in Section 3 of Attachment A.

These upgrades will result in the WTP providing better performance (greater pollutant loading reduction).

4 BADCT UPDATE—TAILING STORAGE FACILITY

The TSF was designed as a lined permanent storage area for placement of historic tailings and potentially acid generating (PAG) waste rock. It was constructed using prescriptive BADCT methods. The TSF is permitted to receive the historic tailings, waste rock (including waste rock that is PAG), impacted soils excavated from beneath the historic tailings facilities, and development rock (including PAG development rock) from the planned exploration decline or shaft.

AMI proposes to add additional solids from WTP and core cutting solids to the permitted materials allowed to be placed in the TSF. Each of these materials is discussed in the sections below, and detailed information is provided in the Engineer of Record Memorandum in Attachment B of the application.

4.1 Solids from WTP

Filter cake from the existing WTP is currently stored in the TSF, as noted in the 2017 APP application. The proposed upgrades to the WTP will result in additional filter cake solids. AMI proposes to place approximately 10 cubic yards per day (3,650 cubic yards per year) of solids from WTP on the TSF. Information regarding the estimated volumes, material properties, method of placement in the TSF, and a stability evaluation are provided in Attachment B of this amendment application.

4.2 Core-cutting solids

AMI proposes to place approximately 1 cubic yard per month (12 cubic yards per year) of core cutting solids on the TSF. This material simply consists of rock fragments generated from cutting of core. Information regarding the estimated volumes, material properties, method of placement in the TSF, and a stability evaluation are provided in Attachment B of this amendment application.

4.3 Stability and Discharge Reduction

Placement of the additional materials in the TSF will not impact discharges from or stability of the TSF. The permit will still require that total deposition of tailings, development rock, and WTP solids and core cutting solids shall not cause the ultimate facility height to exceed an elevation of 5,110 feet above mean sea level, per Section 2.3.1 and Table 4.2.1. Inspection requirements for height, structural integrity, and piezometric head in the TSF piezometers, as required in Table 4.2.1, will not change under this amendment.

5 OTHER PROPOSED REVISIONS

The proposed revisions to the APP are provided in Attachment C of this application. In addition to the administrative details, the authorization for additional materials to be placed on the TSF, and the text related to the BADCT upgrades for the WTP, the following minor clarifying revisions are proposed:

- Revise all references of “Phase”1 and 2 TSF to “Stage” 1 and 2 TSF to be consistent with engineering design report.
- Section 1.1: Refer to the “Hermosa Project” as shown in the redline copy in Attachment C.
- Section 2.1, third paragraph, fourth sentence will be revised as follows to clarify that PAG development rock from the exploration decline or shaft and surface construction is permitted for placement on the TSF: “PAG development rock **from site surface construction and** from a planned exploration decline or shaft**, filter cake from the water treatment plant, and core cuttings solids** will also be stored in the lined TSF as a co-mingled material with the existing tailings and PAG waste rock.

.

6 POLLUTANT MANAGEMENT AREA, DISCHARGE IMPACT AREA AND POINTS OF COMPLIANCE

The Pollutant Management Area (PMA) and Discharge Impact Area (DIA) are unchanged from the original APP application (Figure 4). The PMA was drawn to closely circumscribe the APP-regulated facilities, including the TSF, the Underdrain Collection Pond, and the extents of surface flows of the discharge from the WTP.

The location for a conceptual Point-of-Compliance (POC-1) is shown on Figure 4. It is downgradient of the TSF. The latitude and longitude are as follows:

Latitude: **31° 28' 15.21" N**
Longitude: **110° 43' 48.83" W**

POC-2 (MW-3) located 200 feet downgradient of the AZPDES discharge is located at:

Latitude: **31° 28' 18.91" N**
Longitude: **110° 43' 48.83" W**

POC-3 is a conceptual location approximately one mile to the north-northwest and downgradient of the WTP outfall. It is located at:

Latitude: **31° 29' 1.7" N**
Longitude: **110° 44' 16.4" W**

7 PROPOSED MONITORING REQUIREMENTS

The changes proposed in this amendment application do not require any revisions to operational monitoring or groundwater monitoring.

8 CONTINGENCY PLAN

The Contingency Plan will remain unchanged with the exception of Section 1.1 which updates the Emergency Response Coordinators as follows:

Emergency Response Coordinators

AMI's Emergency Response Coordinator (ERC) should be contacted immediately in the event of an emergency and is responsible for implementing the contingency plan. A primary and secondary contact including name, job title, address, office number and cell number is listed below:

Primary Contact – Emergency Response Coordinator (ERC):
Contact Name: Brent Musslewhite
Title: Director, Environment and Permitting
Address: 2210 East Fort Lowell Road Tucson, Arizona 85719
Office Number: 520-485-1300
Cell Number: 505-801-2977

Secondary Contacts – Back up ERC:
Contact Name: Sarah Richman
Title: Principal, Environment and Permitting
Address: 2210 East Fort Lowell Road Tucson, Arizona 85719
Office Number: 520-485-1300
Cell Number: 805-617-9300

Contact Name: Kara Haas
Title: Principal, Environment
Address: 749 Harshaw Road, Patagonia, AZ 85624
Email: Kara.haas@south32.net
Cell Number: 505-947-1738

9 COMPLIANCE SCHEDULE

AMI proposes the following compliance schedule for ADEQ's consideration:

Action	Completed by:
WTP As-Builts: The permittee shall submit as-built drawings for the WTP.	Within 90 days of commissioning of upgraded WTP.

10 PERMITTING AND LEGAL REQUIREMENTS

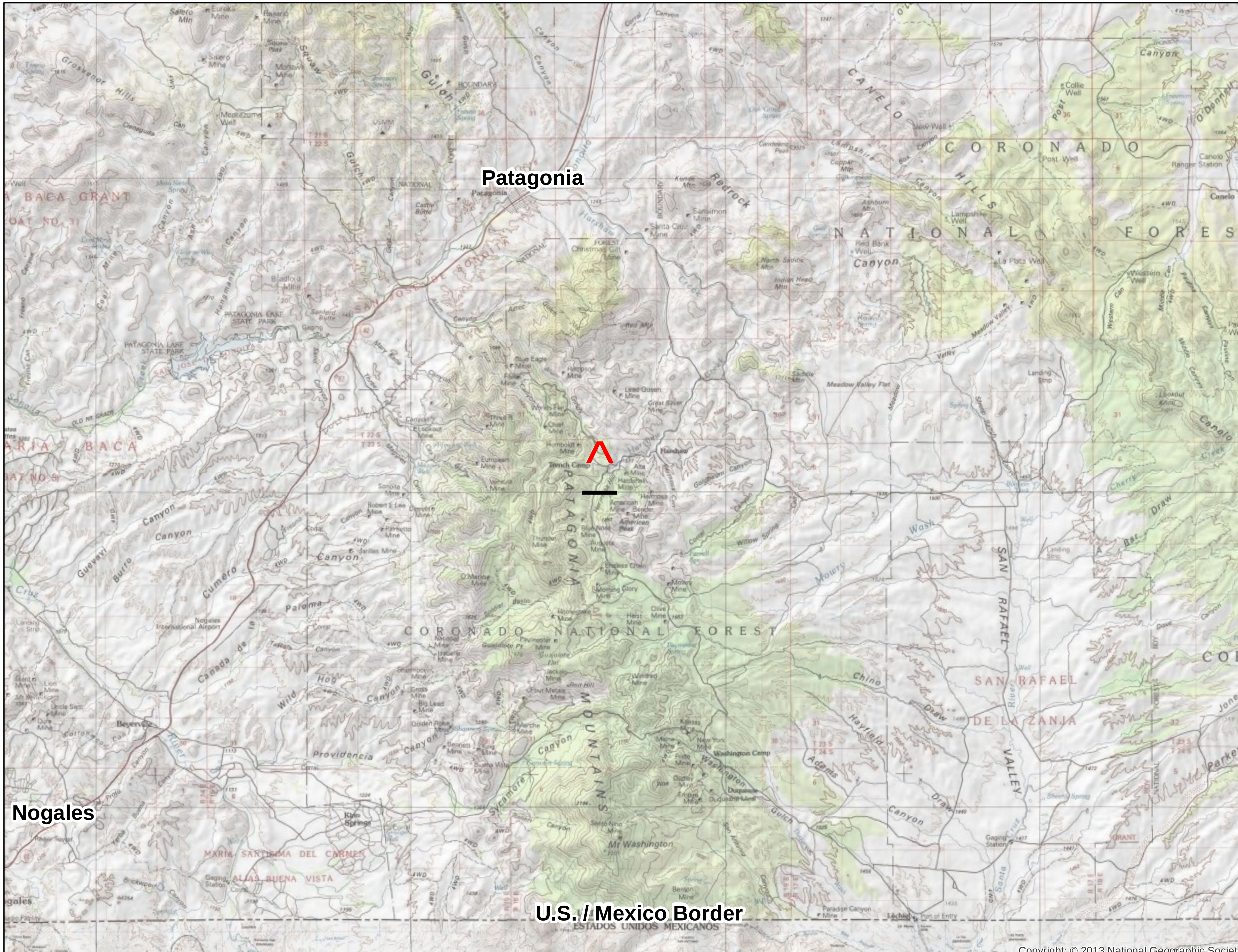
AMI currently has the following authorizations/permits:

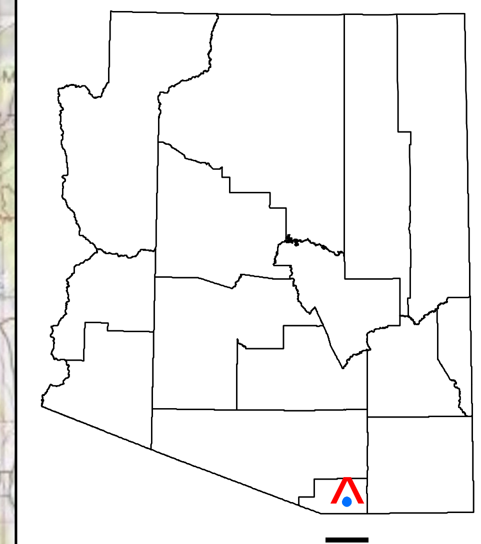
- Mining Multi-Sector General Permit Authorization AZMSG-67872;
- Arizona State Mine Inspector State ID# 13-03295;
- ADEQ Voluntary Remediation Program Site Code #505143-02.
- APP No. P-512235.
- AZPDES Permit No. AZ0026387.

11 REFERENCES

Arizona Minerals, Inc., 2017. ASARCO January Adit (Norton Mine) Aquifer Protection Permit Application, Santa Cruz County, Arizona. Submitted to Arizona Department of Environmental Quality, June 5.

FIGURES





Legend

Project Location

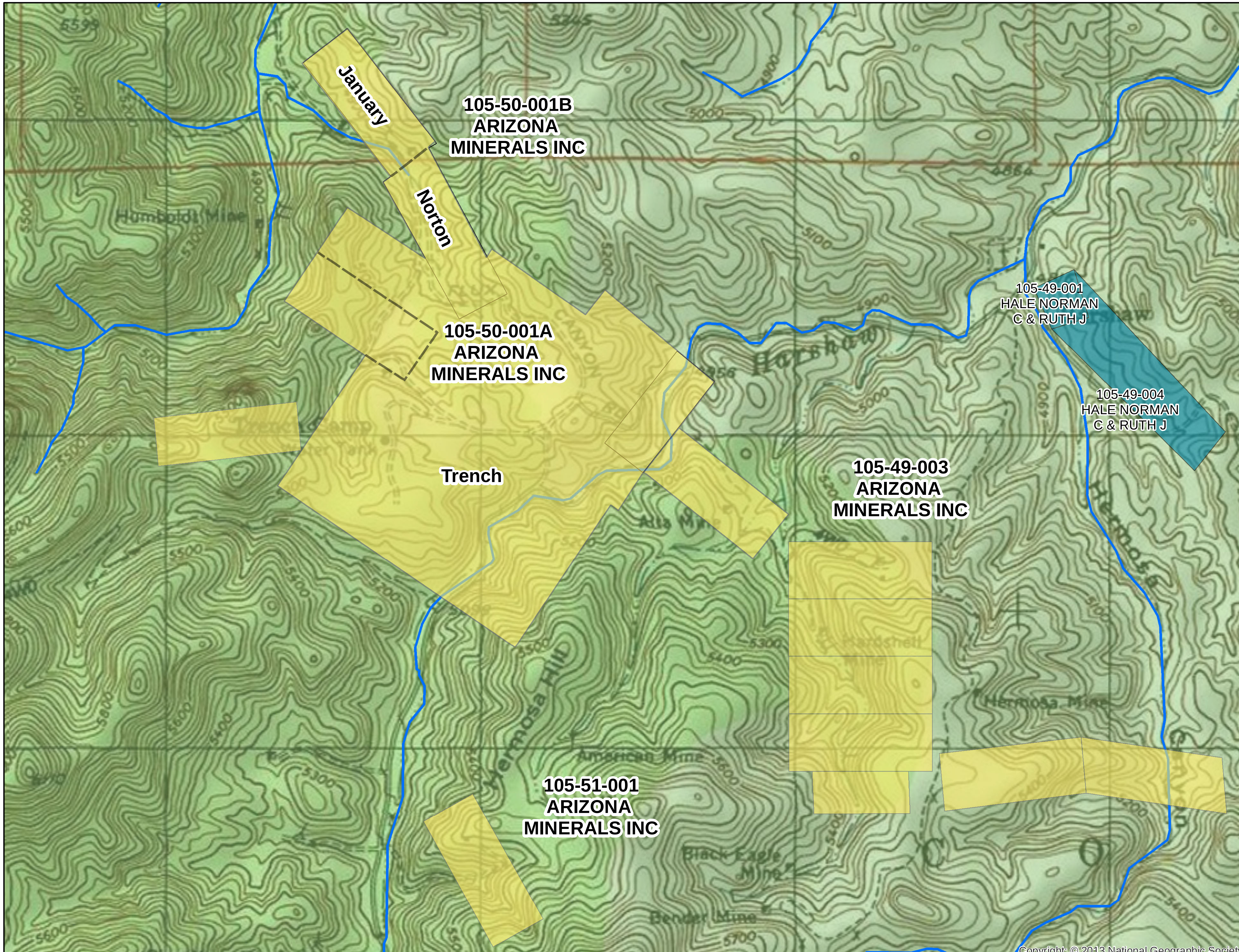
0 1 2 4
Miles

Projection: UTM Zone 12N NAD83

Date	5/28/2020	File ID	AZM-019B

CLEAR CREEK ASSOCIATES

FIGURE 1
Project Location
Hermosa Project
APP No. P-512235



Legend

- Arizona Minerals Inc. Properties
- USFS - Coronado National Forest
- Private Property

0 500 1,000 2,000

Feet

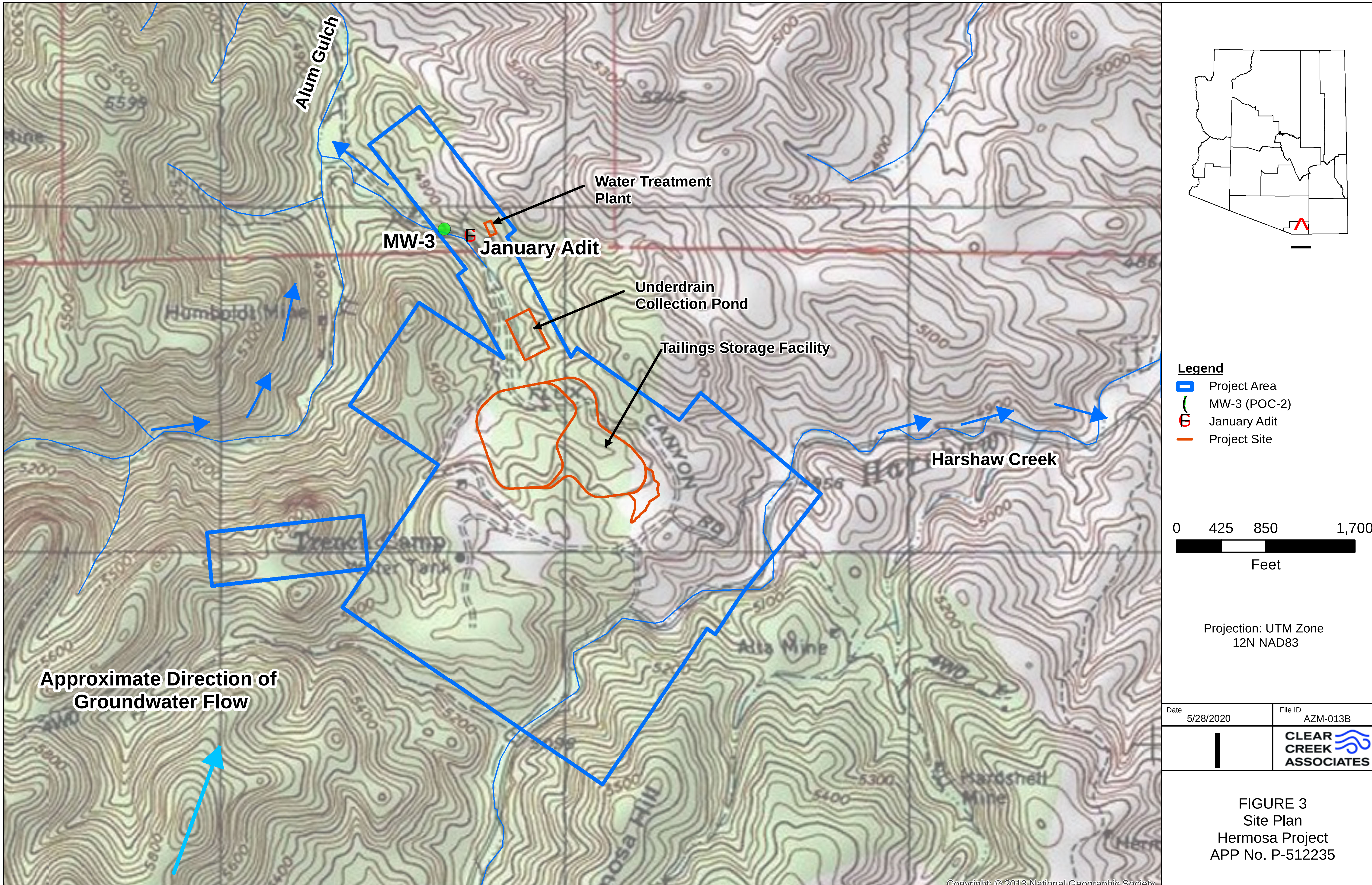
Projection: UTM Zone 12N NAD83

Source: https://gis.santacruzcountyaz.gov/arcgis/rest/services/ParcelSearch/Parcels/MapServer

Date	File ID
5/28/2020	AZM-014A

CLEAR CREEK ASSOCIATES

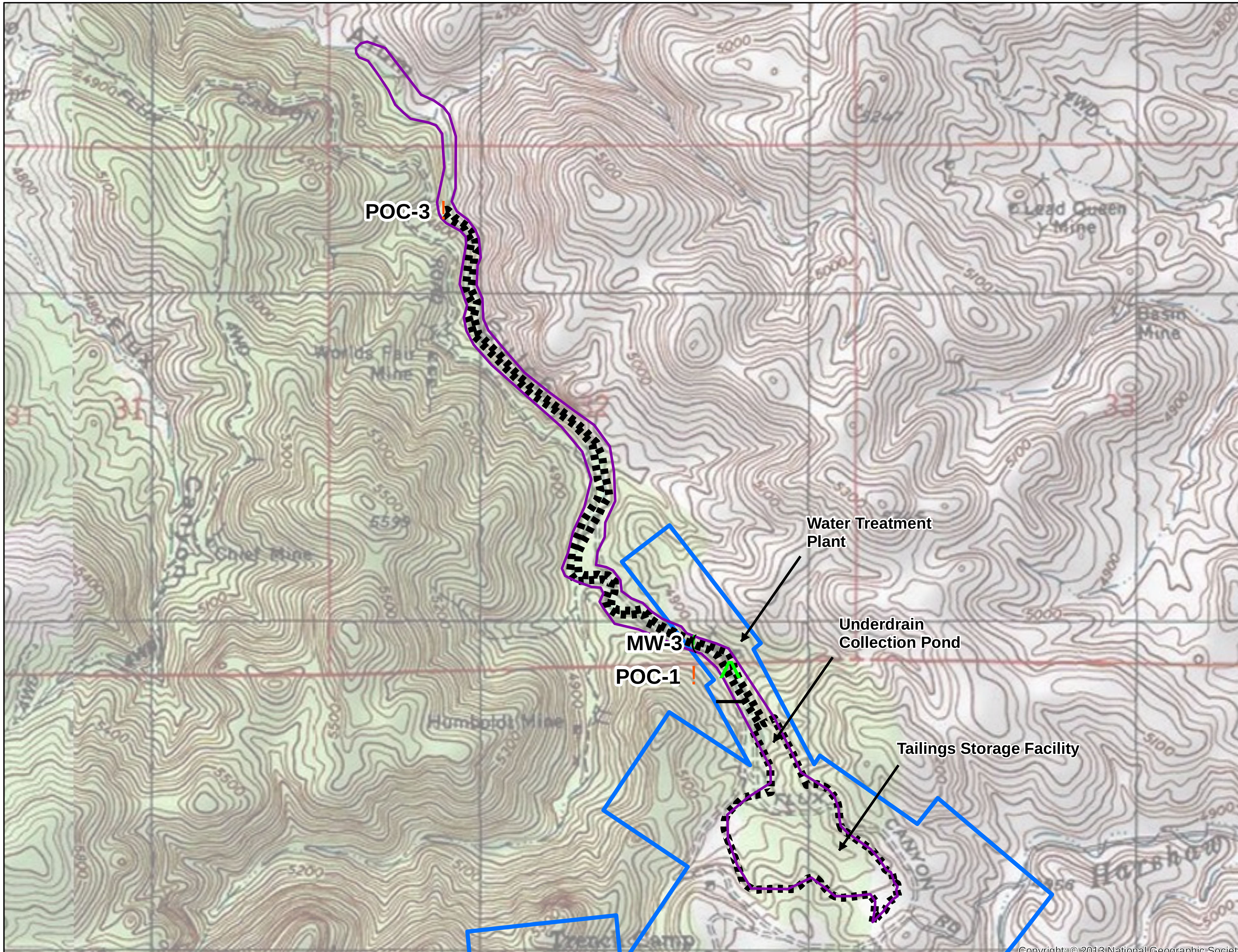
FIGURE 2
Land Ownership
Hermosa Project
APP No. P-512235



Date	File ID
5/28/2020	AZM-013B

CLEAR CREEK ASSOCIATES

FIGURE 3
Site Plan
Hermosa Project
APP No. P-512235



Legend

- Conceptual POC
- MW-3 (POC-2)
- Discharge Impact Area
- Pollutant Management Area
- WTP Discharge Point
- Property

0 750 1,500
Feet

Projection: UTM Zone 12N NAD83

Date	File ID
5/28/2020	AZM-033B

CLEAR CREEK ASSOCIATES

FIGURE 4
Hermosa Project
Pollutant Management Area, Discharge Impact Area, and Point of Compliance (POC)
APP No. P-512235

ATTACHMENT A

Water Treatment Plant Upgrades and Modifications

M3 Engineering

M3-PN190449
May 27, 2020
Revision 2

ARCHITECTURE
ENGINEERING
CONSTRUCTION MANAGEMENT

Hermosa Water Treatment Plant

WTP Upgrades and Modifications

Hermosa Project

Santa Cruz County, AZ

Prepared For:

ARIZONA
MINERALS

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
64339
ROBERT P.
DAVIDSON
Date Signed: 5/27/2020
ARIZONA, U.S.A.

HERMOSA WATER TREATMENT PLANT

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- South 32 RO and Sulfate Desaturation Summary of Lab Work

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- P100-00
- P101-00
- P102-00
- P103-00
- 18022-WTP-PFD-300-01
- 18022-WTP-PFD-300-02
- 18022-WTP-PFD-500-01
- 18022-WTP-PFD-600-01

I Proposed Upgrade Mechanical and Electrical Equipment Lists

- ERC Equipment List – BQE Water
- PN190449-Equipment Register_ENV

J Proposed Upgrade General Arrangements (GAs)

- 24350-EN-101

Abbreviations and Terms

Abbreviation or Unit	Term
ADEQ	Arizona Department of Environmental Quality
AMI	Arizona Minerals, Inc.
AODD	Air Operated Double Diaphragm
APP	State of Arizona Aquifer Protection Permit
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technology
BD	Below Detection
CEB	Chemically Enhanced Backwash
$CaCO_3$	Calcium carbonate
Cf	Cubic foot
CIP	Clean in Place
DI	deionized
DO	dissolved oxygen
EC	Electrical Conductivity
EQ Tank	Equalization Tank
ERC	Electro Reduction Circuit
FeCl	Ferric Chloride
Ft	Feet
ºF	Fahrenheit
GA	General Arrangement
g/l	Gram per liter
Gpm	Gallons per minute
HCl	Hydrochloric acid
Hp	horsepower
Lb	Pounds
M3	M3 Engineering and Technology Corp.
MBBR	Moving Bed Biofilm Reactor
MF	Membrane Filtration
mg/L	Milligrams per liter
µg/L	Micrograms per liter
µS/cm	Microsiemens per centimeter
NF	Nanofiltration
NaHS	Sodium Hydrosulfide
PAG	Potentially acid generating
PFD	Process Flow Diagrams
P&IDs	Piping and Instrumentation Diagrams
PLC	Programmable logic controller
Psig	Pound-force per square inch
RO	Reverse Osmosis
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TSF	Tailing Storage Facility
TSS	Total Suspended Solids
UCP	Underdrain Collection Pond
UF	Ultrafiltration
VRP	Voluntary Remediation Program
WET	Whole Effluent Toxicity
WTP	Water Treatment Plant

1 INTRODUCTION

1.1 REPORT OBJECTIVES

M3 Engineering and Technology Corp. (M3), on behalf of South 32's Arizona Minerals, Inc. (AMI), has prepared this report to document proposed upgrades and existing modifications made to the water treatment plant (WTP) at the Hermosa Project located in Santa Cruz County, AZ. Information presented in this report has been developed by multiple sources and studies performed by M3 and other consultants. This report details minor modifications made to the plant at the time of construction (for the purpose of additional polishing and to address the potential presence of residual ammonia which may be generated during exploration activities) and future upgrades proposed to the existing plant to further improve water quality prior to discharge. The upgrades proposed herein for the existing WTP include the basis of design, basic engineering and process philosophy as well as tie-ins to AMI's existing WTP. Since its installation and commissioning in September 2018, treated water from the WTP has been exclusively used onsite and has not been discharged to Alum Gulch. The following summarizes each section of this report:

- Section 2 describes the existing WTP permitting and the original basis of design. This section also summarizes the main process flows throughout the plant and provides details specific to minor process design modifications made to the plant since the original permit application. This section of the report includes revised process flow diagrams (PFDs), as-built piping and instrumentation diagrams (P&IDs), descriptions of the major mechanical equipment and pertinent equipment data which reflect the current operations of the WTP.

- Section 3 of this report describes the current WTP water quality data; test work and additional pilot studies completed to date.

- Section 4 of this report details the basic engineering design for the proposed upgrades to the WTP along with the plant process design philosophy, such that WTP treated water shall comply with the regulatory standards stipulated in the issued permits. This section of the report includes PFDs, equipment selection, sizing and proposed layout for the upgrades being considered for the existing WTP. The flow rate in or out of the WTP is not impacted by any of the proposed upgrades.

- Sections 3 and 4 of this report are intended to satisfy the Best Available Demonstrated Control Technology (BADCT) requirement pursuant to A.A. C R18-9-A202(A)(5) and ARS 49-243-B.1 and to replace the existing description of the WTP found in the Aquifer Protection Permit (APP) No. P-512235.

2 EXISTING WATER TREATMENT PLANT

This section briefly details the permitting and original basis of design of the existing WTP. Described herein are a detailed mass balance, PFDs, a process summary of the entire WTP, and a general arrangement of the as-built facility. The remainder of this section details process descriptions of modifications made to the plant during construction and includes as-built P&IDs illustrating these modifications, a list of all major mechanical and electrical equipment, instrumentation and controls highlighted to reflect these modifications. Current chemical reagent usage is also described.

2.1 WATER TREATMENT PLANT PERMITTING AND DESIGN HISTORY

In 2017, AMI submitted applications for both a State of Arizona Aquifer Protection Permit (APP) and an Authorization to Discharge under the Arizona Pollutant Discharge Elimination System (AZPDES) Permit. The applications were submitted for discharges associated with ADEQ's Voluntary Remediation Program (VRP) related to eliminating discharges of impacted water from the old January Adit mine workings, seepage from existing tailings piles containing potentially acid generating (PAG) waste rock and seepage through PAG development rock from planned exploration drilling. The application included a lined Tailings Storage Facility (TSF) for the permanent storage of the existing tailings and development rock as well as future-generated development rock. Seepage in the TSF is directed into a double-lined underdrain collection pond (UCP). The VRP also provided for an active WTP to process and treat the impacted waters from old mine workings and water captured in the UCP. In 2018, ADEQ authorized AZPDES Permit No. AZ0026387 allowing for discharge of treated water to Alum Gulch.[1]

2.2 ORIGINAL BASIS OF DESIGN

In the Water Engineering Technologies Report (2017), water chemistry from a 20:3 (January Adit to tailings seep water) mixture was characterized as the likely source water for the WTP (Table 2-1). In this report, water treatability jar tests were conducted to mimic different treatment strategies. Jar tests whereby the 20:3 mixed sample adjusted, to a pH of 10.5, along with aeration plus filtration, showed the most favorable results and thus formed the basis of the design criteria for the existing WTP, which may be found in the APP Application submitted to ADEQ on June 5, 2017. Veolia was contracted by AMI to provide detailed engineering, installation, and startup (including training) for the existing WTP. M3 was solicited to commission and support operations of the WTP after installation and startup.

[1] On May 22, 2019, ADEQ amended APP No. P-512235 after reviewing and approving the Alert Levels (ALs) and Aquifer Quality Limits (AQLs) at the facility Point of Compliance (POC).

Table 2-1: Original Raw Water Chemistry

Parameter	Units	Design Value JA Adit + Seep 20:3 Ratio(1)
pH(2)	s.u.	4.6
Temperature	ºF	55 – 80
Conductivity	µS/cm	6000
Hardness	mg/L $CaCO_3$	2300
Calcium, dissolved	mg/L	440
Magnesium, dissolved	mg/L	280
Total Dissolved Solids	mg/L	4400
Sulfate	mg/L	3100
Iron, dissolved	mg/L	<0.0044
Iron, total	mg/L	21
Arsenic, dissolved	mg/L	0.0030
Arsenic, total	mg/L	0.054
Beryllium, dissolved	mg/L	0.0045
Beryllium, total	mg/L	0.0058
Cadmium, dissolved	mg/L	0.23
Cadmium, total	mg/L	0.25
Copper, dissolved	mg/L	0.35
Copper, total	mg/L	0.38
Manganese, dissolved	mg/L	210
Manganese, total	mg/L	200
Nickel, dissolved	mg/L	0.23
Nickel, total	mg/L	0.29
Lead, dissolved	mg/L	<0.005
Lead, total	mg/L	0.011
Selenium, dissolved	mg/L	0.0081
Selenium, total	mg/L	0.011
Thallium, dissolved	mg/L	<0.0050
Thallium, total	mg/L	<0.00050
Zinc, dissolved	mg/L	84
Zinc, total	mg/L	91
Ammonia	mg/L	15

Notes:
1. Influent design based on normally treating a 20:3 blend of January Adit water and raw tailings seep water with the ability to treat 100 percent of either stream.
2. Assumed value for pH since no data provided.

2.3 PROCESS SUMMARY

The treatment process for the as-built WTP to treat 100% January Adit, 100% UCP or any combination of both waters is summarized as follows and depicted in the block flow diagram shown in Figure 2-1:

- January Adit or UCP water, or any combination thereof, is routed to an equalization (EQ) tank at a flow rate not to exceed 120 gpm;
- Water from the EQ tank is routed to a reaction tank within the MULTIFLO™ for pH adjustment to 10.5 and heavy metal precipitation using hydrated lime;
- Water from the reaction (or crystallization) tank flows continuously to a flocculation tank then onto a lamella partitioned clarifying or settling tank for liquid/solids separation. Polymer is added to the flocculation tank to enhance hydroxide floc formation and settling;

- Clarified overflow is routed to an ultrafiltration (UF) skid to further reduce suspended solids and particulate metals that carryover from the clarifier. Ferric chloride (FeCl) is added to enhance larger floc formation of unspent polymer;
- Water from the UF skid is pumped to a pH adjustment tank. Sulfuric acid is used to decrease the pH to between 6.5 and 7.5;
- Neutralized water flows by gravity to two Moving Bed Biofilm Reactor (MBBR) tanks and is treated for residual ammonia before collection in an effluent tank for use in exploration, dust control, construction purposes or eventual discharge to Alum Gulch;
- Sludge collected in the clarifier underflow is primarily routed to a sludge holding tank, with a portion recycled back to the crystallization tank;
- Sludge is routed to a filter press for dewatering; and lastly,
- Dewatered sludge or filter cake is transported to the TSF for permanent storage.

The existing WTP, as constructed to date, differs in the following aspects from that presented in the 2017 APP Application:

1. The permitted reaction (or crystallization) tank, flocculation tank and clarifier or settling tank all make up a single large unit (the MULTIFLO™) that is compartmentalized into each of these process units.
2. Clarified overflow is now routed to a new UF Unit skid. This unit was added to further clear suspended solids and particulates which may carry over from the clarifier unit.
3. Neutralized water flows by gravity to a set of MBBR tanks. Although not currently present in the raw water from either source, these tanks were installed for the treatment of ammonia in the event that ammonia levels increase in either water source during exploration activities.

The following subsections describe, in detail, the existing as-built Hermosa Project WTP including revised PFDs and GAs. P&IDs, the equipment list, and datasheets have been provided specifically for the UF and MBBR modifications that were made to the existing plant during construction to improve water quality.

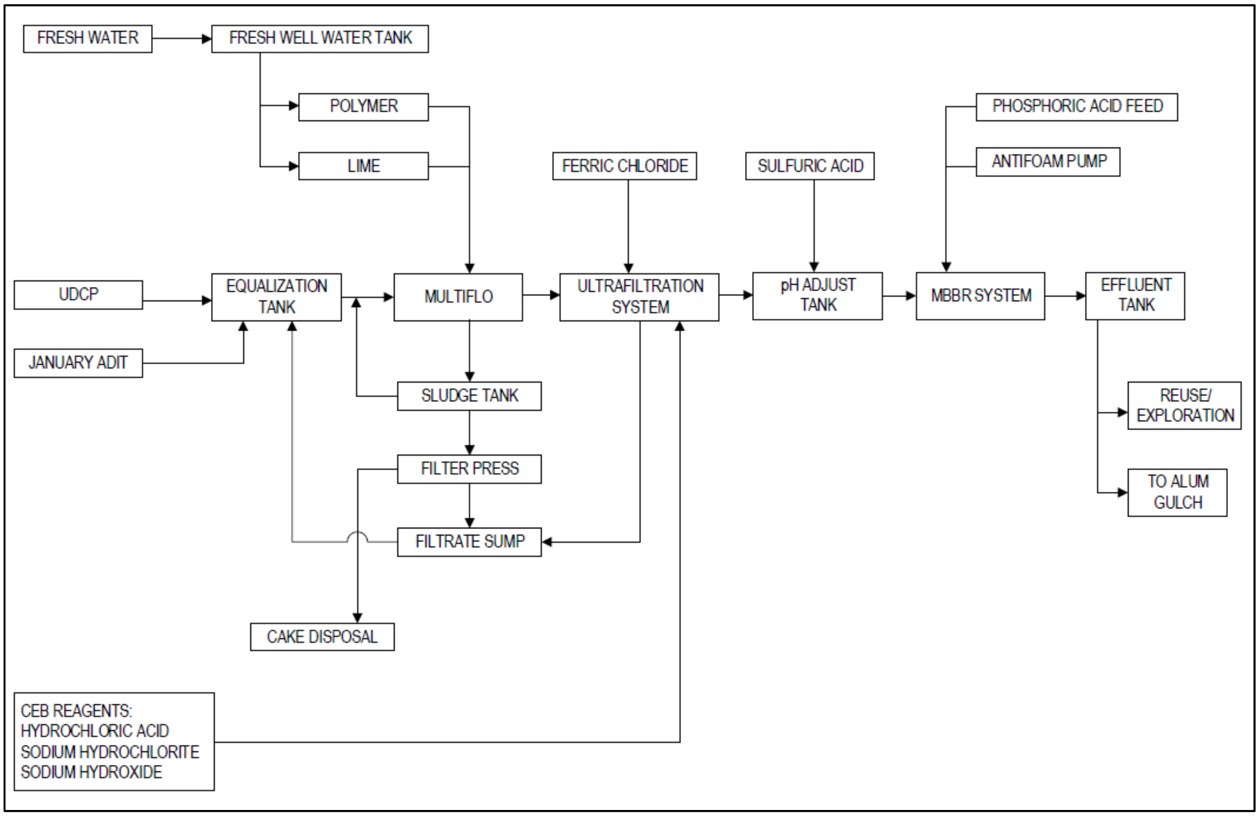


Figure 2-1: As-Built WTP Block Flow Diagram

2.4 PFD'S AND MASS FLOW FOR THE WTP

Detailed as-built PFDs including the mass balance of the existing water treatment plant are presented in Appendix A.

2.5 OVERALL LAYOUT

The general arrangement of equipment at the as-built WTP plant is included in Appendix B.

2.6 EXISTING PLANT PROCESS DESCRIPTION

A detailed description of the modifications made at the time of construction to the WTP is provided in the following paragraphs. Refer to the piping and instrumentation diagrams (P&IDs) and equipment list presented in Appendices C & D, respectively, for detailed information regarding the MBBR and the UF process modifications, including equipment dimensions, pump sizes, pipe sizes and materials of construction, and instrumentation. Equipment related to the UF skid and MBBRs are highlighted in the equipment list (Appendix D). Datasheets describing the UF skid and the MBBR system are presented in Appendix E.

Ultrafiltration System: Clarified water overflows a weir into a shallow launder and is conveyed by gravity to the 2,000-gallon ultrafiltration (UF) feed tank prior to being pumped to the UF unit. The primary function of the UF system is to remove any residual suspended solids from the clarified water. The UFLEX 6 ultrafiltration skid consists of the following: a feed pump and strainer, a valve skid and instrumentation panel, one membrane rack assembly with six UF membrane modules, a backwash pump and chemically enhanced backwash feed package (CEB) and a main control panel. FeCl is dosed into the discharge line of the UF feed pump to coagulate any suspended, unspent polymer/flocculant that is carried over from the MULTIFLO™. This mixture is filtered through six (6) UF membranes, each with an active area of

753 square feet and 0.02 micron pore size. The filtrate from the UF unit flows to the pH adjustment tank. The pH adjustment tank also serves as the source of backwash water for the UF system. Static mixers associated with the CEB package are tied into the backwash feed line to introduce the appropriate concentrations of sodium hypochlorite, sodium hydroxide and hydrochloric acid during the backwash cycle. UF feed flow is paused during the UF backwash cycle which occurs every 60 minutes and lasts approximately 2-3 minutes. During this time, clarified water accumulates in the UF feed tank. Chemical reagents for the backwash system are described in Section 2.9.

MBBR Tanks: The neutralized water from the pH adjustment tank then flows by gravity to two moving bed biological reactor (MBBR) tanks set in series. The intent of these tanks is to microbially clear residual ammonia via biological nitrification coupled to anaerobic ammonia oxidation prior to discharge. The MBBR tanks are filled with perforated plastic media disc 10-25 mm in diameter to encourage biofilm formation. Blowers are used to aerate the tanks thereby maintaining a constant dissolved oxygen (DO) concentration in the water and keeping the biofilm media well dispersed and suspended. Phosphoric acid is dosed at low concentrations to promote and maintain microbial growth while antifoam is added periodically to suppress foam formation. These tanks will be inoculated with a microbial consortium capable of nitrifying and anaerobically oxidizing ammonia to dinitrogen and water. For the time being, however, ammonia concentrations are below detection and the microbial consortium has not been introduced into the MBBR tanks.

2.7 PIPING AND INSTRUMENTATION DIAGRAMS

A set of as-built P&IDs for the existing plant modifications is included in Appendix C.

2.8 MAJOR EQUIPMENT

The major mechanical equipment list highlighting the UF and MBBRs for the WTP is shown in Appendix D.

2.9 CHEMICAL USAGE

The following chemicals are currently in use at the WTP:

- Hydrated Lime is added to the MULTIFLO™ in order to raise the pH to 10.5 to which results in a decrease in the solubility of the dissolved components in the raw water and aids in their precipitation.
- Polymer is added to the MULTIFLO™ flocculation tanks as an aid in the settling of solids.
- Ferric Chloride is added to the inlet to the UF unit at the ferric chloride injection quill to help coagulate suspended solid particles remaining in clarified water from the MULTIFLO™ and to aid in filtering at the UF unit.
- Sodium Hypochlorite is added to the UF unit during the CEB sequence as a disinfectant to remove biological growth on the UF membranes. It is injected after the UF Backwash Pump at the Sodium Hypochlorite Injection Quill.
- Sodium Hydroxide is added to the UF unit during the CEB sequence to increase the removal of organics from the UF membranes.
- Hydrochloric Acid is added to the UF unit during the CEB sequence and serves as an antiscalant for the UF membranes.
- Sulfuric Acid is added to the pH Adjustment Tank (TK-1050) in order to lower the pH in the pH Adjustment Tank to ~7.0 s.u.. A pH closer to neutral is optimal for UF unit operation.
- Antifoam is added to the MBBR Tank A intermittently to help disperse any foaming that may occur.

- Phosphoric Acid is added to the MBBR Tank A in order to provide the biomass with the essential nutrient phosphorous.

2.9.1 Chemical Reagent System Description

All of the reagents listed above are automatically pumped to their desired dosage locations as controlled by the chemical dosage rates set manually by the operator at the PLC control system. Current chemical usage rates are provided in the PFD presented in Appendix A. The chemicals are then automatically added on a flow paced basis measured by the flow meter/transmitters throughout the plant.

The reagent systems listed below are currently in use at the WTP specifically for the UF and MBBR:

- Antifoam: The Antifoam Pump is a solenoid-driven, diaphragm-type chemical metering pump, dosing antifoam solution to MBBR Tank A. The pump's stroke length is manually adjustable. The pump's stroke frequency is flow paced. The input signal controlling the Antifoam Pump's stroke frequency (dosing rate) comes from flow indicating controller.
- Phosphoric Acid: The phosphoric acid pump is a solenoid-driven, diaphragm-type chemical metering pump, dosing phosphoric acid to MBBR Tank A. The pump's stroke length is manually adjustable. The pump's stroke frequency is flow paced. Input signal control of the phosphoric acid pump's stroke frequency (dosing rate) comes from the flow indicating controller.

3 CURRENT WATER CHEMISTRY & ADDITIONAL TEST WORK

3.1 WTP INFLUENT & EFFLUENT WATER QUALITY

The current raw water quality analyses (Table 3-1) for both January Adit and UCP are similar to the water quality analysis used as the basis of design for the WTP (Table 2-1). Hardness ranges from 1350 mg/L to 2100 mg/L, calcium levels are approximately 400 mg/L, whereas sulfate levels tend to be lower, 2100 mg/L, compared to the level reported in Table 2-1. Current average total selenium levels are lower than those originally estimated using data from a 20:3 blend of January Adit to tailing seepage water.

Table 3-1: Current Raw (Influent) Water Quality and Stipulated Thresholds

Chemical Constituent (1)	Units	Average (Maximum) WTP Raw Water Chemistry		Targeted Water Quality	Stipulated Thresholds(2)		Recommended Level(3)
		January Adit	UCP		APP*	AZPDES	
pH	s.u.	6.1 - 7.4	4.1 – 8.4	6.5 – 9.0		6.5-9	
Conductivity	µS/cm	NR	NR	~ 1700	Monitor		1,550 to 1,750
Hardness	mg/L $CaCO_3$	2067 (2800)	1378 (2100)	~ 600	Monitor		~600
Ca, Dissolved	mg/L	475 (530)	297 (330)	< 500			
Fe, Dissolved	mg/L	3.5 (15)	0.012 (0.46)	<0.2	Monitor		
As, Dissolved	mg/L	0.004 (0.072)	0.009 (0.066)	< 0.02	0.04		
Cd, Dissolved	mg/L	0.002 (0.049)	0.006 (0.017)	<0.005	0.008		
Cu, Dissolved	mg/L	0.002 (0.035)	0.004 (0.031)	< 0.02	Monitor		
Mg, Dissolved	Mg/L	202 (280)	153 (170)	<200			
Mn, Dissolved	mg/L	31	28	< 2	Monitor		
Zn, Dissolved	mg/L	7.0 (35)	0.6 (2.5)	< 0.5	Monitor		
Fe, Total	mg/L	28.8 (100)	3.4 (55)	<0.81		0.819***	
As, Total	mg/L	0.087 (0.38)	0.011 (0.16)	<0.12		0.123***	
Cd, Total	mg/L	0.009 (0.043)	0.02 (0.33)	<0.0095		0.00953**	
Cu, Total	mg/L	0.006 (0.019)	0.01 (0.12)	< 0.024		0.0247**	
Ni, Total	mg/L	0.049 (0.12)	0.041 (0.48)	< 0.13		0.138***	
Pb, Total	mg/L	0.042 (0.17)	0.074 (1.4)	< 0.30		0.300**	
Se, Total	mg/L	0.001 (0.0053)	0.007 (0.016)	< 0.0016		0.0016***	
Zn, Total	mg/L	9.4 (38)	2.9 (37)	<0.31		0.311**	
Na, Total	mg/L	68	87	<120			
TSS	mg/L	169 (1000)	537 (8400)	<20		20**	
TDS	mg/L	3189 (3700)	2282 (2900)	< 1700	Monitor		
SO_4(3)	mg/L	2086 (3700)	1486 (2400)	~ 800			720 to 970
Nitrate (as N)(4)	mg/L		11.6 (18)	< 8.0	8.0		
Cl	mg/L	23	39	Equal raw water conc.			

Notes:

1. Any parameters or constituents not listed in the table above are assumed to not be present in the raw water at concentrations that will impact the treatment process or exceed the stipulated threshold. NR = not measured.
2. *APP data are the Alert Levels extracted from Table 4.2.2: Compliance Discharge Monitoring of the State of Arizona Aquifer Protection Permit No. P-512235 Minor Amendment Place ID 150279, LTF 71251.
   **AZPDES values were extracted from monthly average maximum allowable discharge limits in Table 1.b: Acute Effluent Limitations and Monitoring Requirements of Permit No. AZ0026387 Authorization to Discharge under the Arizona Pollutant Discharge Elimination System effective January 8, 2018 and converted to mg/L.
   ***AZPDES values were extracted from Table 2: Trace Substance Monitoring Requirements of Permit No. AZ0026387 Authorization to Discharge under the Arizona Pollutant Discharge Elimination System effective January 8, 2018 and converted to mg/L.
3. Sulfate (SO_4), hardness and electrical conductivity levels recommended to pass Whole Effluent Toxicity (WET) Monitoring for the Acute Toxicity Test.
4. Target nitrate levels are achieved by blending UCP and January Adit raw water in the Equalization Tank prior to treatment.

Since commissioning the WTP, numerous January Adit and UCP raw water samples have been taken directly at the inlet (influent) and outlet (effluent) of the WTP and have been analyzed for the same constituents regulated by the permits; APP No. P-512235 and AZPDES Permit No. AZ0026387. Table 3-1 presents the average water quality constituent concentrations found for both raw water influent sources to the WTP. Early trends of effluent samples taken from the existing WTP suggest that high total dissolved solids (TDS) and high sulfate levels are likely to cause failure of Whole Effluent Toxicity (WET) testing in accordance with AZPDES Action Levels.

Based on internal sampling results, total selenium is, at times, higher than the AZPDES Assessment Level (0.0016 mg/L) after treatment. This constituent, as well as sulfate, exists in anionic form (SeO^{2-} and SO_4^{2-}) with a significant fraction in soluble form under the current operating conditions of the WTP. As such, AMI has undertaken studies to evaluate alternative processes to bring these levels down. Section 3.2 presents the results from the additional test work and pilot studies conducted to evaluate alternative process systems for treating both sulfate and selenium.

3.2 ADDITIONAL TEST WORK & PILOT STUDIES

Section 3.2.1 presents results from test work and pilot studies conducted to evaluate alternative process systems to enhance the performance of the existing WTP to meet WET testing requirements and lower TDS and sulfate concentrations. Selenium speciation analysis and pilot studies were also conducted to identify a treatment process which lowers total selenium concentrations prior to discharge. The results of the latter studies are presented in Section 3.2.2.

3.2.1 WET Test Studies

AMI contracted Veolia to run tests to identify a treatment option to lower TDS and sulfate concentrations in WTP effluent water samples from both January Adit and UCP. Membrane filtration (MF) technology was used to produce a low TDS permeate solution which could be blended with WTP effluent water. Veolia shipped the permeate samples along with effluent water samples obtained from the existing WTP to the Ramboll Laboratory in Brentwood, TN to conduct chronic WET tests. Ramboll conducted (7-day) toxicity tests with *C. dubia* (water fleas) and *Pimephales promelas* (fathead minnow) in accordance with EPA-821-R-02-013, *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms* using a dilution series of 25, 50, 75, and 100 percent permeate to the WTP-treated effluent sample of the same influent water source; January Adit or UCP. Results from these tests demonstrated a strong correlation between a reduction in *C. dubia* reproduction rates and TDS measured as electrical conductivity and hardness for both water sources, UCP and January Adit. The fathead minnow tests indicated no mortality or reduction in growth in any of the January Adit dilution samples; whereas the UDCP 100 percent permeate sample did show increased mortality rates and reductions in growth of the minnow compared to the control.

The Ramboll Laboratory ran an additional series of tests using synthetic effluent samples similar to the dilution series used in the previous study. Here, triplicate toxicity tests were conducted with synthetic effluent made to simulate UCP and January Adit effluent samples from the WTP. For these tests, deionized (DI) water served to mimic the permeate. These results were compared to laboratory controls initiated for each test. Survival/mortality results from this set of tests were similar to those measured for the previous tests and in other similar WET test studies reported in the literature (de Vlaming, V., et al. 2000; Soucek, D. & A. Kennedy. 2005). From these results, Ramboll recommends WTP effluents be treated to reduce sulfate, hardness and electrical conductivity levels to between 720 to 970 mg/L, 600 mg/L as $CaCO_3$, and between 1,550 and 1,750 µS/cm, respectively.

At the same time, Veolia sent samples of filtered permeate and brine, along with different ratios of permeate to treated effluent from the existing WTP, for each water source for analysis of Total Metals, Dissolved Metals, Anions, TDS and TSS by Turner Laboratories Inc. Presented in Table 3-2 are the lab results for select metals including selenium for brine, permeate and permeate mixed at different ratios with January Adit and UCP effluent obtained from the existing WTP, respectively. Complete water quality data sets are presented in the Turner Laboratory Reports found in Appendix F. Veolia demonstrated that blending permeate with WTP effluent would achieve the recommended concentration ranges reported for sulfate, calcium and conductivity (Table 3-1).

Table 3-2: Select Metals in Blended Samples of WTP Effluent Processed via MF

Chemical Constituent	Units	100% Permeate	100 % Brine	75:25 Permeate : Effluent	50:50 Permeate : Effluent	60:40 Permeate : Desat. Brine
January Adit						
Hardness	mg/L $CaCO_3$	24	3500	490	860	1300
EC	µS/cm	110	6900		800	4800*
Ca, dissolved	mg/L	9.6	1300	180	320	520
Mg, dissolved	mg/L	BD	67	9.6	16	BD
As, Dissolved	mg/L	BD	0.0062	BD	BD	BD
Se, Dissolved	mg/L	0.0003	0.0062	0.0009	0.0013	0.0009
Pb, Dissolved	mg/L	BD	0.0054	BD	BD	BD
As, Total	mg/L	BD	BD	BD	BD	0.0001
Se, Total	mg/L	BD	0.0036	BD	BD	BD
Pb, Total	mg/L	BD	0.0045	BD	BD	0.008
Sulfate	mg/L	29	3500	500	910	640
TDS	mg/L	49	5400	800	1400	3000
UCP						
Hardness	mg/L $CaCO_3$	25	3500	440	800	790
EC	µS/cm	100	6600	940	1900	2300
Ca, dissolved	mg/L	10	1200	170	310	410
Mg, dissolved	mg/L	BD	26	3.6	6.5	BD
As, Dissolved	mg/L	BD	0.0033	0.0006	0.0012	BD
Se, Dissolved	mg/L	0.0003	0.022	0.0009	0.0059	0.0039
Pb, Dissolved	mg/L	BD	0.0054	BD	BD	BD
As, Total	mg/L	BD	BD	BD	BD	BD
Se, Total	mg/L	BD	0.020	0.0021	0.0048	0.0026
Pb, Total	mg/L	BD	0.0088	BD	BD	0.0006
Sulfate	mg/L	25	3500	440	830	870
TDS	mg/L	55	5500	710	1300	1600

BD = Below detection

*Note: Hardness and EC measurements for the 60:40 blend of January Adit permeate with desaturated January Adit brine (Table 3-2) were considerably higher than recommended. The former is due to excess lime addition and the latter is attributed to the addition of hydrochloric acid (HCl) to adjust the pH to meet discharge limits in this series of tests. The measurements reported for the UCP 60:40 sample were more in line with the recommended range for hardness and EC because the pH was adjusted using carbon dioxide instead of HCl. Lime addition during desaturation may be minimized if antiscalant levels are not excessive (antiscalant is used to prevent fouling of the membrane filter).

As with any MF treatment, there is a brine (or reject) stream to contend with Veolia also conducted a series of tests to treat the brine discharge stream generated during MF. Veolia's test work on the brine stream included the addition of 2 g/L hydrated lime along with ferric chloride and anionic flocculant (polymer) to effectively precipitate approximately half of the concentrated soluble sulfates and salts. Sludge (precipitate) generated from this reaction was concentrated further in a clarifier to reduce the overall brine stream requiring filtration and deposition into the TSF as a dry solid. The clarified brine liquid fraction was then blended with permeate. The results from this set of tests are presented in Veolia's South 32 RO and Sulfate Desaturation Summary of Lab Work by M. Taylor (2019) and in Table 3-2.

On the whole, these data suggest that blending of the desaturated brine with permeate is a practical approach for treating both influent water sources to achieve constituent levels meeting discharge limits while still maintaining a maximum outflow of 120 gpm and concentrating the brine stream.

3.2.2 Selenium Treatment Options

In Table 3-2, the data also suggest that total selenium levels may be reduced by blending existing WTP effluent or desaturated brine with permeate water; yet due to the total selenium screening level concentration of 1.6 µg/L, blending alone was determined to not be a viable approach for reducing total selenium levels. To evaluate how best to reduce these levels to the greatest extent possible, AMI obtained water samples at different stages of the process throughout the WTP to determine the relevant species of selenium (selenite or selenate). Selenate is more recalcitrant to precipitation than selenite. Results from this sampling event indicated that selenium exists only as selenate throughout the plant. Raw data are presented in the AZC Laboratory Analytical Report in Appendix F.

To reduce the concentration of total selenium in the final effluent of WTP, AMI considered the following methods:

1. Electroreduction of selenate to selenite / elemental selenium
2. Zero-valent iron reduction of selenate to selenium

The electroreduction of selenate is achieved when a direct electrical current is applied to water containing iron anodes. Iron released from anodes chemically reduces selenate and fixes selenium into a mixed iron oxide solid that has been demonstrated to be stable and pass Toxicity Characteristic Leaching Procedure (TCLP) tests.

Zero-valent iron (ZVI) chemically reduces oxidized selenate to selenite, then selenite to elemental selenium. However, passivation of ZVI surface tends to lead to relatively rapid decrease in selenium capture capacity and kinetics of removal from water. This makes ZVI not suitable for a long-term deployment at Hermosa.

In March 2020, AMI commissioned BQE Water to conduct bench scale testing of simulated MF-treated WTP effluent samples designed to lower total selenium concentration to < 1.6 µg/L by electro-reduction. Six tests were carried out using the initial selenium concentration of 20 µg/L (the upper limit of selenium concentration based on water quality data available) and two tests were conducted at a higher initial selenium concentration of 45 µg/L to assess capital and operating costs. This treatment involves the reduction of hexavalent selenium (selenate) into more reduced forms such as selenite and elemental selenium and subsequent precipitation as an insoluble iron oxyhydroxide. BQE reports selenium removal was consistent with good repeatability. In all tests, selenium was removed to below 1.6 µg/L. In order to ensure that ERC treatment would not result in unintended consequences for the operation and discharge of water from WTP, BQE tracked non-selenium constituents across the ERC. They demonstrated that a vast majority of constituents simply pass through the ERC process as inert salts. See BQE Water – 18033 - Hermosa WTP Treatability Report 20200417 in Appendix G for additional information.

As part of the BQE test work, other opportunities for improved treatment were identified: (1) Nanofiltration (NF) (another MF process) coupled to a minor process change of adding sulfide as the heavy metal precipitant rather than lime upstream at the MULTIFLO™ of the existing plant. (2) Soluble sulfide has been demonstrated to be an effective precipitant for the removal of heavy metals from industrial wastewater streams (Robinson & Sum.1980; Ye, M. et al. 2017). In this respect, BQE highlights, in their report, that the addition of sulfide at the MULTIFLO™ shall improve the efficiency of MF for the use of NF by reducing the scaling potential. Furthermore, they demonstrate that sulfide addition coupled to NF significantly improves the efficiency of the ERC unit. The proposed process changes also serve to minimize reagent consumption and process redundancy.

3.3 AMI SELECTED WTP UPGRADES

Based on the combined results of test studies completed by Veolia, Ramboll Laboratory and BQE, AMI has selected to upgrade and enhance the performance of the existing WTP by installing a NF unit coupled to a brine desaturation clarifier and ERC unit. An instrumentation-controlled blending strategy to mix filtered permeate from the NF unit with desaturated brine will be employed to maintain the recommended levels of sulfate, EC and hardness measurements. The ERC unit will treat the desaturated brine stream prior to blending with permeate to precipitate out soluble selenium to achieve discharge limits. Both reverse osmosis (RO) and NF are tested, proven and approved BADCTs shown to remove sulfates and reduce overall TDS from mine waters (Pérez-Gonzáleza, 2015) with the only difference being that RO removes both mono and divalent ions, whereas NF removes mainly divalent ions. Given the constituents of concern in the raw (influent) water requiring treatment at the Hermosa Project, AMI has elected to install a nanofilter to lower TDS and sulfate concentrations. ERC is a relatively new technology that effectively removes selenium from wastewater streams (BQE, 2017). The target constituent concentrations expected after combining these technologies with brine desaturation of sulfate into a single water treatment strategy are presented in Table 3-1.

Details regarding the selected upgrades to the WTP are presented in Section 4 and include major process flows (Section 4.2), a detailed process description (Section 4.3), new facility layout (Section 4.6), additional equipment lists (Section 4.4), and chemical usage (Section 4.5).

4 PROPOSED UPGRADES

The selected upgrades of the WTP are summarized below:

1) Nanofiltration of the WTP treated effluent, coupled to brine desaturation and sulfate precipitation, reject volume reduction to achieve the recommended sulfate, EC and water hardness levels in the final effluent.

2) Electroreduction of the desaturated brine stream to reduce selenate concentrations in the final effluent stream. Precipitated selenium will be dewatered to form a solid along with the other sludge (precipitated salts) streams via the existing filter press.

4.1 PROCESS SUMMARY OF UPGRADES

The upgrades proposed for the WTP to treat for excess sulfate and selenium are summarized below and are depicted in the block flow diagram shown in Figure 4-1.

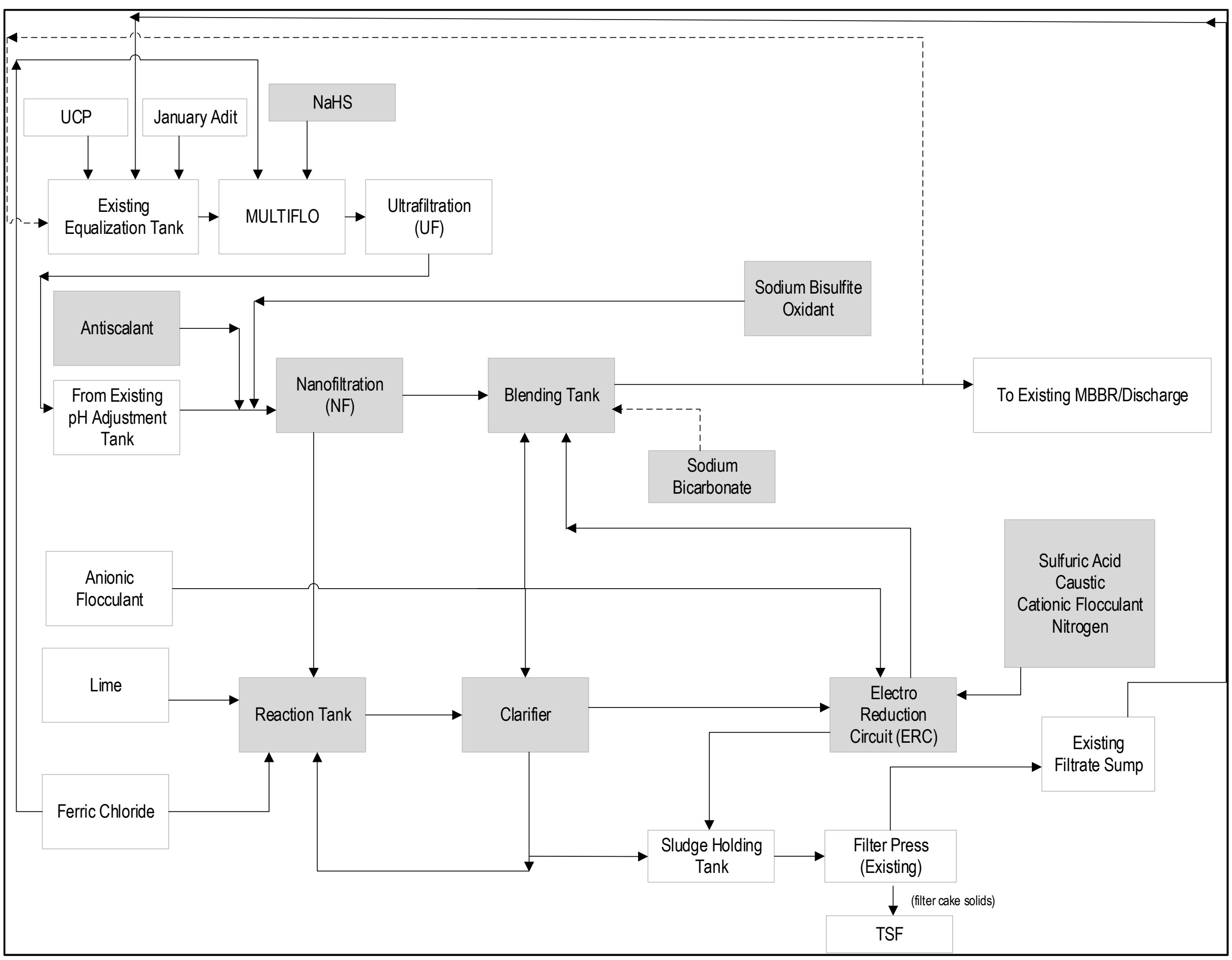
- Raw water will be treated primarily with sodium hydrosulfide (NaHS) to precipitate metals at the MULTIFLO™ rather than lime. Switching to soluble sulfide addition at this stage of the process serves to reduce scaling, membrane fouling and reagent consumption. Lime addition at the MULTIFLO™ will be intermittent on an as needed basis for pH adjustment.
- After processing the raw water through the existing MULTIFLO™ and UF skid of WTP, neutralized filtered water at the existing pH adjustment tank will be diverted to a new NF unit.
- Filtered water or permeate recovered (at 50% to 60% of the original flow) from the NF unit will be conveyed to a new blending tank.
- Brine recovered (at 40% to 50% the original flow) from the NF unit will be directed to the desaturation reaction tank where Ferric Chloride, Lime and recycled clarifier underflow are mixed to promote further gypsum precipitation.
- The reject brine gypsum mixture is routed to a flocculating clarifier along with the existing anionic flocculant (polymer) to separate, flocculate, and precipitate the suspended solids, particulate metals and thicken gypsum. The precipitated sludge is raked to the clarifier underflow and pumped to the existing sludge holding tank.
- Overflow from the clarifier is pumped through the ERC to reduce selenate prior to blending with permeate at the blending tank to achieve a pH between 7 and 8 to maximize the volume of water permissible for release to Alum Gulch or for reuse. Sodium bicarbonate may be used to ensure the water is consistently meeting pH targets.
- The blended water is pumped to the existing MBBR tanks or the existing effluent tank if the water is within specification. If turbidity and conductivity are out of spec, the water will be diverted to the EQ tank and cycled back through the process.
- Selenium-laden solids, generated by the ERC of the desaturated brine, are pumped to the existing sludge holding tank along with sludge accumulated in the desaturation clarifier and MULTIFLO™ underflow. This sludge is pumped to the existing filter press for dewatering; and lastly,
- Dewatered sludge or filter cake is transported to the TSF for permanent storage.

4.2 UPGRADE PFDS AND MASS FLOWS

4.2.1 Nanofiltration and Desaturation Process Flows

A set of PFDs for the proposed upgrades to the WTP, showing the major flow streams of the process, is attached in Appendix H. The goal of the NF and desaturation stages of the proposed upgrades is to concentrate sulfate and TDS into a brine stream. Sulfate levels in the brine stream are desaturated with lime, polymer and coagulant to form gypsum, which is precipitated along with other hydroxide and carbonate salts in the clarifier. The heavier sludge generated in the clarifier is directed towards the underflow with approximately 10% of the sludge pumped to the existing sludge holding tank for dewatering at the existing filter press. Ninety percent of the sludge underflow is recycled back to the reaction tank to seed the precipitation of gypsum. Soluble sulfate and other salts in the overflow of the clarifier are diluted with filtered permeate to lower the water hardness, TDS including sulfate levels and allow for the release of more treated water to the final effluent tank. Filter cake volume is anticipated to increase from the current filter cake volume of 147 cubic feet per day to 265 cubic feet per day.

Selenium (as selenate) does not traverse the NF membrane to the permeate stream, but neither does it undergo a reduction in concentration in the desaturation process. Therefore, to ensure total levels of selenium are reduced in the final effluent stream, ERC has been proposed (Section 3.2.2).



Note: Grey blocks represent upgrade process to the existing WTP.

Figure 4-1: Block Flow Diagram for Upgrades to WTP – for Sulfate and Selenium Reduction

4.2.2 Selenium Reduction Process Flows

A second set of PFDs developed by BQE for the ERC is presented in Appendix H. Here, selenate in the desaturated brine stream, is reduced to elemental selenium in nitrogen blanketed electrocells and precipitated out of solution as an inorganic iron oxyhydroxide. The precipitated selenium is separated from the desaturated brine in a series of clarifying/reaction tanks. The selenium-laden solids in the underflow of the clarifiers are then conveyed to the sludge holding tank and dewatered using the existing filter press. BQE demonstrated that these selenium laden solids are stable, having passed TCLP tests (Appendix G). To maximize water discharged off site, selenium-free desaturated brine is then blended with NF permeate, at a blend ratio which achieves target threshold.

4.3 UPGRADE PROCESS EQUIPMENT DESCRIPTIONS

The proposed upgrades for WTP to reduce TDS, including sulfate and selenium, are described in the following paragraphs. Refer to the PFDs in Appendix H for further information, and a visual guide as to the process flows described below. Equipment lists found in Appendix I give further information on equipment sizes. Input and output flows are not impacted by the modifications made or proposed upgrades for the WTP.

Nanofiltration System: The NF filter unit will consist of a feed pump delivering WTP effluent at a flowrate of 120 gpm from the existing pH adjustment tank, a 5 micron cartridge filter, and a skid mounted NF unit. Antiscalant and an intermittent sodium bisulfite stream will be injected into the discharge line of the feed pump via injection quills and chemical metering pumps. These chemicals prevent scaling and protect the membrane from any residual oxidant, respectively. Salts retained against the membrane vessels are rejected as brine. Filtered water passing through the membranes is recovered and directed towards the permeate tank. The brine stream is directed toward the reaction tank for sulfate desaturation and salts precipitation/clarification. Oxidant is introduced upstream of the membrane system in order to disinfect the water and protect the membranes from biofouling. Membrane will require periodic cleaning which will be accomplished using low and high pH flush; the design of which will be incorporated into the NF package as “Clean-in-Place” (CIP) system.

Permeate Tank: Filtered water, or permeate, is collected in a 500-gallon tank before it is pumped to the pH adjustment tank via the permeate booster pump, which is a centrifugal pump sized for 72 gpm.

Reaction Tank: Brine, or reject, from the NF is piped to a 3000-gallon reaction tank and reacted with hydrated lime and anionic flocculant (AKA polymer) supplied from the existing WTP lime and polymer systems, respectively. Ferric chloride will be added to the flocculating desaturation clarifier to encourage precipitation, flocculation and coagulation of gypsum and hydroxide salts. This tank is equipped with an agitator to ensure adequate mixing of the reagents and brine water. The lime addition rate will be regulated under pH control. Lime usage will be determined upon startup and commissioning of the WTP upgrade for mass balance verification purposes. The hydraulic residence time in the reaction tank is designed for 1 hour at the 48 gpm design flowrate, corresponding to a 40% reject rate for the NF. pH is controlled via the output signal from the pH probe to the control valve on a separate hydrated lime pipeline routed from the existing lime system.

Desaturation Clarifier: Water from the reaction tank will overflow directly into a 14-foot diameter clarifier for liquid/solids separation of the brine reject mixture. An Anionic Flocculant from the existing flocculation system is added to the clarifier center well, where a slotted flocculator assists with gypsum and hydroxide floc formation. As the flocs settle in the water column, an internal impeller circulates the solids within the center well to mix with incoming solids formed in the reaction tank. Solids separate in the water column within the tank and settle to the bottom of the tank. Clarified water overflows the internal weir at the top of the tank and is conveyed to the Selenium reduction unit or ERC by gravity. Sludge formed in the feed well of the clarifier as gypsum and metal hydroxide solids are directed to the cone-shaped bottom of the clarifier via a mechanical rake. The sludge is pumped from the cone bottom to a second sludge holding tank. A portion of the pumped sludge is diverted back to the reaction tank where it serves as a seed bed to encourage solids precipitation.

Selenium Reduction Unit: Desaturated brine will gravity flow from the clarifier overflow to the ERC feed tank where it is pumped via the ERC feed pump to one of three Recirculation Tanks, where each Recirculation Tank is hydraulically linked to a single electrocell. The brine solution is recirculated from the recirculation tank through its respective electrocell using the connected Recirculation Pump. In these electrocells, iron anodes are dissolved into solution to precipitate the selenate out of solution as an inorganic iron oxyhydroxide laden with selenium.

During electrocell operation, sulfuric acid is used to control the pH in the recirculation tank. The recirculation tank is sealed and maintained under lightly positive pressure using a nitrogen blanket line from the nitrogen generator and a low-pressure relief valve. Hydrogen gas produced in the electrocells and evolving out of solution in the recirculation tank will be contained and confined to the recirculation tank headspace and off-gas header. Moreover, two air blowers will be used to provide continuous and constant flow of sweep air passing through the ducting (enclosing the recirculation tank headspace and low-pressure relief valve) to dilute hydrogen at the exhaust point to environment. The air blowers will be installed in parallel with flow detection to ensure continuous sweep air. One blower will be in active duty operating at 100% with the other on standby in the event that the primary blower goes out of operation.

The recirculation tanks and associated electrocell banks are operated in batch mode; where the batch lengths are offset by 1/3 in order to average out flow rates to downstream equipment. When a batch is complete, the recirculation tank is drained into the Aging Tank, which buffers the flow from the recirculation tank and allows the aging pump to produce a steady flow into an ERC clarifier. Flocculant is added at this point to promote solids settling in the clarifier and clear desaturated selenium-free solution overflows into the polishing reactor. Sulfuric acid and caustic are used to control the pH in this reactor. A small quantity of ferric oxyhydroxide solids is generated in this process, which is then settled and thickened in the downstream polishing clarifier. Again, flocculant is added to this clarifier to aid settling. A portion of the underflow is recycled back to the polishing reactor via the polishing reseed pump to seed the polishing reactor to improve reaction efficiency and solids settling.

The remainder of the underflow polishing clarifier and underflow from the electroreduction is conveyed by air diaphragm pumps to the second sludge holding tank. From here, slurry is pumped to the existing sludge holding tank and then to the existing Filter Press, adding an estimated filter cake volume of 10 cubic feet per day.

The treated selenium-free and impurities-free desaturated brine overflows from the polishing clarifier into the polishing clarifier overflow tank and pumped from here to the Blending Tank where it is blended with the NF permeate.

Blending Tank: ERC clarified effluent is routed to a second new pH adjustment tank and mixed with the permeate to achieve an effluent of the desired water quality characteristics presented in column four of Table 3-2 above. Effluent quality water will be pumped to the existing effluent tank for use at the mine site or discharged to Alum Gulch. The salt content and electrical conductivity of the treated water in the blending tank is tightly controlled such that water not meeting the effluent standards is diverted back through the system. pH levels will be elevated to between 7 and 8, if necessary, with sodium bicarbonate.

Filtrate Sump & Pump: Water in the filtrate sump will be pumped to existing equalization tank, MBBR tanks or the effluent tank. The discharge location is dependent on the water quality signal relayed from a turbidity sensor on the discharge line of the drum filter to a diverter control valve.

Secondary Containment Sump & Pump: The upgrade of WTP shall be located immediately northwest of the existing WTP on an engineered foundation and concrete slab designed to convey all potential spills or accidental overflows from the process equipment/tank into a common area sump. From here, the fluid is pumped to the existing filtrate sump and pumped back to the existing equalization tank for re-treatment.

4.4 PROPOSED MAJOR EQUIPMENT

The major mechanical and electrical equipment lists for upgrades to reduce both sulfate and selenium levels are provided in Appendix I.

4.5 PROPOSED CHEMICAL USAGE

All of the reagents listed below are automatically pumped to their desired dosage locations as controlled by the chemical dosage rates set manually by the operator at the new PLC control system for the WTP upgrade. The chemicals are then automatically added on a flow paced basis measured by the flow meter/transmitters throughout the upgrade of the plant.

Table 4-1 lists the design dosage rate for each of the process chemical reagents used to lower the overall sulfate concentration in the proposed upgrades to the WTP.

- NaHS is added to the existing MULTIFLO™ to precipitate soluble metals at a circumneutral pH, effectively replacing lime.
- Antiscalant is added prior to NF vessels to minimize scaling.
- Sodium Bisulfite reduces free chlorine concentrations entering the NF vessels.
- Oxidant lowers the risk of membrane fouling caused by manganese and/or microbial growth.
- Ferric Chloride is added to the reaction tank to coagulate suspended solids, creating additional particles remaining in reject or brine.
- Hydrated Lime is added to the reaction tank to raise the pH to ~ 9, which results in a decrease in the solubility of many of the salt constituents in the reject or brine stream. The upgrade will make use of the existing hydrated lime skid. Lime will be added intermittently to the MULTIFLO™ to maintain a circumneutral pH.
- Polymer (Anionic Flocculant) is added to the MULTIFLO™ and new desaturation clarifier to aid in the settling of solids.

Table 4-1: Chemical Usage for the Sulfate Reduction

Chemical Reagent	Dosage (mg/L)	Concentration (%)	Specific Gravity	Volumetric Flow		
				GDP	gph	lb/h
MULTIFLO ™ NaHS		35		Intermittent		
Reaction Tank Hydrated Lime	2000	10		1225	51	48
Reaction Tank Polymer	6	0.2	1.06	120	5	5
Reaction Tank Ferric Chloride	10	40	1	5	0.2	0.15
Antiscalant	8	30	1.42	3	0.125	0.1
Oxidant	48	20	1.1	48	2.0	1.613
Sodium Bisulfite	7	5	1.24	24	1.0	0.980

Table 4-2 is a list of reagents and projected usage rates for the ERC.

Table 4-2: Chemical Usage for Electro Reduction Circuit (ERC)

Reagent	Unit	Value	Stock Concentration	Notes
Sulfuric Acid	lbs/d	121	93%	
	gpd	8.7		
Caustic	-	Intermittent	10%	
Sodium Bicarbonate		Intermittent	3%	To be added to blending tank
Ferric Chloride	lbs/d	81.4	70%	
	gpd	6.6		
Flocculant, Anionic	lbs/d	3.6	dry solids	
Flocculant, Cationic	lbs/d	0.6	dry solids	
Nitrogen	SCFD	3500		

4.6 PROPOSED WTP UPGRADE LOCATION

The footprint of the proposed upgrade to WTP shown in Figure 4-2 is immediately south of the existing plant and covers approximately 5,800 square feet. The upgrades to the WTP will tie directly into the existing plant as shown in the General Arrangement presented in Appendix J.

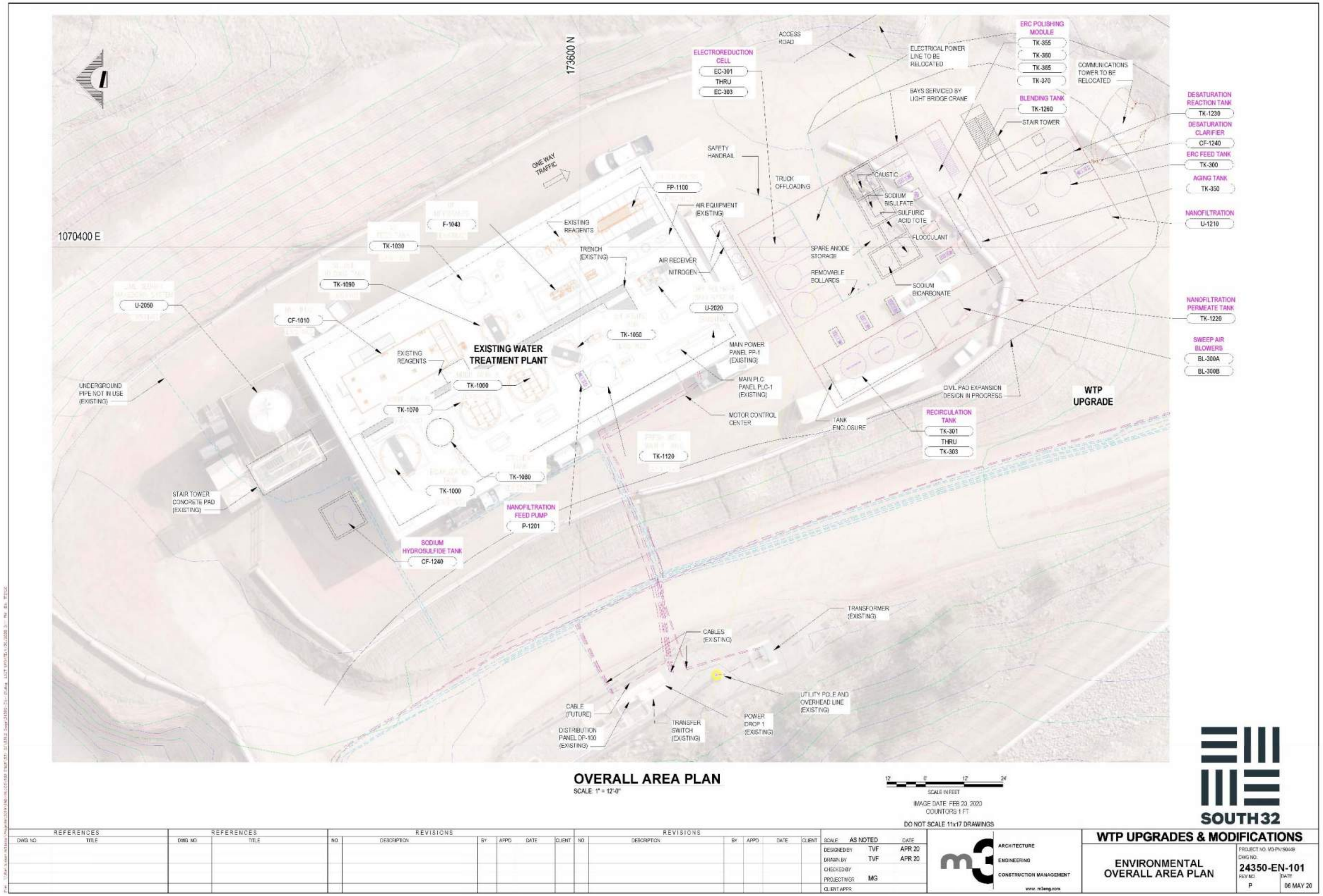


Figure 4-2: Overall Site Plan

5 REFERENCES

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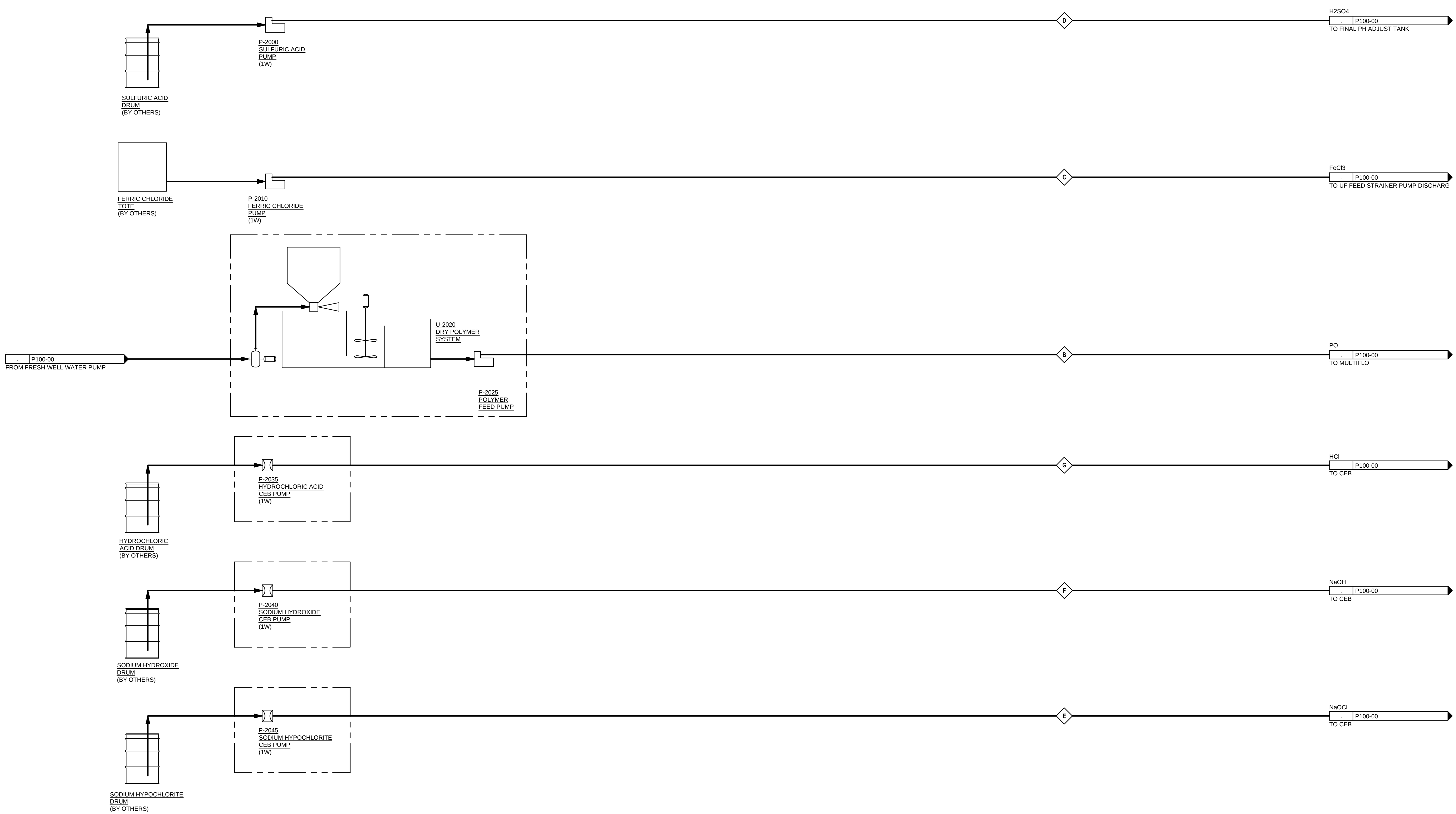
APPENDIX A: EXISTING PLANT PROCESS FLOW DIAGRAMS



REV. NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	REVIEWED BY	APPROVED BY	DESCRIPTION
0	4-13-18	L. HAUBACH	K. BENSON	L. STUDEBAKER	J. PITTS	ISSUED FOR CONSTRUCTION

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VEOLIA

INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA. TEL. 1-412-809-6000

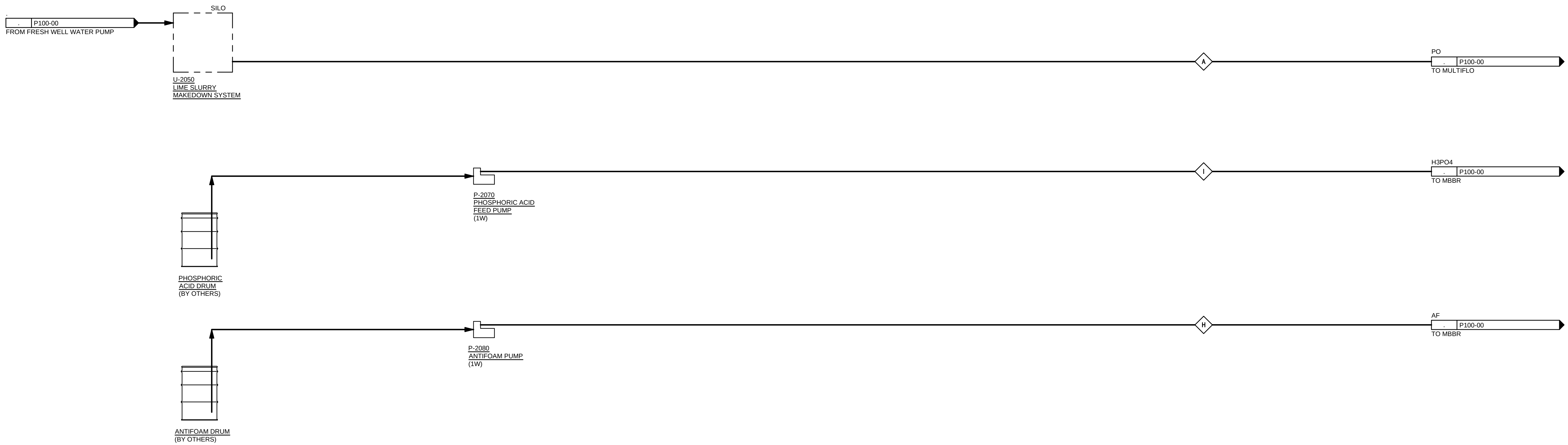
SCALE: NONE
DRAWN BY: W. KONYHA

TITLE:
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

PFD
CHEMICALS
(1 OF 2)

DWG. NO. 5600217059-VWP-PX-PFD-P101-00
REV 0

\\USPIT01CADD\PIDProjects\5600217059 – ARIZONA MINERALS\PID DWG\5600217059-VWP-PX-PFD-P101-00.dwg



NOTES:

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0	4-13-18	L. HAUBACH	K. BENSON	L. STUDEBAKER	J. PITTS	ISSUED FOR CONSTRUCTION

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SCALE: NONE
DRAWN BY: W. KONYHA

TITLE:
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

PFD
CHEMICALS
(2 OF 2)

DWG. NO. 5600217059-VWP-PX-PFD-P102-00
REV 0

\\USPIT01CADD\PIDProjects\5600217059 – ARIZONA MINERALS\PID DWG\5600217059-VWP-PX-PFD-P102-00.dwg

		MINE RAW WATER (1)	RAW SEEP WATER (1)	COMBINED 20:3 MINE TO SEEP (1)	EQUALIZATION TANK EFFLUENT	MULTIFLO EFFLUENT	MULTIFLO UNDERFLOW	SLUDGE RECIRCULATION	SLUDGE HOLDING TANK FEED	FILTER PRESS FEED	FILTER PRESS FILTRATE	FILTER CAKE	UF FEED TANK
	UNIT	(1a)	(1b)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Volumetric flow	GPM	120	120	120	137	129	139	20	10	10	8.10	1.90	128.6
							44	44	44	50.0	50.0		
Min. temperature	deg F	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Ave. temperature	deg F	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Max. temperature	deg F	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
Sp. gravity		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.2	1.0
pH	SU	7.2	3.5	4.6	5.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	9.4
SULFATES	PPM	2,200	8,800	3,100	3,153	2,900	4,224	4,224	4,224	4,224	4,224		2,900
TOTAL DISSOLVED SOLIDS	PPM	3,200	12,296	4,366	4,690	4,114	4,114	4,114	4,114	4,114	4,114		4,114
TOTAL ALKALINITY (AS CACO3)	PPM as CaCO3			150	100	100	100	100	100	100	100		100
TOTAL AMMONIA (AS N)	PPM as N	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0		15.0
TOTAL SUSPENDED SOLIDS	PPM	10	10	10	200	10	50,000	50,000	50,000	50,000	3,086	250,000	10

		UF FEED	UF EFFLUENT	UF BACKWASH & CEB WATER	UF BWW & CEB WASTE	pH ADJUSTMENT TANK EFFLUENT	MBBR EFFLUENT	EFFLUENT TANK	FILTRATE SUMP EFFLUENT	FRESH WELL WATER TANK INFLUENT	WATER TO LIME SILO	WATER TO DRY POLYMER
	UNIT	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Volumetric flow	GPM	128.6	128.6	9.3	9.3	119.4	0.0	119.4	17.4	1.9	1.0	0.1
		156.0		490.0	490.0		119.4		20.0	20.0	20.0	20.0
Min. temperature	deg F	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0	55.0
Ave. temperature	deg F	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Max. temperature	deg F	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
Sp. gravity		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
pH	SU	9.4	9.4	6 - 9	6 - 9	7.0	7.0	6 - 9	7.0	7.0	6 - 9	7.0
SULFATES	PPM	2,900	2,900	2,900	2,900	2,905	2,905	2,905	3,518	0	36	36
TOTAL DISSOLVED SOLIDS	PPM	4,120	4,114	4,114	4,139	4,118	4,133	4,132	6,932	0	350	350
TOTAL ALKALINITY (AS CACO3)	PPM as CaCO3	100	100	100	-544	150	46	46	-244	0	260	260
TOTAL AMMONIA (AS N)	PPM as N	15.0	15.0	15.0	15.0	15.0	0.2	< 0.2	15.0	260.00	0.0	0.0
TOTAL SUSPENDED SOLIDS	PPM	10	0.5	0.5	132	0.5	10	10	1,511	0	10	10

REV. NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	REVIEWED BY	APPROVED BY	DESCRIPTION
0	4-13-18	L. HAUBACH	K. BENSON	L. STUDEBAKER	J. PITTS	ISSUED FOR CONSTRUCTION

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VEOLIA

INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA. TEL. 1-412-809-6000

SCALE: NONE

DRAWN BY: W. KONYHA

TITLE:
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

MASS BALANCE
PROCESS

DWG. NO. 5600217059-VWP-PX-PFD-P120-00

REV 0

\\USPIT01CADD\PIDProjects\5600217059\5600217059 -- ARIZONA MINERALS\PID DWG\5600217059-VWP-PX-PFD-P120-00.dwg

		HYDRATED LIME	POLYMER	FERRIC CHLORIDE FOR UF FEED	SULFURIC ACID FOR pH	SODIUM HYPOCHLORITE FOR UF CEB	CAUSTIC FOR UF CEB	HYDROCHLORIC ACID FOR UF CEB	MBBR PHOSPHORIC ACID	MBBR ANTIFOAM
	UNIT	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
Dosage	mg/l	1,020.0	1.5	0.0	4.9	20.0	20.0	20.0	1.0	1.0
Concentration	%	10%	0.20%	40%	93%	12.5%	50%	30%	75%	100%
Sp. Gravity		1.06	1.00	1.42	1.81	1.2	1.51	1.15	1.61	1.00
Volumetric flow	GPD	1,661	171	2	0.5	0.026	0.54	0.57	0.1	0.2

(1) UF CEB chemical usage is intermittent, based on 1 CEB per day

REV. NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	REVIEWED BY	APPROVED BY	DESCRIPTION
0	4-13-18	L. HAUBACH	K. BENSON	L. STUDEBAKER	J. PITTS	ISSUED FOR CONSTRUCTION

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SCALE NONE

DRAWN BY W. KONYHA

TITLE
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

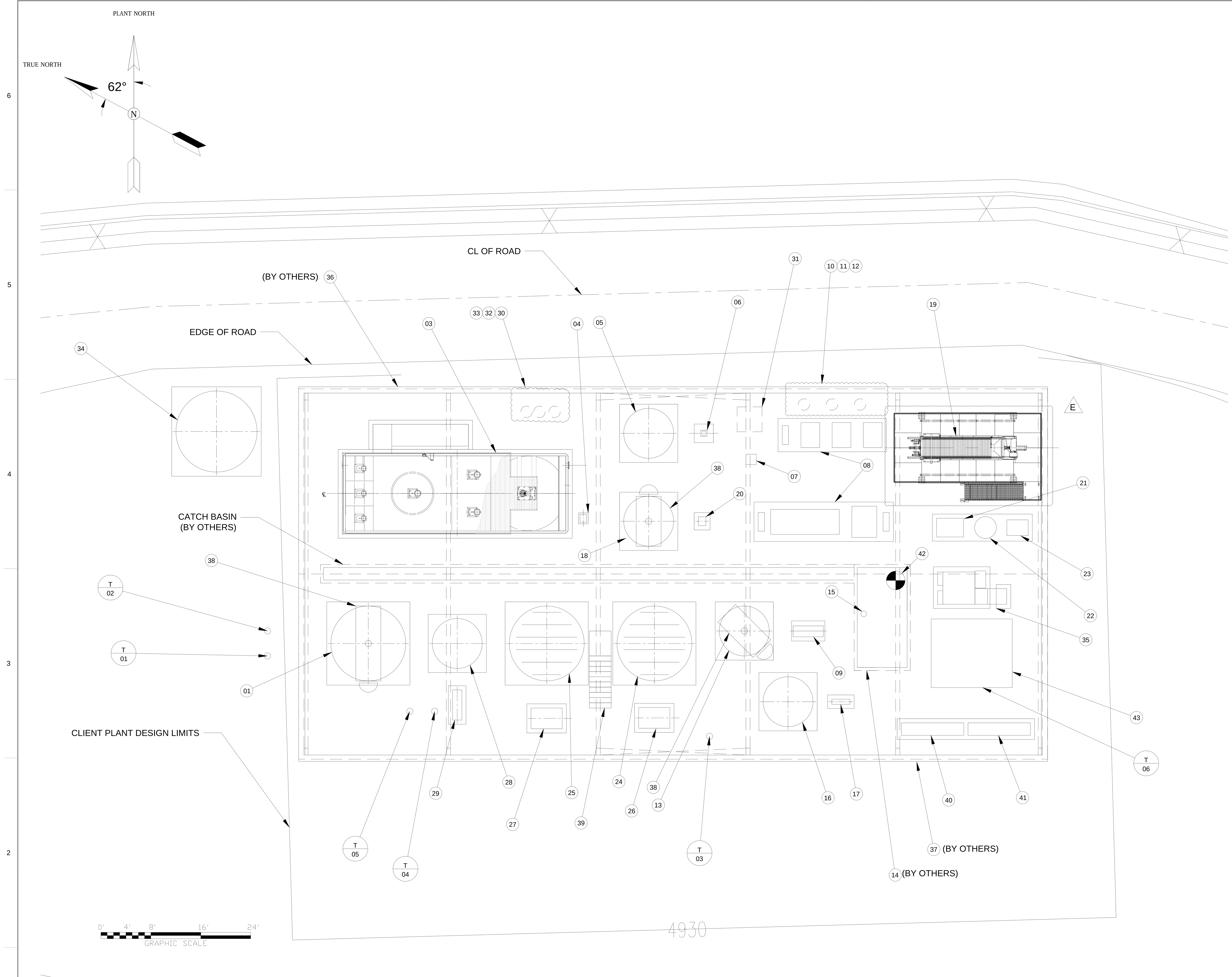
MASS BALANCE
CHEMICALS

DWG. NO. 5600217059-VWP-PX-PFD-P121-00

REV 0

\\USPIT01CADD\PIDProjects\5600217059 – ARIZONA MINERALS\PID DWG\5600217059-VWP-PX-PFD-P121-00.dwg

APPENDIX B: EXISTING PLANT GENERAL ARRANGEMENT DRAWINGS



EQUIPMENT LIST

ID	TAG	DESCRIPTION	OWNER
01	TK-1000	EQUALIZATION TANK W/ MIXER	VEOLIA
02	---	---	---
03	CF-1010	MUTIFLO MCP-600R	VEOLIA
04	P-1025	SLUDGE WASTE/RECYCLE PUMP	VEOLIA
05	TK-1030	UF FEED TANK	VEOLIA
06	P-1040	UF FEED PUMP	VEOLIA
07	F-1041	UF FEED STRAINER	VEOLIA
08	F-1043	UF UNIT	VEOLIA
09	P-1052	UF BACKWASH PUMP	VEOLIA
10	P-2035	HYDROCHLORIC ACID CEB PUMP	VEOLIA
11	P-2040	SODIUM HYDROXIDE CEB PUMP	VEOLIA
12	P-2045	SODIUM HYPOCHLORITE CEB PUMP	VEOLIA
13	TK-1050	pH ADJUST TANK	VEOLIA
14	SP-1110	FILTRATE SUMP (8'-0" X 16'-0" X 8'-6")	OTHERS
15	P-1111	FILTRATE PUMP	VEOLIA
16	TK-1120	FRESH WELL WATER TANK	VEOLIA
17	P-1121	FRESH WELL WATER PUMP	VEOLIA
18	TK-1090	SLUDGE HOLDING TANK	VEOLIA
19	FP-1100	FILTER PRESS	VEOLIA
20	P-1091	FILTER PRESS FEED PUMP	VEOLIA
21	C-1500	AIR COMPRESSOR	VEOLIA
22	TK-1510	PLANT AIR RECEIVER	VEOLIA
23	U-1505	INSTRUMENT AIR DRYER	VEOLIA
24	TK-1060	MBBR TANK A	VEOLIA
25	TK-1070	MBBR TANK B	VEOLIA
26	B-1075A	MBBR BLOWER A	VEOLIA
27	B-1075B	MBBR BLOWER B	VEOLIA
28	TK-1080	EFFLUENT TANK	VEOLIA
29	P-1081	REUSE PUMP	VEOLIA
30	P-2000	SULFURIC ACID PUMP	VEOLIA
31	P-2010	FERRIC CHLORIDE PUMP	VEOLIA
32	P-2070	PHOSPHORIC ACID PUMP	VEOLIA
33	P-2080	ANTIFOAM PUMP	VEOLIA
34	U-2050	LIME SLURRY MAKEDOWN SYSTEM	VEOLIA
35	U-2020	DRY POLYMER SYSTEM	VEOLIA
36	---	CONCRETE PAD (60'-0" X 120'-0")	OTHERS
37	---	CANOPY 60-0" X 120'-0")	OTHERS
38	---	STEEL PLATFORM	VEOLIA
39	---	STAIRS AND PLATFORM	VEOLIA
40	PLC-1	MAIN PLC PANEL	VEOLIA
41	PP-1	MAIN POWER PANEL	VEOLIA
42	---	EYEWASH STATION	OTHERS
43	---	ELECTRICAL AREA 13' X 11'	OTHERS

TIEPOINT LIST

TP	SIZE	TYPE	SERVICE
T-01	3"	#150	INFLUENT MINE WATER
T-02	3"	#150	INFLUENT POND WATER
T-03	3"	#150	INFLUENT SERVICE/WELL WATER
T-04	3"	#150	EFFLUENT TO MINE USE
T-05	4"	#150	EFFLUENT TO ALUM GULCH
T-06	---	---	PLANT ELECTRICAL FEED

WORK BY OWNER IS AS FOLLOWS:

1. CLEARED, LEVEL SITE.
2. SITE SECURITY AND MAINTENANCE.
3. CIVIL, MECHANICAL, AND ELECTRICAL INSTALLATION.
4. BUILDING SUPPLY AND INSTALLATION IF APPLICABLE.
5. GROUNDING RING.
6. AREA LIGHTING.
7. ALL APPLICABLE SITE SAFETY APPARATUSES.
8. SUN SHIELD CANOPY (ITEM #37)
9. EROSION AND SEDIMENTATION CONTROLS, STORM WATER CONTROLS, AND FINAL LANDSCAPING.
10. SECONDARY CONTAINMENT AREAS.
11. ALL PERMITS.
12. CHEMICAL DRUMS AND TOTES.

REV. NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	REVIEWED BY	APPROVED BY	DESCRIPTION
E	2-19-18	M.WATSON	T.SHULTZ	J.PITTS	D.NILL	FILTER PRESS FOOTPRINT UPDATE
D	2-16-18	M.WATSON	T.SHULTZ	J.PITTS	D.NILL	ISSUED FOR DESIGN
C	1-22-18	M.WATSON	T.SHULTZ	J.PITTS	D.NILL	ISSUED FOR INFORMATION
B	1-8-18	M.WATSON	T.SHULTZ	J.PITTS	D.NILL	ISSUED FOR INFORMATION
A	12-29-17	M.WATSON	T.SHULTZ	J.PITTS	D.NILL	ISSUED FOR INFORMATION

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VEOLIA

INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA. TEL. 1-412-809-6000

SCALE 1/8"=1'-0" | DRAWN BY M.WATSON

TITLE
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

GENERAL ARRANGEMENT
MECHANICAL EQUIPMENT LAYOUT

DRAWING NO. 5600217059-VWP-GA-GAD-M101-00 | REV E

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APPENDIX C: EXISTING PLANT PIPING AND INSTRUMENTATION DIAGRAMS

TK-1030
UF FEED TANK
CAPACITY: 1,500 GALLONS (W.V)
SIZE: 8'-0" DIA x 5'-7" SSH
DIMENSION-SWD: 4'-0" SWD
MATERIAL: HDPE
DESCRIPTION: OPEN TOP, FLAT BOTTOM

P-1040
UF FEED PUMP
CAPACITY: 150 GPM @ 100' TDH
MOTOR: 10HP 3600 RPM
POWER: 460V 3PH 60HZ
MATERIAL: 316SS
TYPE: VERTICAL CENTRIFUGAL PUMP
MODEL: CRN 32-2
MANUFACTURER: GRUNDFOS
CONFIGURATION: OPERATING

F-1041
UF FEED STRAINER
TYPE: AUTOMATIC SELF- CLEANING
RATING: 200 MICRON
MATERIAL- SCREEN: 304SS
MATERIAL- HOUSING: PLASTIC
MODEL: 3" TAF750
MANUFACTURER: AMIAD

U-1035
FeCl3 INJECTION QUILL

NOTES:
1. TEMPORARY STRAINERS TO BE REPLACED BY SPOOL PIECE AFTER COMMISSIONING UPON APPROVAL OF PROJECT MANAGER OR COMMISSIONING MANAGER.
2. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
3. PROVIDED BY UF PACKAGE VENDOR; SHIPPED LOOSE, INSTALLATION BY CONTRACTOR.
4. INSTRUMENTATION TO BE PROVIDED BY VEOLIA; SHIPPED LOOSE, INSTALLATION BY OTHERS.

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Registered Professional Engineer (Control Systems)
CERTIFICATE NO. 31166
DONALD M. MOYER
DATE SIGNED
ARIZONA, U.S.A.

SOUTH32

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REFERENCES		REFERENCES		REVISIONS						REVISIONS					
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DRAWN BY	DEE	APR 20
CHECKED BY	DMM	APR 20
PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT
WTP UPGRADES & MODIFICATIONS
P&ID
UF FEED TANK AND PUMP

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-204
REV NO. P
DATE 03 APR 20

File: P:\2019\190449.00\3500 ENGR\343 Instrumentation\ENVRO Package\24350-PI-204.dwg LAST UPDATE: 4/2/2020 9:15 AM BY: DAVID.ELVER

U-1042

UF FEED VALVE SKID

DESCRIPTION: VALVE SKID

MODEL: F04B06

NOTES:
1. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
2. ALL CONNECTIONS TO AND FROM THE VALVE SKID ARE FLANGED AND ARE SIZED BASED ON LINE SIZE.

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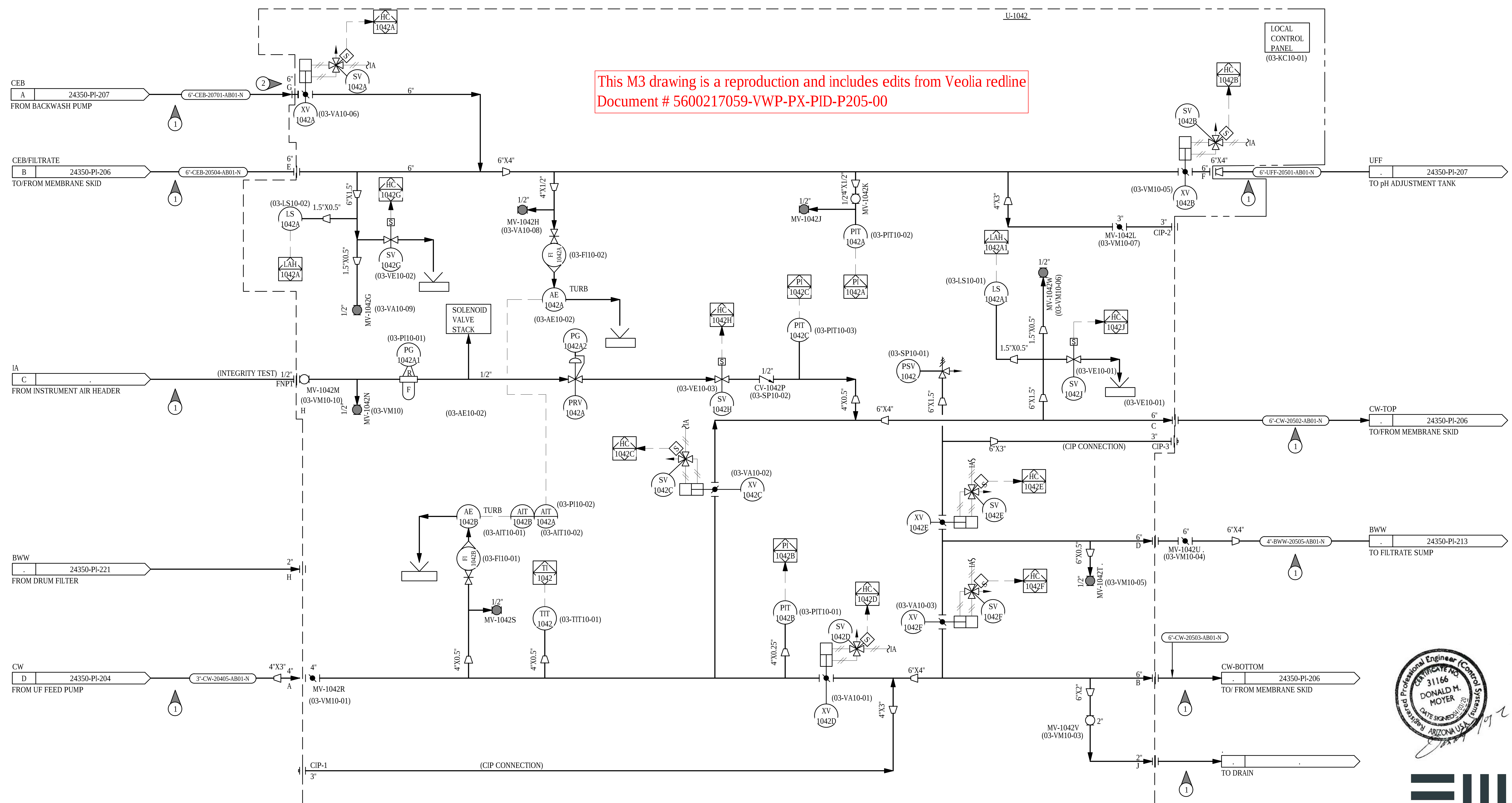

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
P&ID
UF FEED VALVE SKID

PROJECT NO. M3-PN190449

DWG NO. 24350-PI-205

REV NO. P

DATE 03 APR 20

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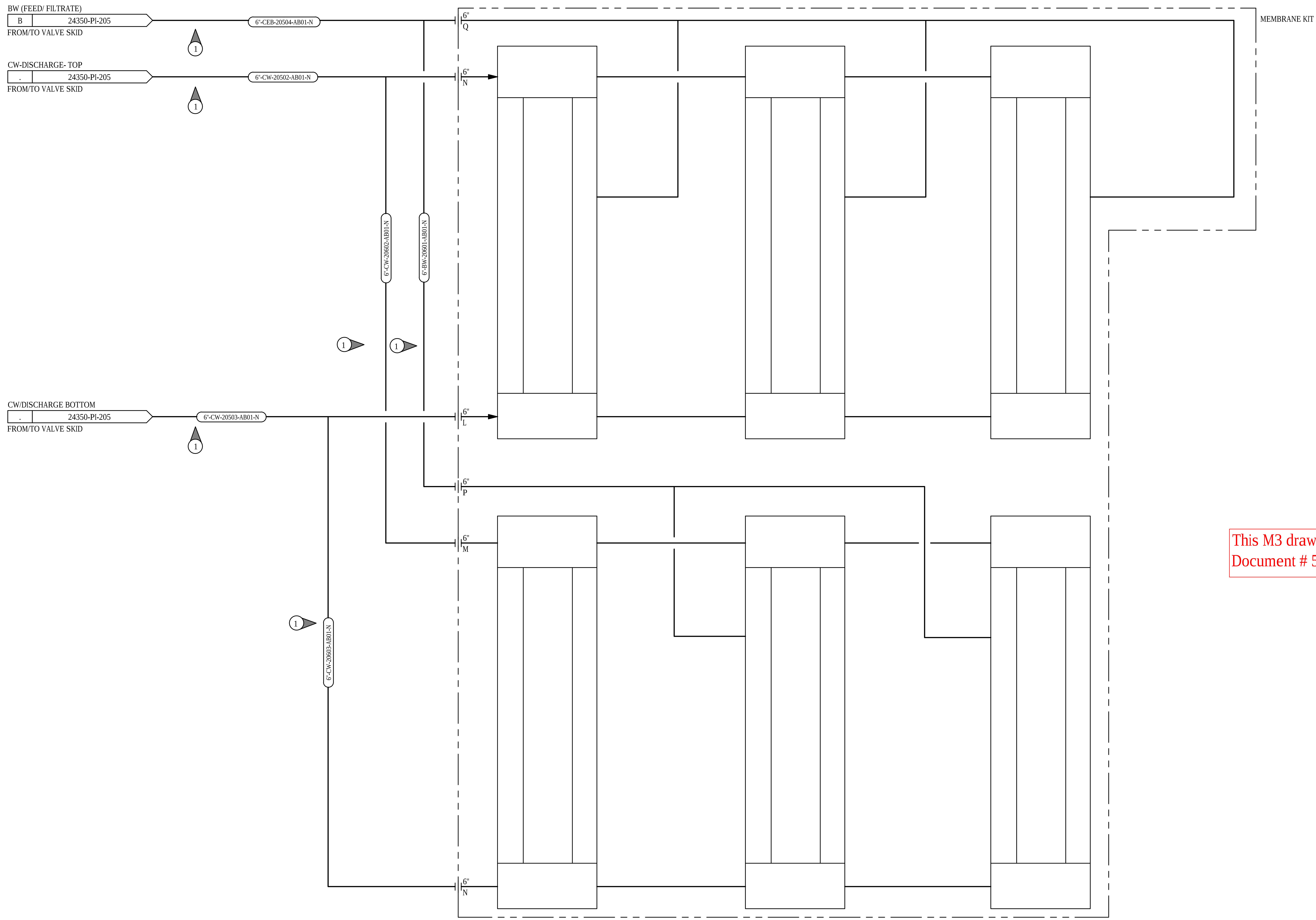
File: P:\2019\190449.00\500 ENGR\543 Instrumentation\ENVRO Package\24350-PI-205.dwg LAST UPDATE: 4/2/2020 9:14 AM BY: DAVID.ELVER

NOTES:
1. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
2. ONE MEMBRANE RACK ASSEMBLY KIT WITH 6 (SIX) UF MODULES TO BE ASSEMBLED AT SITE BY CONTRACTOR

F-1043
UF MEMBRANES
DESCRIPTION: 6 MODULE KIT



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PROJECT MGR	
CLIENT APPR.	

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS P&ID UF MEMBRANE KIT

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-206
REV NO. P
DATE 03 APR 20

TK-1050
pH ADJUST TANK
CAPACITY: 4000 GALLONS (W.V.)
SIZE: 8' DIA X 13'-6" SSH
DIMENSION-SWD: 12'-6" SWD
MATERIAL: FRP
DESCRIPTION: OPEN TOP, FLAT BOTTOM W/4 BAFFLES

A-1050
pH ADJUST TANK AGITATOR
MOTOR: 1.5 HP 1,200 RPM
POWER: 460V 3PH 60HZ
MATERIAL-SHAFT: 316SS
MATERIAL-IMPELLER: 316SS
TYPE: AGITATOR (3 BLADES)
OUTPUT-SPEED: 84 RPM
MODEL: LIGHTNIN 14Q1.5

P-1052
UF BACKWASH PUMP
CAPACITY: 484 GPM @ 127' TDH
MOTOR: 30HP 3600 RPM
POWER: 460V 3PH 60HZ
MATERIAL: DUCTILE IRON
TYPE: HORIZONTAL CENTRIFUGAL PUMP
MODEL:
MANUFACTURER: FLOWSERVE
CONFIGURATION: OPERATING

U-1054
STATIC MIXER
SIZE: 240-480 GPM
LENGTH: 25 in.
DIAMETER: 6 in.
CONNECTIONS: FLANGE

NOTES:
1. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
2. PROVIDED BY PACKAGE VENDOR; SHIPPED LOOSE, INSTALLATION BY CONTRACTOR

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DESIGNED BY	DEE	APR 20
DRAWN BY	DEE	APR 20
CHECKED BY	DMM	APR 20
PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
P&ID
PH ADJUST TANK AND UF BACKWASH PUMP

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-207
REV NO. P
DATE 03 APR 20

TK-1060
MBBR TANK A
CAPACITY: 10,000 GALLONS (W.V.)
SIZE: 12'-0" DIA X 14' SSH
DIMENSION-SWD: 12' SWD
MATERIAL: FRP
DESCRIPTION: OPEN TOP, FLAT BOTTOM W/4 BAFFLES

U-1060
AERATION GRID A
CAPACITY: 65 SCFM
MATERIAL: 304SS
DESCRIPTION: MEDIUM BUBBLE AERATION GRID

U-1061
SIEVE- DISCHARGE A
CAPACITY: 120 GPM
SIZE: 6" DIA
MATERIAL: 304SS

TK-1070
MBBR TANK B
CAPACITY: 10,000 GALLONS (W.V.)
SIZE: 12'-0" DIA X 14' SSH
DIMENSION-SWD: 12' SWD
MATERIAL: FRP
DESCRIPTION: OPEN TOP, FLAT BOTTOM W/4 BAFFLES

U-1070
AERATION GRID B
CAPACITY: 65 SCFM
MATERIAL: 304SS
DESCRIPTION: MEDIUM BUBBLE AERATION GRID

U-1071
SIEVE- DISCHARGE B
CAPACITY: 120 GPM
SIZE: 6" DIA
MATERIAL: 304SS

NOTES:
1. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
2. INSTRUMENTATION TO BE PROVIDED BY VEOLIA; SHIPPED LOOSE, INSTALLATION BY OTHERS

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PROJECT MGR	
CLIENT APPR.	

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
P&ID
MBBR TANKS

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-208
REV NO. P
DATE 03 APR 20

File: P:\2019\190449.003\500 ENGR\543 Instrumentation\ENVRO Package\24350-PI-208.dwg LAST UPDATE: 4/2/2020 9:13 AM BY: DAVID.ELVER

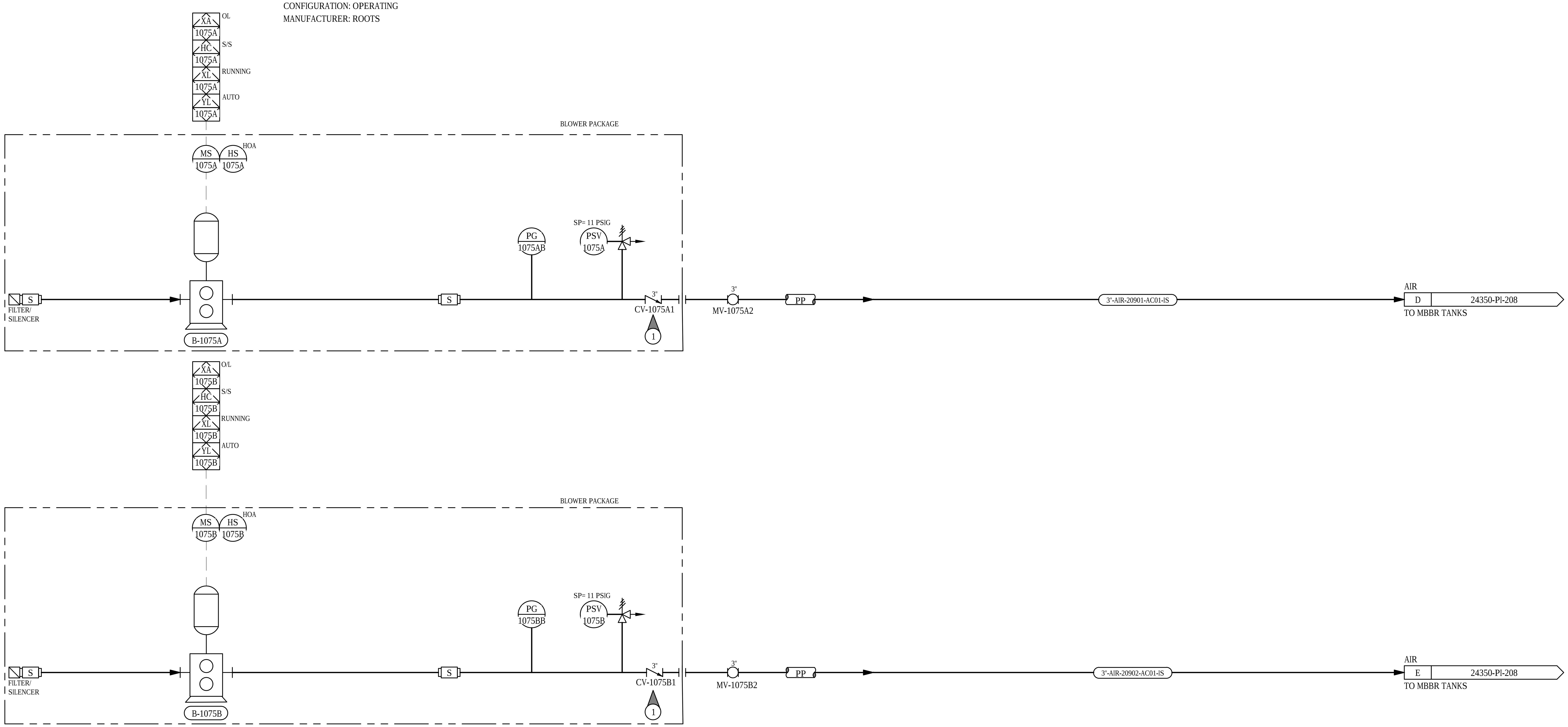
B-1075A

MBBR BLOWERS
CAPACITY: 160 CFM@ 10 PSIG
MOTOR: 15HP 1,760 RPM
POWER: 460V 3PH 60HZ
MATERIAL-CASTING: CAST IRON
MATERIAL- IMPELLER: CAST IRON
MODEL: 53 URAI
TYPE: POSITIVE DISPLACEMENT BLOWER
CONFIGURATION: OPERATING
MANUFACTURER: ROOTS

B-1075B

MBBR BLOWERS
CAPACITY: 160 CFM@ 10 PSIG
MOTOR: 15HP 1,760 RPM
POWER: 460V 3PH 60HZ
MATERIAL-CASTING: CAST IRON
MATERIAL- IMPELLER: CAST IRON
MODEL: 53 URAI
TYPE: POSITIVE DISPLACEMENT BLOWER
CONFIGURATION: OPERATING
MANUFACTURER: ROOTS

NOTES:
1. RELIEF AND CHECK VALVES, PROVIDED BY BLOWER VENDOR; SHIPPED LOOSE; INSTALLATION BY CONTRACTOR.
2. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.



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CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS P&ID MBBR BLOWERS

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-209
REV NO. P
DATE 03 APR 20

File: P:\2019\190449.00\500 ENGR\543 Instrumentation\ENVRO Package\24350-PI-209.dwg LAST UPDATE 4/2/2020 9:13 AM BY: DAVID.ELVER

ANTIFOAM DRUM (BY OTHERS)
CAPACTIY: 55 GALLONS
SIZE:
DIMENSION-SWD:
MATERIAL:
DESCRIPTION:

P-2080

ANTIFOAM PUMP
CAPACTIY: 0.2 GPD @ 100 PSIG
MOTOR: SOLENOID DRIVEN RPM
POWER: 115V 1PH 60HZ
MATERIAL: PVDF
TYPE: DIAPHRAGM METERING PUMP
MODEL: GAMMA/X
MANUFACTURER: PROMINENT
CONFIGURATION: OPERATING

NOTES:

1. CONTRACTOR TO PROVIDE AND INSTALL CONTINUOUS TUBING.
2. FOOT VALVE AND SUCTION TUBING ARE BEING PROVIDED WITH CHEMICAL PUMP; SHIPPED LOOSE, INSTALLATION BY OTHERS.

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CHECKED BY	DMM	APR 20
PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
P&ID
ANTIFOAM STORAGE AND PUMP

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-404
REV NO. P
DATE 03 APR 20

File: P:\2019\190449.00\3500 ENGR\343 Instrumentation\ENVIRO Package\24350-PI-404.dwg LAST UPDATE: 4/2/2020 9:29 AM BY: DAVID.ELVER

PHOSPHORIC ACID DRUM (BY OTHERS)
CAPACTIY: 55 GALLONS
SIZE:
DIMENSION-SWD:
MATERIAL:
DESCRIPTION:

P-2070
PHOSPHORIC ACID FEED PUMP
CAPACTIY: 0.2 GPD @ 100 PSIG
MOTOR: SOLENOID DRIVEN RPM
POWER: 115V 1PH 60HZ
MATERIAL: PVDF
TYPE: DIAPHRAGM METERING PUMP
MODEL: GAMMA/X
MANUFACTURER: PROMINENT
CONFIGURATION: OPERATING

NOTES:

1. CONTRACTOR TO PROVIDE AND INSTALL CONTINUOUS TUBING.
2. FOOT VALVE AND SUCTION TUBING ARE BEING PROVIDED WITH CHEMICAL PUMP; SHIPPED LOOSE, INSTALLATION BY OTHERS.

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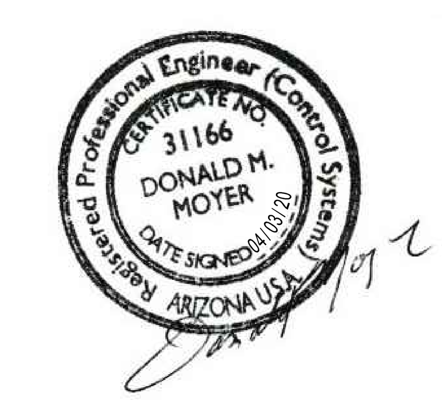

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS P&ID PHOSPHORIC ACID STORAGE AND PUMP

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-405
REV NO. P
DATE 03 APR 20

File: P:\2019\190449.003\500 ENGR\543 Instrumentation\ENVRO Package\24350-PI-405.dwg LAST UPDATE: 4/2/2020 9:28 AM BY: DAVID.ELVER

P-2045

SODIUM HYPOCHLORITE CEB PUMP
CAPACTIY: 1 GPM @ TBD
MOTOR: N/A
POWER: N/A
MATERIAL: PP/PVDF
TYPE: AODD
MODEL: PD01P
MANUFACTURER: INGERSOLL-RAND
CONFIGURATION: OPERATING

P-2040

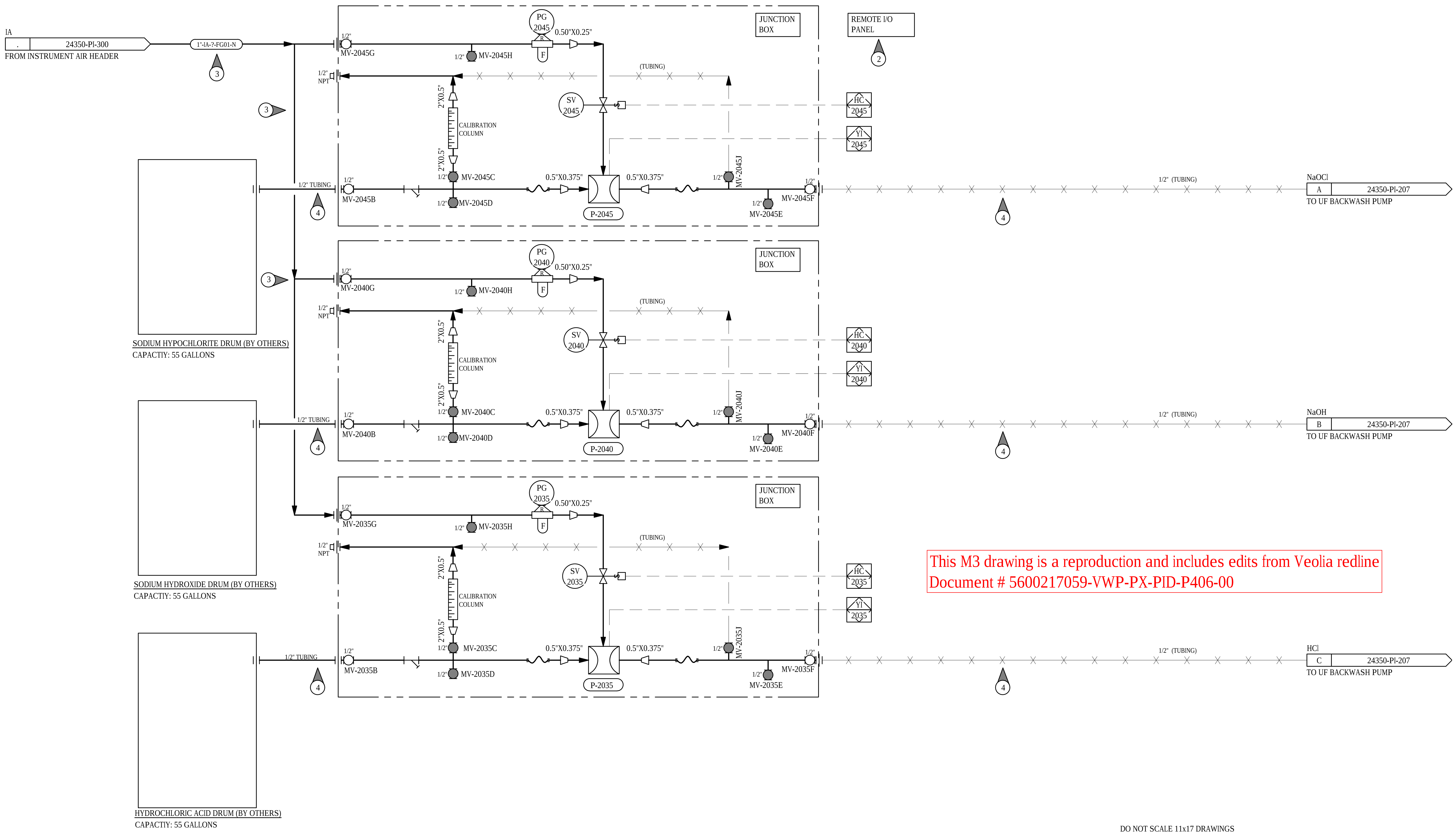
SODIUM HYDROXIDE CEB PUMP
CAPACTIY: 1 GPM @ TBD
MOTOR: N/A
POWER: N/A
MATERIAL: PP/SANTOPRENE
TYPE: AODD
MODEL: PD03P
MANUFACTURER: INGERSOLL-RAND
CONFIGURATION: OPERATING

P-2035

HYDROCHLORIC ACID CEB PUMP
CAPACTIY: 1 GPM @ TBD
MOTOR: N/A
POWER: N/A
MATERIAL: PVDF/PTFE
TYPE: AODD
MODEL: PD03P
MANUFACTURER: INGERSOLL-RAND
CONFIGURATION: OPERATING

NOTES:

1. CONNECTIONS AND SKID INTERNALS MIGHT VARY FROM FINAL PRODUCT.
2. ONE PANEL COMMON TO THE THREE CHEMICAL FEEDS.
3. INTERCONNECTING PIPING AND MANUAL VALVES (INCLUDING LOW POINT DRAINS AND HIGH POINT VENTS) TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
4. CONTRACTOR TO PROVIDE AND INSTALL CONTINUOUS TUBING/PIPING.



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PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
P&ID
CEB PUMPS

PROJECT NO. M3-PN190449
DWG NO. 24350-PI-406
REV NO. P
DATE 03 APR 20

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APPENDIX D: EXISTING PLANT MECHANICAL EQUIPMENT LIST

VEOLIA

PROJECT NUMBER:	5600217059
CLIENT:	ARIZONA MINERALS
FACILITY:	Trench Camp Property WTP
FACILITY LOCATION:	Patagonia, AZ
DOCUMENT NUMBER:	5600217059-VWP-MEL-LST-M001-00

MECHANICAL EQUIPMENT LIST

REV	DATE	BY	CHK	APPROVED
0	26-Apr-18	SCP	CRG	JP

REV. NO.	EQUIPMENT NO.	EQUIPMENT DESCRIPTION	DUTY	EQUIPMENT TYPE	DESIGN CAPACITY / MISC. INFO.	EQUIPMENT SUPPLIED BY	P&ID NO.	P&ID REV. NO	SPEC NUMBER	VEOLIA P.O NUMBER	MODEL/ SIZE / MANUFACTURER	DESIGN PRESS. (psig)	DESIGN TEMP. (Deg. F)	MATERIAL OF CONSTRUCTION	PUMP DIFF.HEAD (FT),	MOTOR RATING HP	VFD	VOLT/PHASE/Hz	DIMENSIONS	WEIGHT (LBS)	TECHNICAL COMMENTS
	TK-1000	Equalization Tank	ONLINE	Open top, flat bottom	10,000 gal	Veolia	P201-00	0	S103	17000687	Model C-OFV-12-12501 / Belding	-	-	FRP	NA	NA	NA	NA	12' Dia x 14'H (12' SWD)	103,325	Tank to include 4 mix baffles
	A-1000	Equalization Tank Agitator	ONLINE	Mechanical agitator	100 rpm	Veolia	P201-00	0	R501	18000094	Lightnin 14Q1.5	-	-	316 SS wetted parts	NA	1.5	NO	460/3/60	Impeller 33" dia x 134" long shaft	480	
	CF-1010	MULTIFLO® MCP-600R	ONLINE	Package Unit	150 gpm	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA	36' L x 12.8' W x 10.4' H	374,000	Skidded Package
	TK-1011A	Reaction Tank 1	ONLINE	Included in the Package Unit	734 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1011A	Reaction Tank 1 Mixer	ONLINE	Mechanical agitator	83.6 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX1 0.5	-	-	304SS	NA	0.5	NO	460/3/60			
	TK-1011B	Reaction Tank 2	ONLINE	Included in the Package Unit	734 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1011B	Reaction Tank 2 Mixer	ONLINE	Mechanical agitator	83.6 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX1 0.5	-	-	304SS	NA	0.5	NO	460/3/60			
	TK-1011C	Reaction Tank 3	ONLINE	Included in the Package Unit	734 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1011C	Reaction Tank 3 Mixer	ONLINE	Mechanical agitator	83.6 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX1 0.5	-	-	304SS	NA	0.5	NO	460/3/60			
	TK-1012	Crystallization Tank	ONLINE	Included in the Package Unit	11,000 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1012	Crystallization Tank Mixer	ONLINE	Mechanical agitator	40.55 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX4-3.0	-	-	304SS	NA	3.0	YES	460/3/60			
	TK-1013A	Flocculation Tank 1	ONLINE	Included in the Package Unit	734 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1013A	Flocculation Tank 1 Mixer	ONLINE	Mechanical agitator	15.7 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX1 0.5	-	-	304SS	NA	0.5	YES	460/3/60			
	TK-1013B	Flocculation Tank 2	ONLINE	Included in the Package Unit	734 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1013B	Flocculation Tank 2 Mixer	ONLINE	Mechanical agitator	15.7 rpm	Veolia	P202-00	0	NA	17000647	MIX TECH EVGX1 0.5	-	-	304SS	NA	0.5	YES	460/3/60			
	TK-1014	Settling Tank	ONLINE	Included in the Package Unit	10,500 gallons	Veolia	P202-00	0	NA	17000647	MCP-600R	-	-	Coated Carbon Steel	NA	NA	NA	NA			
	A-1014	Settling Chamber Scraper	ONLINE	Mechanical Scraper	0.35 rpm	Veolia	P202-00	0	NA	17000647	RF97/AD4 / ZR-FA47 DRS 71S4/DH/C/RI	-	-	Galvanized	NA	0.5	NO	460/3/60			
	P-1025	Sludge Waste/Recycle Pump	ONLINE	Horizontal centrifugal	40 gpm	Veolia	P203-00	0	NA	17000647	McLanahan M3H-CR 1.5/1.5	-	-	Linatex Lined CI	30	5.0	NO	460/3/60	29"L x 13"W x 53"H	550	
	TK-1030	UF Feed Tank	ONLINE	Open top, flat bottom	2,000 gal	Veolia	P204-00	0	S104	17000691	XLPE / Natural Stock# 41502000110	-	-	XLPE	NA	NA	NA	NA	8ft Dia x 5'-7" H (4' SWD)	18,000	
	P-1040	UF Feed Pump	ONLINE	Vertcal centrifugal	150 gpm	Veolia	P204-00	0	NA	17000645	CRN 32-2 A-G-G-E-HQQE Grundfos	-	-	316SS	100	10.0	YES	460/3/60	12.75"L x 11.75"W x 38.5"H	236 / 254	
	F-1041	UF Feed Strainer	ONLINE	Self Cleaning	200 micron	Veolia	P204-00	0	NA	17000645	Amiad/ 3" / TAF-750	-	-	304 SS screen	NA	NA	NA	NA	11"D x 41.5"H		
	U-1042	UF Feed Valve Skid	ONLINE	Valve Skid	-	Veolia	P205-00	0	NA	17000645	Uflex UFD F04B06	-	-	PVC	NA	NA	NA	NA	11'L x 4'W x 12'H	1,500 / 2,000	
	F-1043	UF Membrane Kit	ONLINE	Inge T-Rack, 6 Modules	150 gpm	Veolia	P206-00	0	NA	17000645	M6 Membrane Kit	-	-	PVC	NA	NA	NA	NA	4'L x 5'W x 10'H	1,200 / 2,100	Dizzer XL 0.9 MB 80 WT, 6 Modules
	U-1054	UF Backwash Static Mixer	ONLINE	Static Mixer	240-480 gpm	Veolia	P207-00	0	NA	17000645	Koflo			PVC	NA	NA	NA	NA	8" dia x 25" long	-	
	TK-1050	pH Adjust Tank	ONLINE	Open top, flat bottom	4,000 gal	Veolia	P207-00	0	S103	17000687	Model C-OFV-8-5075 / Belding	-	-	FRP	NA	NA	NA	NA	8' Dia x 13.5' H (12.5' SWD)	44,000	Tank to include 4 mix baffles
	A-1050	pH Adjust Tank Agitator	ONLINE	Mechanical agitator	84 rpm	Veolia	P207-00	0	R501	18000094	Lightnin 14Q1.5	-	-	316 SS wetted parts	NA	1.5	NO	460/3/60	Impeller 32" dia x 120" long shaft	530	
	P-1052	UF Backwash Pump	ONLINE	Horizontal centrifugal	484 gpm	Veolia	P207-00	0	NA	17000645	Flowserve 2K4x3	65	60	Ductile Iron	127	30.0	YES	460/3/60	58" L x 21" W x 19.25" H	886	
	TK-1060	MBBR Tank A	ONLINE	Open top, flat bottom	10,000 gal	Veolia	P208-00	0	S103	17000687	Model C-OFV-12-12051 / Belding	-	-	FRP	NA	NA	NA	NA	12' D x 14' H (12' SWD)	103,325	
	TK-1070	MBBR Tank B	ONLINE	Open top, flat bottom	10,000 gal	Veolia	P208-00	0	S103	17000687	Model C-OFV-12-12051 / Belding	-	-	FRP	NA	NA	NA	NA	12' D x 14' H (12' SWD)	103,325	
	U-1060	Aeration Grid A	ONLINE	Medium Bubble Aeration Grid	77 scfm	Veolia	P208-00	0	NA	18000255	Fabricated	-	-	304 SS	NA	NA	NA	NA	7.5'W x 10'L x 10.5' H	-	
	U-1070	Aeration Grid B	ONLINE	Medium Bubble Aeration Grid	53 scfm	Veolia	P208-00	0	NA	18000255	Fabricated	-	-	304 SS	NA	NA	NA	NA	7.5'W x 10'L x 10.5' H	-	
	-	Media (To be purchased at a future date)	ONLINE	Bio Carriers	35 m3	Veolia	P208-00	0	NA	-	AnoxKaldnes K5 media	-	-	HDPE	NA	NA	NA	NA	-	-	
	U-1061	Sieves - DISCHARGE A	ONLINE	Cylindrical Sieves	6" Diameter	Veolia	P208-00	0	NA	18000255	Fabricated	-	-	304 SS	NA	NA	NA	NA	1.25' D x 3' L	100	
	U-1071	Sieves - DISCHARGE B	ONLINE	Cylindrical Sieves	6" Diameter	Veolia	P208-00	0	NA	18000255	Fabricated	-	-	304 SS	NA	NA	NA	NA	1.25' D x 3' L	100	
	B-1075A	MBBR Blower A	ONLINE	Positive Displacement Blower	160 cfm	Veolia	P209-00	0	R201	18000089	Roots Model 53 URAI	10	250	FRP	10 psig	15.0	NO	460/3/60	62.5"L x 30.5"W x 56.5"H	650	
	B-1075B	MBBR Blower B	OFFLINE	Positive Displacement Blower	160 cfm	Veolia	P209-00	0	R201	18000089	Roots Model 53 URAI	10	250	FRP	10 psig	15.0	NO	460/3/60	62.5"L x 30.5"W x 56.5"H	650	
	TK-1080	Effluent Tank	ONLINE	Open top, flat bottom	4,000 gal	Veolia	P210-00	0	S104	17000691	XLPE / Natural Stoc# 1150400110	-	-	XLPE	NA	NA	NA	NA	8' Dia x 11'-5" H 10'-5" SWD	37,000	
	P-1081	Reuse Pump	ONLINE	Horizontal centrifugal	150 gpm	Veolia	P210-00	0	R101	18000102	3196 MTI 1x2-10 / Goulds	-	-	Ductile Iron / 316 SS Shaft Sleeve	350	40.0	NO	460/3/60	58" L x 18" W x 22" H	1,000	
	TK-1090	Sludge Holding Tank	ONLINE	Open top, flat bottom	5,000 gal	Veolia	P211-00	0	S103	17000687	Model C-OFV-8-4493 / Belding	-	-	FRP	NA	NA	NA	NA	8' Dia x 12' H (10'-10" SWD)	40,000	Tank to include 4 mix baffles
	A-1090	Sludge Holding Tank Agitator	ONLINE	Mechanical agitator	100 rpm	Veolia	P211-00	0	R501	18000094	Lightnin 14Q1.5	-	-	316 SS wetted parts	NA	1.5	NO	460/3/60	Impeller 32" dia x 120" long shaft	460	Operating - Intermittant
	P-1091	Filter Press Feed Pump	ONLINE	AODD	100 gpm	Veolia	P211-00	0	R108	18000093	Warren Rupp S20B1I1EANS000	100	-	Cast Iron	100 psig	NA	NO	NA	17" x 13" x 30"	140	
	FP-1100	Filter Press	ONLINE	Manual, Side Bar, Chamber Press	30 cf @ 100psi	Veolia	P212-00	0	S501	18000085	Evoqua 800G32-58-30SYLWC	100	-	Polypropylene plates / cloths	NA	NA	NA	NA	236" L x 57" W x 78.5" H	10,000	
	SP-1110	Filtrate Sump	ONLINE	In Ground Sump	7,500 gal	Veolia	P213-00	0	NA	-	-	-	-	Concrete	NA	NA	NA	NA	8' x 16' x 9.5' D	-	
	P-1111	Filtrate Pump	ONLINE	Submersible	20 gpm	Veolia	P213-00	0	R102	18000090	J08-460T BJM	-	-	Cast Iron	43	1.0	NO	460/3/60	12" DIA x 15" Tall	60	
	C-1500	Air Compressor	ONLINE	Rotary Screw	100 scfm	Veolia	P300-00	0	R301	18000086	Ingersoll Rand UP6S-25	125	150	CI	125 psi	25.0	NO	460/3/60	52x36x42.5	1,250	
	TK-1501	Instrument Air Receiver	ONLINE	ASME Vessel	240 gal	Veolia	P300-00	0	R301	18000086	Samuel	200	150	CI	NA	NA	NO	NA	30" DIA x 92"H	550	
	U-1505	Instrument Air Dryer	ONLINE	Desicant Dryer	-40F Dew Point	Veolia	P300-00	0	R301	18000086	Ingersoll Rand HLA120	125	150	CI	NA	NA	NA	115/1/60	40.5x30x63.1	600	
	TK-1120	Fresh Well Water Tank	ONLINE	Open top, flat bottom	2,000 gal	Veolia	P301-00	0	S104	17000691	XLPE / Natural Stock# 41503050110	-	-	XLPE	NA	NA	NA	NA	8' Dia x 8'-5" H (6'-11" SWD)	27,500	
	P-1121	Fresh Well Water Pump	ONLINE	Horizontal centrifugal	10 gpm	Veolia	P301-00	0	R101	18000102	LFI 3196 STI 1x1.5-4 / Goulds			Ductile Iron/316SS	50	1.5	NO	460/3/60	35" x 10" x 15"	250	

VEOLIA

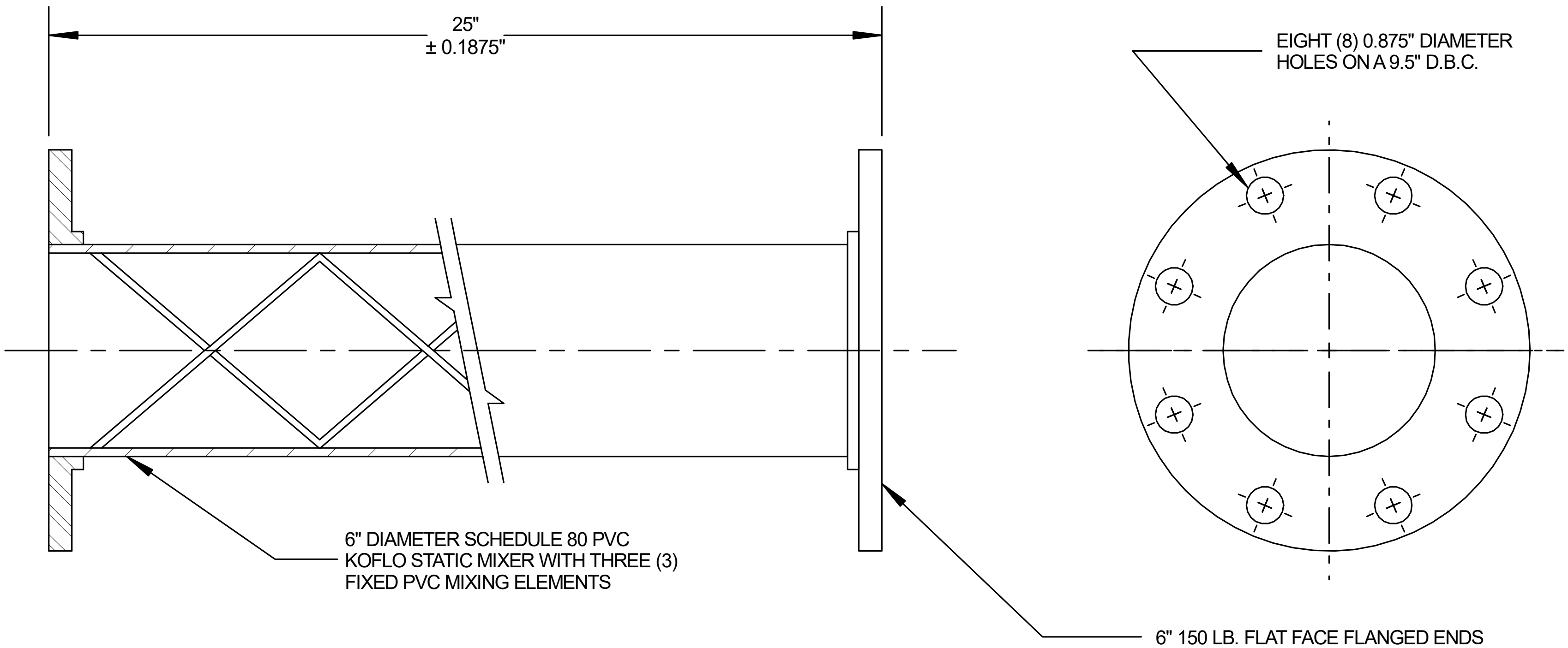
PROJECT NUMBER:	5600217059
CLIENT:	ARIZONA MINERALS
FACILITY:	Trench Camp Property WTP
FACILITY LOCATION:	Patagonia, AZ
DOCUMENT NUMBER:	5600217059-VWP-MEL-LST-M001-00

MECHANICAL EQUIPMENT LIST

REV	DATE	BY	CHK	APPROVED
0	26-Apr-18	SCP	CRG	JP

REV. NO.	EQUIPMENT NO.	EQUIPMENT DESCRIPTION	DUTY	EQUIPMENT TYPE	DESIGN CAPACITY / MISC. INFO.	EQUIPMENT SUPPLIED BY	P&ID NO.	P&ID REV. NO	SPEC NUMBER	VEOLIA P.O NUMBER	MODEL/ SIZE / MANUFACTURER	DESIGN PRESS. (psig)	DESIGN TEMP. (Deg. F)	MATERIAL OF CONSTRUCTION	PUMP DIFF.HEAD (FT),	MOTOR RATING HP	VFD	VOLT/PHASE/Hz	DIMENSIONS	WEIGHT (LBS)	TECHNICAL COMMENTS
Chemical Feed Systems																					
		Lime Slurry Makedown System	ONLINE	Dry Chemical Feed	40' Eave height	Veolia	P400-00	0	NA	17000646	Chemco	-	-	-	NA	NA	NA	NA	13' DIA x 40' Eave Height	197,000	
	U-2050	Lime Silo	ONLINE	Silo	2600 CF	Veolia	P400-00	0	NA	17000646	Chemco	-	-	Carbon Steel	NA	NA	NA	NA			
	U-2051	Dust Collector	ONLINE	Pulse Jet	300 ft2 media	Veolia	P400-00	0	NA	17000646	Chemco	-	-	Polyester	NA	2.0	NO	460/3/60			
	U-2052	Bin Activator	ONLINE	Activator	5' Diameter	Veolia	P400-00	0	NA	17000646	Model MVSI 18-3190 / ITALVIBRAS	-	-	Carbon Steel	NA	1.5	NO	460/3/60			
	U-2053	Volumetric feeder	ONLINE	Screw Type	67 Lb/h Hydrated Lime, 25 Lb/ft2	Veolia	P400-00	0	NA	17000646	Chemco	-	-	304SS	NA	0.75	NO	460/3/60			
	B-2056	Dust Collector Blower	ONLINE	Blower	611cfm @ 5" SP	Veolia	P400-00	0	NA	17000646	American Fan	-	-	-	NA	2 HP	NO	460/3/60			
	B-2058	Exhaust Fan	ONLINE	Fan	16" Diameter	Veolia	P400-00	0	NA	17000646	Model ALA3 Dayton (Grainger)	-	-	-	NA	1/20	NO	115/1/60			
	H-2057	Electric Heater	ONLINE	Wall Heater	10 kW	Veolia	P400-00	0	NA	17000646	Model HVH-10-43-30 Chromalox	-	-	-	NA	10 kW	NA	460/3/60			
	TK-2054	Lime Slurry Tank	ONLINE	Tank	500 gal	Veolia	P400-01	0	NA	17000646	Chemco	-	-	Carbon Steel	NA	NA	NA	NA	4-6" Dia x 5'-0" Overall Ht, 4'-6" Working Liqid Level		
	A-2054	Slurry Tank Agitator	ONLINE	Mechanical agitator	Two Impellers	Veolia	P400-01	0	NA	17000646	Model EVSP-75 / Lightnin	-	-	Carbon Steel	NA	NA	NA	NA	-		
	P-2055	Lime Slurry Pump	ONLINE	Horizontal centrifugal	20 gpm	Veolia	P400-01	0	NA	17000646	Model 1K2x1-8 Wilfley			Maxalloy 5	40	5.0	NO	460/3/60	20.5" W x 46" L x 36" H		
		Dry Polymer System	ONLINE	50 lbs Bag System	450 gallons	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	316SS	NA	NA	NA	NA	134"L x 67"W x 74"H	6,200	Single 460/3/60 15 amp hookup for skid
	U-2020	Dry Polymer Skid System	ONLINE	Dry Polymer Makedown	4 lb/day (Active)	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	-	NA	NA	NA	NA			
	P-2015	Booster Pump	ONLINE	Horizontal centrifugal	10 GPM	Veolia	P401-00	0	R402	18000084	Goulds 3HM06	-	-	316 Stainless	200	1.5	NA	460/3/60			
	U-2021	Hopper	ONLINE	Hopper	110 Lb	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	304 SS	NA		YES	460/3/60			
	U-2022	Screw Feeder	ONLINE	Feeder	-	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	-	NA	0.5 HP	YES	460/3/60			
	U-2023	Wetting Box	ONLINE	Wetting Box	-	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	304 SS	NA	NA	NA	NA			
	P-2025	Polymer Feed Pump	ONLINE	Chemical metering pump	16 gph	Veolia	P401-00	0	R402	18000084	Grundfos DME60	-	-	-	100 psig	NA	NA	115/1/60			
	TK-2024	Polymer Mix Tank	ONLINE	Flat Bottom, Closed Top	-	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	316 Stainless	NA	NA	NA	NA			
	A-2024	Polymer Mix Tank Mixer	ONLINE	Agitator	-	Veolia	P401-00	0	R402	18000084	Clearwater M100SS	-	-	304 SS Shaft and Impeller blades	NA	1.5	Yes	460/3/60			
	P-2010	Ferric Chloride Pump	ONLINE	Chemical metering pump	0.4 gph @ 100 psig	Veolia	P402-00	0	R401	18000097	Prominent Gamma/X	232 psig	-	PVDF Head	-	NA	NA	115/1/60	-	10	Solenoid driven Diaphragm Metering Pump
	-	Ferric Chloride Tote	-	Tote	320 gal	By Others	P402-00	0	NA	-	-	-	-	PVC	NA	NA	NA	NA	By Others	-	
	P-2000	Sulfuric Acid Pump	ONLINE	Chemical metering pump	0.1 gph @ 100 psig	Veolia	P403-00	0	R401	18000097	Prominent Gamma/X	232 psig	-	PVDF Head	-	NA	NA	115/1/60	-	10	Solenoid driven Diaphragm Metering Pump
	-	Sulfuric Acid Drum	-	Drum	55 gal	By Others	P403-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	
	P-2080	Antifoam Pump	ONLINE	Chemical metering pump	0.2 gpd @ 100 psig	Veolia	P404-00	0	R401	18000097	Prominent Gamma/X	232 psig	-	PVDF Head	-	NA	NA	115/1/60	-	10	Solenoid driven Diaphragm Metering Pump
	-	Antifoam Drum	-	Drum	55 gal	By Others	P404-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	
	P-2070	Phosphoric Acid Feed Pump	ONLINE	Chemical metering pump	0.2 gpd @ 100 psig	Veolia	P405-00	0	R401	18000097	Prominent Gamma/X	232 psig	-	PVDF Head	-	NA	NA	115/1/60	-	10	Solenoid driven Diaphragm Metering Pump
	-	Phosphoric Acid Drum	-	Drum	55 gal	By Others	P405-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	
	P-2035	Hydrochloric Acid CEB Pump	ONLINE	AODD	5 gpm	Veolia	P406-00	0	NA	17000645	Ingersoll Rand PD03P	-	-	PVDF/PTFE	80 psig	NA	NA	NA	20"L x 36"W x 51"H	150	
	P-2040	Sodium Hydroxide CEB Pump	ONLINE	AODD	5 gpm	Veolia	P406-00	0	NA	17000645	Ingersoll Rand PD03P	-	-	PP / Santoprene	80 psig	NA	NA	NA	20"L x 36"W x 51"H	150	
	P-2045	Sodium Hypochlorite CEB Pump	ONLINE	AODD	1.7 gpm	Veolia	P406-00	0	NA	17000645	Ingersoll Rand PD03P	-	-	PP/PVDF	80 psig	NA	NA	NA	20"L x 36"W x 58"H	150	
	-	Hydrochloric Acid Drum	ONLINE	Drum	55 gal	By Others	P406-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	
	-	Sodium Hydroxide Drum	ONLINE	Drum	55 gal	By Others	P406-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	
	-	Sodium Hypochlorite Drum	ONLINE	Drum	55 gal	By Others	P406-00	0	NA	-	-	-	-	-	NA	NA	NA	NA	By Others	-	

APPENDIX E: EXISTING PLANT DATASHEETS



QUOTE# 60066.1A VEOLIA PO# 18000067 HD

Koflo

Koflo Corporation
309 CARY POINT DR.
CARY, IL 60013

SCALE: NONE	APPROVED BY JLF	DRAWN BY JMO
DATE: 03/21/18		REVISED
CUSTOMER: VEOLIA WATER TECHNOLOGIES		REVISED
		REVISED
MODEL NO: 6-80-4-3-12		DRAWING NUMBER: KD-6041

2.0 Product Specification

2.1 (1) Ultrafiltration System, Model # UFLEX 6

Veolia Dayton is pleased to offer one UFLEX 6 ultrafiltration system (1x100% units). The UF System is broken up into modular skids and some shipped loose components, as described in tables below. Each skid is fully assembled on a painted carbon steel skid and is complete with all of the necessary valves, instrumentation and piping.

For the feedwater to UF modules, the "continuous" TSS must be <50 mg/L with sporadic peaks up to 200 mg/L.

2.1.1 Feed Pump and Strainer

UF Feed Pump, pump and VFD are shipped loose Feed pressure to this pump must be at least 5 psig.	
UF Feed Pump	
Number	One
Manufacturer / Model	Grundfos / CRN 32-2
Materials of Construction	316 stainless steel
Motor	10 HP, 3600 RPM, 460/3/60 VFD provided.
Electrical	
Remote I/O type	Allen-Bradley 1734 Point I/O
Remote I/O Panel	NEMA 4

Automatic Strainer, ship loose	
Number	One
Type	Automatic self-cleaning
Rating	200 Micron
Screen	316 SS
Housing	Plastic
Motor	15 Watt, 120/1/60
Manufacturer / Model	Amiad / 3" TAF 750
Flushing requirements	Minimum 25 gpm @ 22 psi. 16 seconds per flush cycle

VFD, ship loose	
VFD	ABB
VFD Enclosure	NEMA 12

Remote I/O Panel, ship loose	
Remote I/O type	Allen-Bradley 1734 Point I/O
Remote I/O Panel	NEMA 4

2.1.2 Uflex F04B06 Valve Skid

Valves and Piping	
Automatic Valves	6” and 4” automatic butterfly valves, lugged CI body, nylon coated disc, EPDM seat, with spring to close-air to open pneumatic actuator
Automatic Vent	¾” 2-way solenoids
Manual Valves	Manual butterfly valves, lugged CI body, nylon coated disc, EPDM seat
Sample, Drain, and Vent Valves	Manual ball valves
Piping	Sch. 80 PVC
Instrumentation	
Pressure Transmitter	Feed water inlet, filtrate outlet
Temperature Transmitter	Feed water inlet
Level Switch	Refill vents
Flow Transmitter (magflow)	Feed water inlet, shipped loose for installation by the customer
Turbidity Analyzer	Feed water inlet, filtrate outlet; dual channel with two sensors
Electrical	
Remote I/O type	Allen-Bradley 1734 Point I/O
Remote I/O Panel	NEMA 4
Skid	
Composition	Epoxy coated carbon steel

2.1.3 M6 Membrane Rack Assembly Kit

One membrane rack assembly kit with six UF modules is sent the jobsite for assembly on site by others per the instructions provided with the kit. Assembly does not require skilled labor and can be accomplished with standard hand-held tools; neither special tools nor heavy machinery are required. The estimated time for assembly is three laborers for 45 to 60 minutes.

Membranes	
Manufacturer/Model	Dizzer XL 0.9MB80WT
Direction	Inside-out
Active Area and Pore Size	753 ft^2, 0.02 µm
Quantity	6

2.1.4 Backwash Pump

Backwash Pump, pump, VFD, and flow transmitter are shipped loose	
Backwash Pump	
Number	One
Manufacturer / Model	Grundfos / CRN 90-2-2
Materials of Construction	316 stainless steel
Motor	25 HP, 3,600 RPM, 480/3/60, Inverter ready. VFD provided.

Instrumentation	
Flow Transmitter (magflow)	Backwash pump discharge, shipped loose for installation by the

	customer

VFD, ship loose	
VFD	ABB
VFD Enclosure	NEMA 12

Remote I/O Panel, ship loose	
Remote I/O type	Allen-Bradley 1734 Point I/O
Remote I/O Panel	NEMA 4

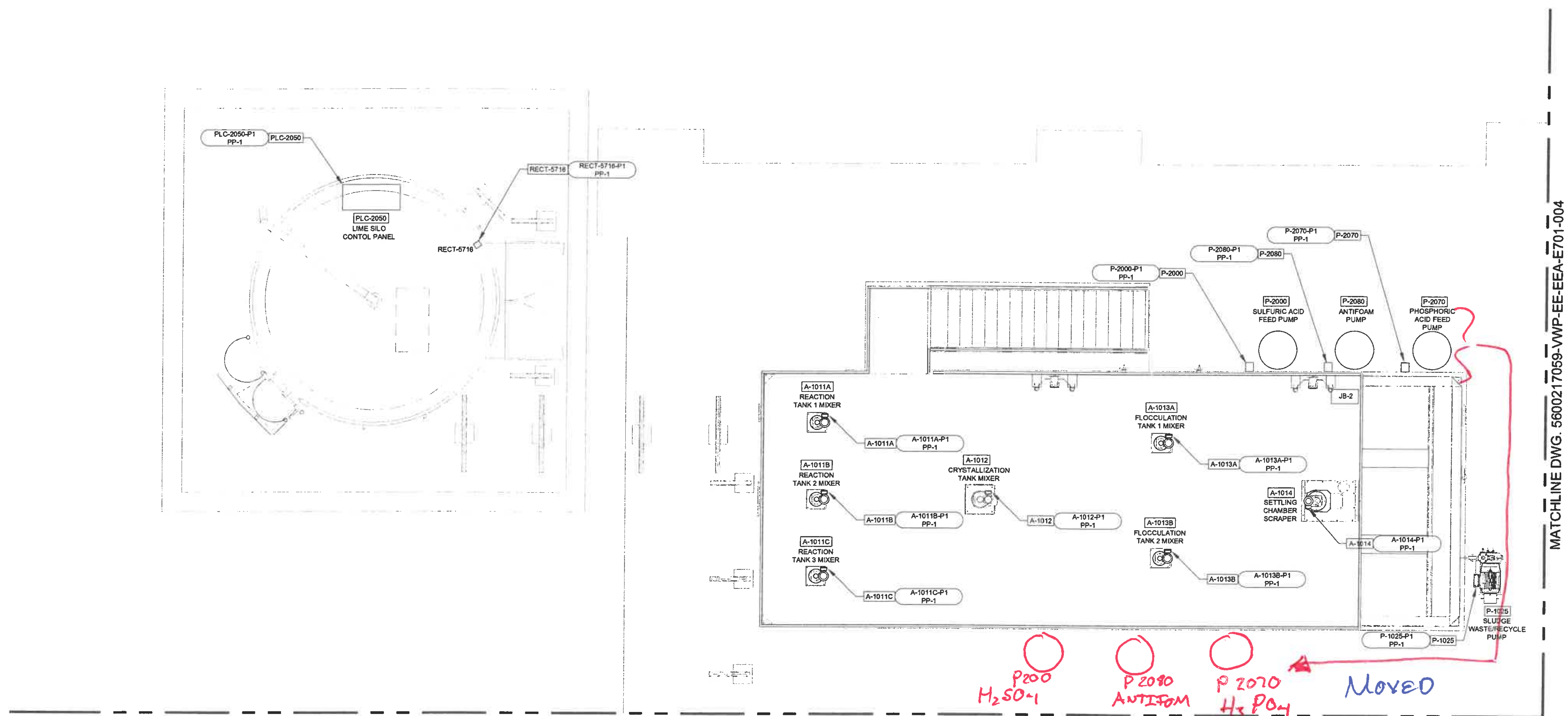
2.1.5 CEB Chemical Feed Packages

Three chemical feed packages are provided for the chemically enhanced backwash cleaning of the UF membranes. Each package is individually mounted on a plastic frame with containment and includes the necessary valves, instruments, and piping.

Sodium Hypochlorite Dosing Pump	
Manufacturer / Model	Ingersoll-Rand PD01P air operated diaphragm pump
Materials of Construction	PP/PVDF wetted parts
Accessories	Calibration column Suction strainer Injection quill (shipped loose)
Sodium Hydroxide Dosing Pump	
Manufacturer / Model	Ingersoll-Rand PD03P air operated diaphragm pump
Materials of Construction	PP/Santoprene wetted parts
Accessories	Calibration column Suction strainer Injection quill (shipped loose)
Acid Dosing Pump	
Manufacturer / Model	Ingersoll-Rand PD03P air operated diaphragm pump
Materials of Construction	PVDF/PTFE wetted parts
Accessories	Calibration column Suction strainer Injection quill (shipped loose)
Valves and Piping	
Manual, chemical service	Manual ball valves, PVC ball and body
Backpressure, chemical service	PVC
Solenoid Valve	½” 2-way
Piping	Schedule 80 PVC
Electrical	
Remote I/O type	Allen-Bradley 1734 Point I/O One panel common to the three chemical feeds
Remote I/O Panel	NEMA 4
Skids	
Composition	Polypropylene or equal

2.1.6 Main Control Panel

Main Control Panel, shipped loose	
PLC	Allen-Bradley CompactLogix
HMI	Siemens, 9” display
PLC/HMI Enclosure	NEMA 4



MATCHLINE DWG. 5600217059-VWP-EE-EEA-E701-001

PLAN
EL. GRADE
SCALE: 3/8" = 1'-0"
003
E701-000

ENTERED
JUN 7 2018
BY:

APPROVED

0' 1' 2' 4' 8'
GRAPHIC SCALE

REV NO.	ISSUE DATE	DESIGNED BY	CHECKED BY	REVIEWED BY	APPROVED BY	DESCRIPTION
0	5-15-18	D. WILLIAMS	S. LIAO	P. MORWY		ISSUED FOR CONSTRUCTION

DRAWINGS WITH ALPHA REVISIONS ARE PRELIMINARY AND SHALL NOT BE USED FOR FINAL DESIGN WORK OR FABRICATION.

VEOLIA
INDUSTRIAL PROJECTS, MOON TOWNSHIP, PA 15108 USA. TEL. 1-412-809-6000

SCALE 3/8" = 1'-0"
DRAWN BY D. WILLIAMS

TITLE
ARIZONA MINERALS, INC.
TRENCH CAMP PROPERTY WATER TREATMENT PLANT
PATAGONIA, AZ

ELECTRICAL
EQUIPMENT POWER PLAN

DRAWING NO. 5600217059-VWP-EE-EEA-E701-003
REV 0

05/15/2018 08:09:28 AM C:\Local_Workspace\AutoCAD\5600217059\5600217059-VWP-EE-EEA-E701-003.dwg

FIBER REINFORCED PLASTIC STORAGE TANK

DATASHEET

VEOLIA CONTRACT:	5600217059
EQUIPMENT NUMBER	TK-1060
EQUIPMENT NAME	MBBR Tank A
SPECIFICATION NUMBER:	5600217059-VWP-MS-SPC-Q103-00
DATASHEET NUMBER	5600217059-VWP-MS-DTS-Q103-03
SHEET: 1 OF 1	REV

SUPPLIER IS RESPONSIBLE FOR COMPLETING CELLS THAT ARE MARKED WITH (*)

Tank Name:	**MBBR Tank A**	Skid:		Stand Alone
Location:	Patagonia, AZ	Manufacturer:	**(*)**	Model C-OFV-12-12051
Tank Type:	Flat bottom, Open Top	No. Required:		One (1)
Tank Description:	Moving Bed Biofilm Reactor A			

PROCESS DATA			MECHANICAL DATA		
Name of Substance Stored		Mine Water	Design Pressure (psig)		atmospheric + static
Liquid Temperature, Max / Min. (^oF)		80 / 55	Design Temperature (^oF)		68
Pressure (psig)		atmospheric + static	Design Safety Factor		10
S.G. Liquid @ Max Temp.		1.0	Shell Thickness (in)	(*)	By Supplier
S.G. Liquid @ Min Temp		1.0	Top Head Type		Open
% Concentrate			Top Head Thickness (in)	(*)	N/A
			Bottom Head Type		Flat
pH of liquid stored		7.2	Bottom Head Thickness (in)	(*)	By Supplier
Tank Vol./ Operating Level (gallons/inches)		10000 W.V. / 144"	Supports (Type/Quantity)		(4) Holddown Lugs / #7 heavy,CS powder coated
Indoor or Outdoor Installation		Outdoor	Wind Loading		105 mph
Nominal Height (inch)		168"	Seismic Zone		Later
Nominal Diameter (inch)		144"	Applicable Design Codes		ASTM D 3299-10, ASCE 7-2010
Internal Piping		(X) Yes ( ) No	Vessel Weight (Empty) (lbs)	**(*)**	*
Internal Trays		(X) Yes ( ) No	Vessel Weight (Filled) (lbs)	**(*)**	*
Overflow Rate: (gpm in / gpm out)		122 / 122	Accessories (please list)	**(*)**	Piping Clips (note 4)
Is Mixer/Agitator Required		( ) Yes (X) No		**(*)**	
Baffles Required		( ) Yes (X) No		**(*)**	
Vortex Breaker		( ) Yes (X) No		**(*)**	
Unique External Loads to Tank:		Piping to Aeration Grid			
Cleaning frequency (min. / cycle)	**(*)**	*			

MATERIALS AND TYPES OF CONSTRUCTION

Shell:	**(*)**	Filament wound per ASTM D3299-10	Supports:	**(*)**	Contact molded per ASTM D4097
Tank Top:	**(*)**	Filament wound per ASTM D3299-10	Insulation:		N/A
Nozzles:	**(*)**	Contact molded per ASTM D4097	Nozzle Flanges:	**(*)**	Contact molded per ASTM D4097, FF
Tank Bottom:	**(*)**	Contact molded per ASTM D4097	Internals:	**(*)**	MBBR Aeraton Grid (By Others)
Internal / External Piping:		None	Bolting / Gaskets:	**(*)**	T-316 SS / EPDM
Lift Lugs:	**(*)**	Contact molded per ASTM D4097	Baffles:		N/A
Studded Outlets:		None	Platform:	**(*)**	N/A
Inner Corrosion Liner, Mat or Veil:	**(*)**	(1) PLY c - glass veil in the corrosion barrier	Ladder:	**(*)**	N/A
Chopped Strand Mat:	**(*)**	Type 'E' Glass w/resin compatible binder	Clips / Pipe Supports:	**(*)**	Contact molded per ASTM D4097
Woven Roving:	**(*)**	Type 'E' Glass, 24-oz / sq. yard	Reinforcement Pads:	**(*)**	Contact molded per ASTM D4097
Continuous Roving:	**(*)**	Type 'E' Glass w/resin compatible sizing	Horizontal Reinforcing Flange:		None

(*) CONNECTIONS, MANHOLES, AND HANDHOLES (*) - Number of nozzles and sizes will be confirmed on supplier's drawings during review process.

Mark	Qty	Rating	Size	Location	Mark	Qty	Rating	Size	Location
A - Inlet	1	150#	6"	Shell	D - Drain	1	150#	2"	Shell
B - Discharge	1	150#	6"	Shell	E - Spare	1	150#	2"	Shell
C - Manway	1	API	24"	Shell					

COATINGS:

UV Resistant Gel Coat

NOTES:

1.) Supplier is responsible for identifying connection, manholes and handholes.

2.) Tank manufacturer is responsible for confirming the materials (resins) of construction per chemistry, temperature and pH of tank content.

3.) Tolerance on overall tank height shall not exceed +/- 1/2%. Nozzle Flange Faces shall be perpendicular to the axis of the pipe and shall be flat within +/- 1/32".

Tolerance on the inside tank diameter , including out-of-roundness, shall not be more than +/- 1%.

4). Deleted

5.) Vendor to provide internal mounting clips on tank floor and tank wall for aeration grid, aeration piping, and effluent sieve. External piping clips to be provided as needed.

REVISION LOG

REV.	ISSUE STATUS	DATE	BY	CHECKED	APPROVED
0	Issue For Purchase	12/20/2017	THS	CRG	JP

VEOLIA	FIBER REINFORCED PLASTIC STORAGE TANK	VEOLIA CONTRACT:	5600217059	
		EQUIPMENT NUMBER	TK-1070	
		EQUIPMENT NAME	MBBR Tank B	
	DATASHEET	SPECIFICATION NUMBER:	5600217059-VWP-MS-SPC-Q103-00	
		DATASHEET NUMBER	5600217059-VWP-MS-DTS-Q103-04	
		SHEET: 1 OF 1		REV

SUPPLIER IS RESPONSIBLE FOR COMPLETING CELLS THAT ARE MARKED WITH (*)

1	Tank Name:			**MBBR Tank B**	Skid:			Stand Alone
2	Location:			Patagonia, AZ	Manufacturer:		(*)	Belding Model C-OFV-12-12051
3	Tank Type:			Flat bottom, Open Top	No. Required:			One (1)
4	Tank Description:			Moving Bed Biofilm Reactor B				
5								
6	**PROCESS DATA**				MECHANICAL DATA			
7	Name of Substance Stored			Mine Water	Design Pressure	(psig)		atmospheric + static
8	Liquid Temperature, Max / Min.	(^oF)		80 / 55	Design Temperature	(^oF)		68
9	Pressure	(psig)		atmospheric + static	Design Safety Factor			10
10	S.G. Liquid @ Max Temp.			1.0	Shell Thickness	(in)	(*)	By Supplier
11	S.G. Liquid @ Min Temp			1.0	Top Head Type			Open
12	% Concentrate				Top Head Thickness	(in)	(*)	N/A
13					Bottom Head Type			Flat
14	pH of liquid stored			7.2	Bottom Head Thickness	(in)	(*)	By Supplier
15	Tank Vol./ Operating Level	(gallons/inches)		10000 W.V. / 144"	Supports (Type/Quantity)			(4) Holddown Lugs / #7 heavy,CS powder coated
16	Indoor or Outdoor Installation			Outdoor	Wind Loading			105 mph
17	Nominal Height	(inch)		168"	Seismic Zone			Later
18	Nominal Diameter	(inch)		144"	Applicable Design Codes			ASTM D 3299-10, ASCE 7-2010
19	Internal Piping			(X) Yes ( ) No	Vessel Weight (Empty)	(lbs)	(*)	*
20	Internal Trays			(X) Yes ( ) No	Vessel Weight (Filled)	(lbs)	(*)	*
21	Overflow Rate:	(gpm in / gpm out)		122 / 122	Accessories (please list)		(*)	Piping Clips (note 4)
22	Is Mixer/Agitator Required			( ) Yes (X) No			(*)	
23	Baffles Required			( ) Yes (X) No			(*)	
24	Vortex Breaker			( ) Yes (X) No			(*)	
25	Unique External Loads to Tank:			Piping to Aeration Grid				
26	Cleaning frequency	(min. / cycle)	(*)	*				
27								
28	**MATERIALS AND TYPES OF CONSTRUCTION**							
29	Shell:		(*)	Filament wound per ASTM D3299-10	Supports:		(*)	Contact molded per ASTM D4097
30	Tank Top:		(*)	Filament wound per ASTM D3299-10	Insulation:			N/A
31	Nozzles:		(*)	Contact molded per ASTM D4097	Nozzle Flanges:		(*)	Contact molded per ASTM D4097, FF
32	Tank Bottom:		(*)	Contact molded per ASTM D4097	Internals:		(*)	MBBR Aeraton Grid (By Others)
33	Internal / External Piping:			None	Bolting / Gaskets:		(*)	T-316 SS / EPDM
34	Lift Lugs:		(*)	Contact molded per ASTM D4097	Baffles:			N/A
35	Studded Outlets:			None	Platform:		(*)	N/A
36	Inner Corrosion Liner, Mat or Veil:		(*)	(1) PLY c - glass veil in the corrosion barrier	Ladder:		(*)	N/A
37	Chopped Strand Mat:		(*)	Type 'E' Glass w/resin compatible binder	Clips / Pipe Supports:		(*)	Contact molded per ASTM D4097
38	Woven Roving:		(*)	Type 'E' Glass, 24-oz / sq. yard	Reinforcement Pads:		(*)	Contact molded per ASTM D4097
39	Continuous Roving:		(*)	Type 'E' Glass w/resin compatible sizing	Horizontal Reinforcing Flange:			None
40								
41								

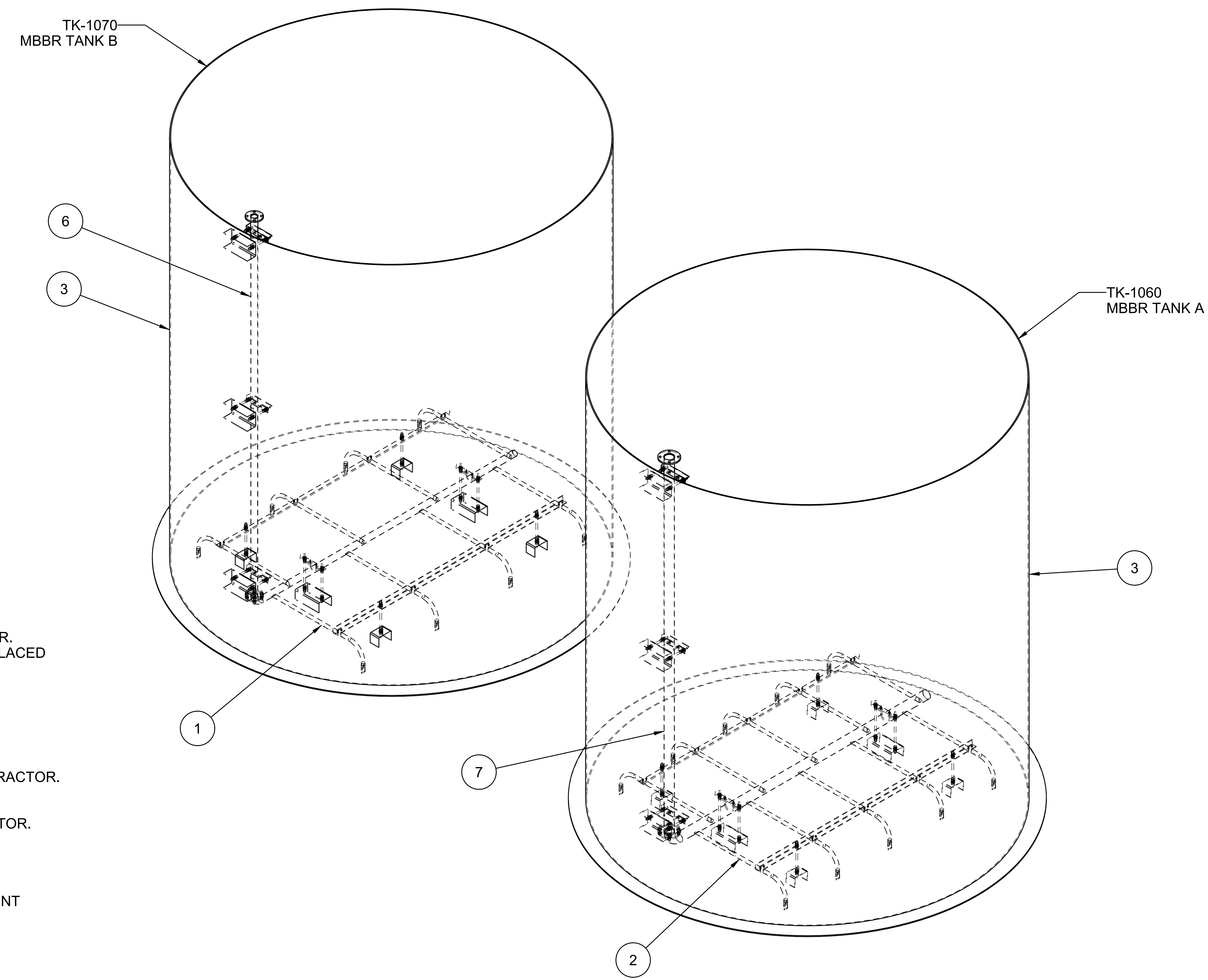
42 (*) CONNECTIONS, MANHOLES, AND HANDHOLES (*) - Number of nozzles and sizes will be confirmed on supplier's drawings during review process.

43	Mark	Qty	Rating	Size	Location	Mark	Qty	Rating	Size	Location
44	A - Inlet	1	150#	6"	Shell	D - Drain	1	150#	2"	Shell
45	B - Discharge	1	150#	6"	Shell	E - Spare	1	150#	2"	Shell
46	C - Manway	1	API	24"	Shell					
47										
48										
49										
50										
51										
52										
53										

54	**COATINGS:**
55	UV Resistant Gel Coat
56	
57	
58	**NOTES:**
59	1.) Supplier is responsible for identifying connection, manholes and handholes.
60	2.) Tank manufacturer is responsible for confirming the materials (resins) of construction per chemistry, temperature and pH of tank content.
61	3.) Tolerance on overall tank height shall not exceed +/- 1/2%. Nozzle Flange Faces shall be perpendicular to the axis of the pipe and shall be flat within +/- 1/32".
62	Tolerance on the inside tank diameter , including out-of-roundness, shall not be more than +/- 1%.
63	4). Deleted
64	5.) Vendor to provide internal mounting clips on tank floor and tank wall for aeration grid, aeration piping, and effluent sieve. External piping clips to be provided as needed.
65	
66	
67	
68	
69	

70 REVISION LOG

71	REV.	ISSUE STATUS	DATE	BY	CHECKED	APPROVED
72	0	Issue For Purchase	12/20/2017	THS	CRG	JP
73						
74						
75						
76						



NOTE:
ANY REFERENCE TO "CONTRACTOR", "INSTALLATION CONTRACTOR", "ENGINEER", "CONSULTING ENGINEER", OR "BY OTHERS" INDICATES NOT BY VEOLIA.

1. ALL PIPE SUPPORTS TO BE SUPPLIED AND INSTALLED BY TANK SUPPLIER. PIPE SUPPORTS ARE DESIGNED BY OTHERS. PIPE SUPPORTS SHALL BE PLACED SO THAT LOADS AND FORCES WILL NOT BE TRANSFERRED TO ANY KRUGER EQUIPMENT.

2. UNLESS OTHERWISE NOTED, ALL PIPING AND FITTINGS SUPPLIED AND INSTALLED BY INSTALLATION CONTRACTOR. ALL PIPING AND FITTINGS TO BE INSTALLED AND FIELD ADJUSTED, AS REQUIRED, ON SITE BY THE INSTALLATION CONTRACTOR BASED ON ACTUAL FIELD DIMENSIONS AND MEASUREMENTS. ALL GASKETS TO BE SUPPLIED BY INSTALLATION CONTRACTOR.

3. ALL EQUIPMENT SUPPORT BRIDGES AND WALKWAYS TO BE DESIGNED BY ENGINEER AND SUPPLIED AND INSTALLED BY INSTALLATION CONTRACTOR.

5. TANK SUPPLIER SCOPE INCLUDES, BUT IS NOT LIMITED TO:
- TANK CLIPS FOR AIR GRID, LATERALS, AND DROP PIPE SUPPORTS.
- TANK PENETRATION NOZZLES
- COORDINATION OF ALL TANK LOCATIONS TO VEOLIA DESIGNED EQUIPMENT

1886476 | 2.1 | Released | 1886476 | 2.1 | Released

REV	DESCRIPTION	DRAWN	APPR	DATE
2	REVISED 2" U-BOLT FASTENERS	JCC	.	02.16.18
1	RENAMED TANKS	JCC	.	02.05.18
0	RELEASED FOR SUBMITTAL	SRW	JJM	01.25.18

VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

ANOXKALDNES
DETAILS, MECHANICAL, PLAN AND SECTIONS

5700217059
ARIZONA MINERALS

SCALE	DRAWING NO	SHEET	REV
1:36	1886476	1 of 7	2

DRAWING NUMBER: 1886476 PROJECT NUMBER: 5700217059 PROJECT NAME: ARIZONA MINERALS	**MD BILL OF MATERIALS**	PAGE 2 OF 7 REVISION: 2

ITEM	QTY	DRAWING NO.	DESCRIPTION	MATERIAL
1	1	1886514	ASSY, AIR GRID, 2", (4) 1" LATERALS @ 36" OC, 7" W, FLG/CAP	SEE BOM
2	1	1886478	ASSY, AIR GRID, 3", (5) 1" LATERALS @ 24" OC, 7" W, FLG/CAP	SEE BOM
3	2	-	ASSY, TANK, Ø12'	SEE BOM
4	1	-	GSKT, FLG, FULL FACE, 2", 125/150 LB ANSI, 1/8" THK	EPDM_70DURO_SHOREA
5	1	-	GSKT, FLG, FULL FACE, 3", 125/150 LB ANSI, 1/8" THK	EPDM_70DURO_SHOREA
6	1	1886546	WLDMT, DROP PIPE, 2", 151"LG	SEE BOM
7	1	1886542	WLDMT, DROP PIPE, 3", 149"LG	SEE BOM

DRAWING NUMBER: 1886476 PROJECT NUMBER: 5700217059 PROJECT NAME: ARIZONA MINERALS	**MD BILL OF MATERIALS**	 REVISION: 2

ITEM	QTY	DESCRIPTION	MATERIAL
901	-	~~~LABEL AND SHIP LOOSE - AERATION PIPE FLOOR FASTENERS (2" PIPE)~~~	
	5	ANG, 6" PIPE SUPPORT, 2.00" SQ X .19"THK X 10.00"LG	AISI 304
	60	NUT, HEX, 5/8-11, ANSI	
	10	ROD, THD, 5/8-11 X 25"LG, ANSI	
	5	U-BOLT, 2", 1/4-20, DALE Co. #US8 OR EQUIV, W/O NUTS	
	40	WSHR, FLAT, 5/8", .688"ID, 1.312"OD, .108"THK, SAE	
	20	WSHR, LOCK, 5/8", ANSI	
	10	NUT, HEX, 1/4-20, ANSI	
	10	WSHR, FLAT, 1/4", .313"ID, .625"OD, .051"THK, SAE	
	10	WSHR, LOCK, 1/4", ANSI	

ITEM	QTY	DESCRIPTION	MATERIAL
902	-	~~~LABEL AND SHIP LOOSE - AERATION PIPE FLOOR FASTENERS (3" PIPE)~~~	
	5	ANG, 6" PIPE SUPPORT, 2.00" SQ X .19"THK X 11.00"LG	AISI 304
	10	NUT, HEX, 3/8-16, ANSI	
	60	NUT, HEX, 5/8-11, ANSI	
	10	ROD, THD, 5/8-11 X 25"LG, ANSI	
	5	U-BOLT, 3", 3/8-16, DALE Co. #US26 OR EQUIV, W/O NUTS	
	10	WSHR, FLAT, 3/8", .438"ID, .812"OD, .064"THK, SAE	
	40	WSHR, FLAT, 5/8", .688"ID, 1.312"OD, .108"THK, SAE	
	10	WSHR, LOCK, 3/8, ANSI	
	20	WSHR, LOCK, 5/8", ANSI	

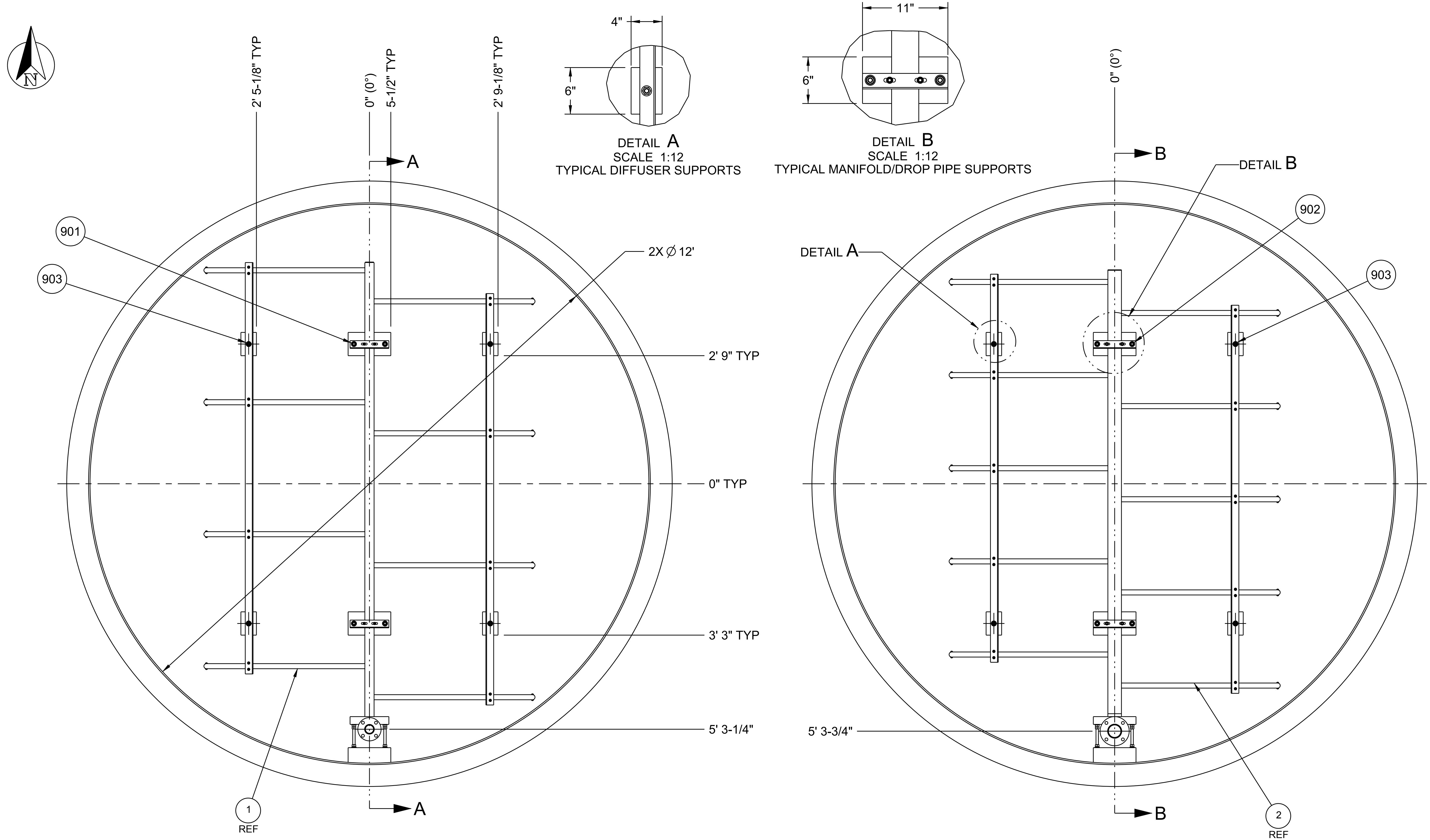
ITEM	QTY	DESCRIPTION	MATERIAL
903	-	~~~LABEL AND SHIP LOOSE - DIFFUSER SUPPORT FASTENERS~~~	
	48	NUT, HEX, 5/8-11, ANSI	AISI 304
	8	ROD, THD, 5/8-11 X 15-1/2"LG, ANSI	
	32	WSHR, FLAT, 5/8", .688"ID, 1.312"OD, .108"THK, SAE	
	16	WSHR, LOCK, 5/8", ANSI	

ITEM	QTY	DESCRIPTION	MATERIAL
904	-	~~~LABEL AND SHIP LOOSE - 2" 125 LB FLANGE FASTENERS~~~	AISI 304
	4	NUT, HEX, 5/8-11, ANSI	
	4	SCREW, HEX, 5/8-11 X 2-1/2"LG, ANSI	
	8	WSHR, FLAT, 5/8", .688"ID, 1.312"OD, .108"THK, SAE	
	4	WSHR, LOCK, 5/8", ANSI	

DRAWING NUMBER: 1886476 PROJECT NUMBER: 5700217059 PROJECT NAME: ARIZONA MINERALS	**MD BILL OF MATERIALS**	 REVISION: 2 CREATED BY: JCC

ITEM	QTY	DESCRIPTION	MATERIAL
905	-	~~~LABEL AND SHIP LOOSE - 3" 125 LB FLANGE FASTENERS~~~	AISI 304
	4	NUT, HEX, 5/8-11, ANSI	
	4	SCREW, HEX, 5/8-11 X 2-1/2"LG, ANSI	
	8	WSHR, FLAT, 5/8", .688"ID, 1.312"OD, .108"THK, SAE	
	4	WSHR, LOCK, 5/8", ANSI	

VEOLIA



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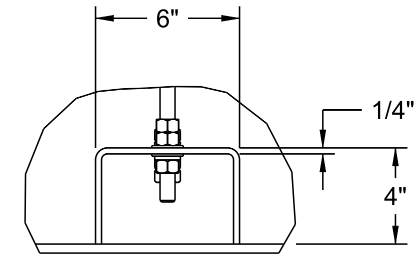
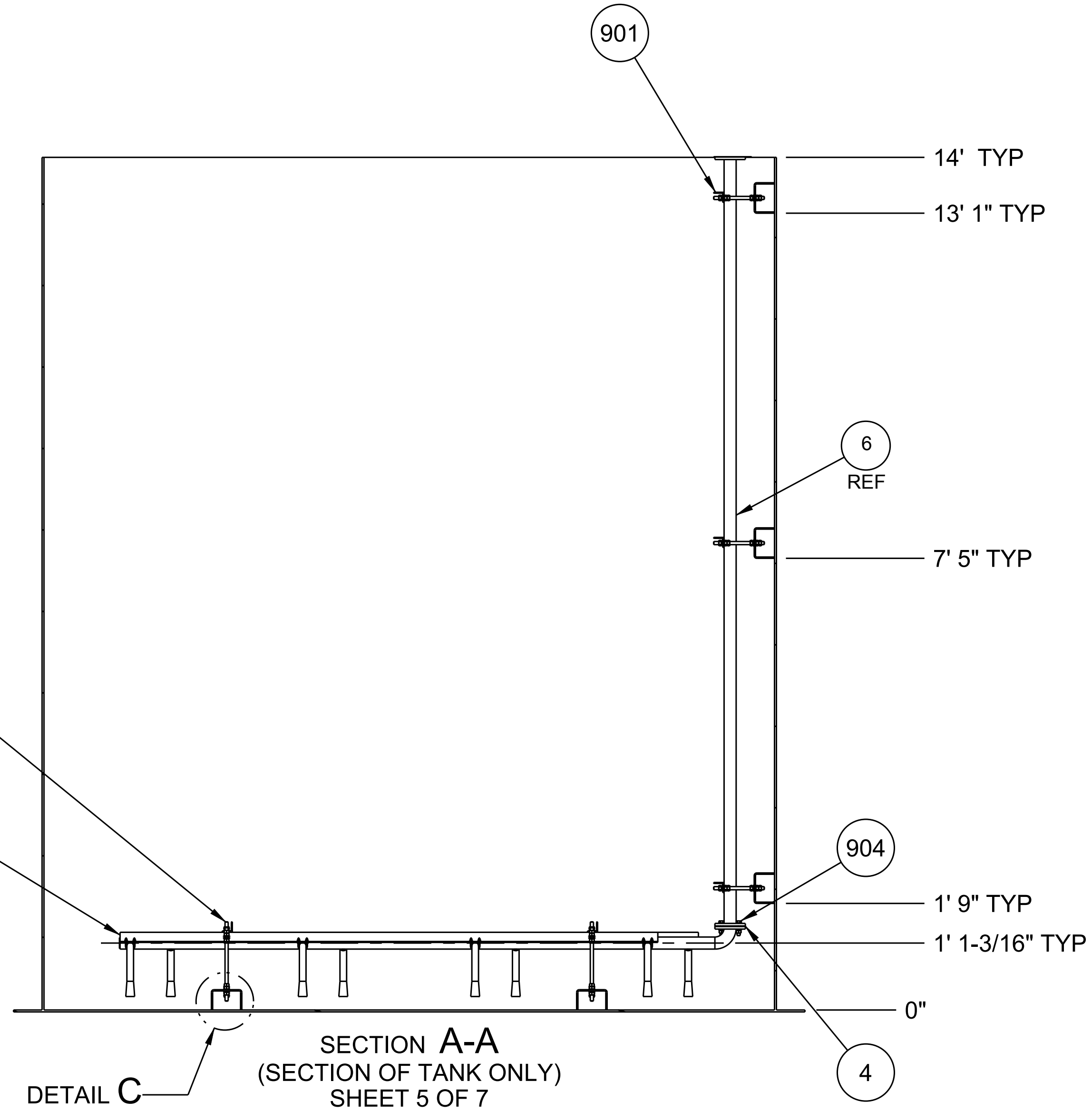
ANOXKALDNES
DETAILS, MECHANICAL, PLAN AND SECTIONS

5700217059
ARIZONA MINERALS

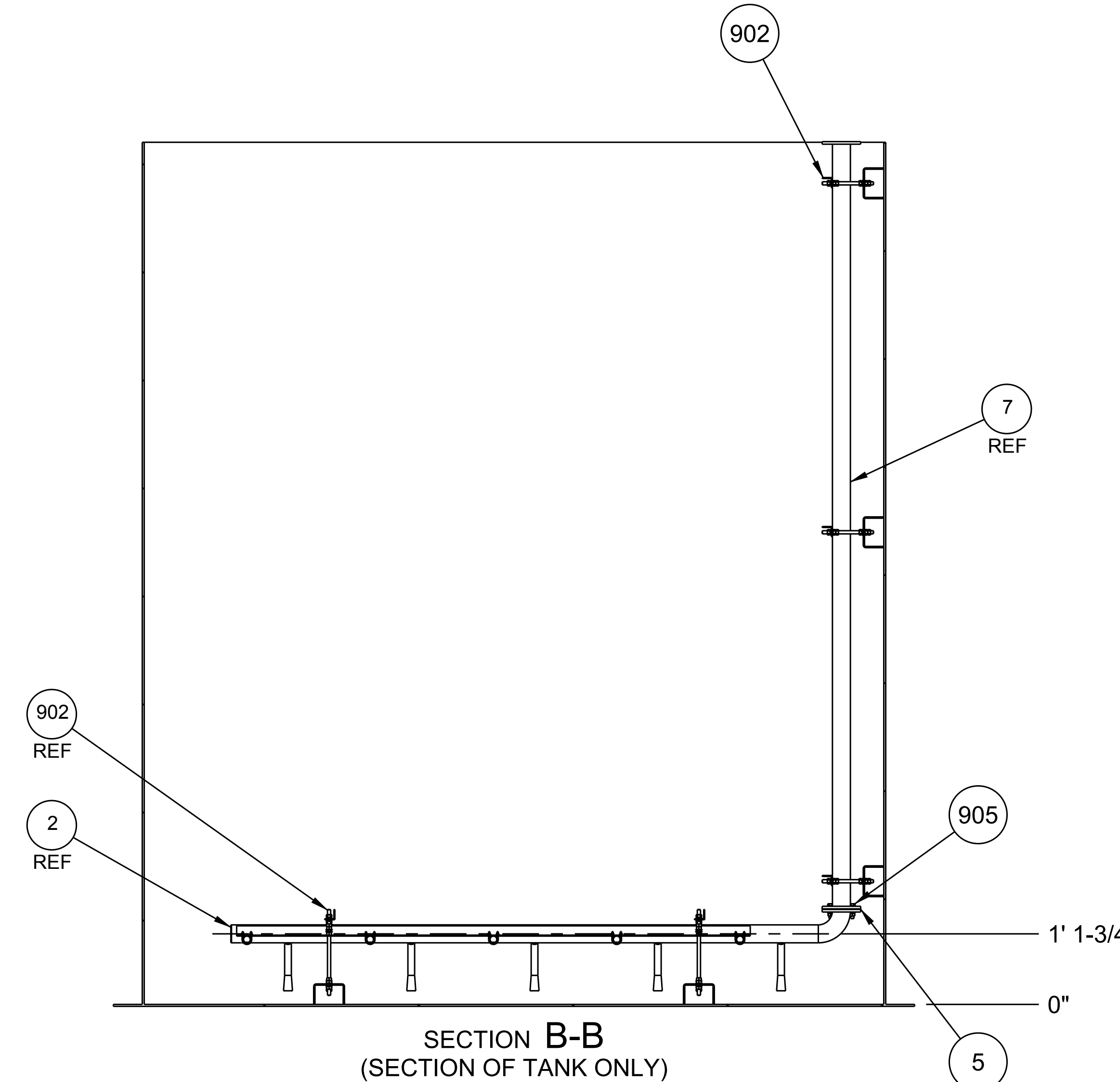
SCALE	DRAWING NO	SHEET	REV
1:24	1886476	5 of 7	2



DETAIL C
SCALE 1:8
TYPICAL SUPPORT CLIP



SECTION A-A
(SECTION OF TANK ONLY)
SHEET 5 OF 7



SECTION B-B
(SECTION OF TANK ONLY)
SHEET 5 OF 7

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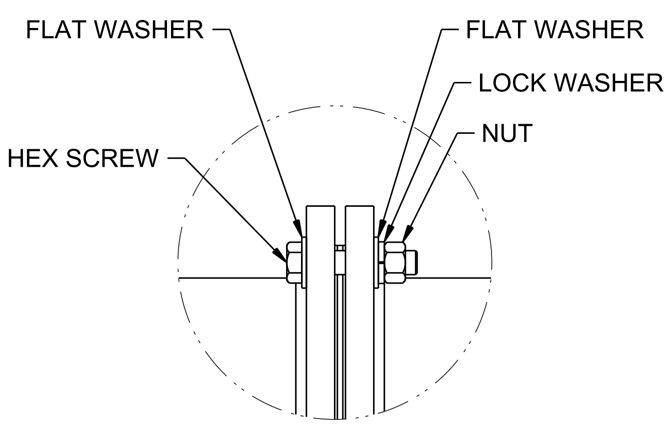
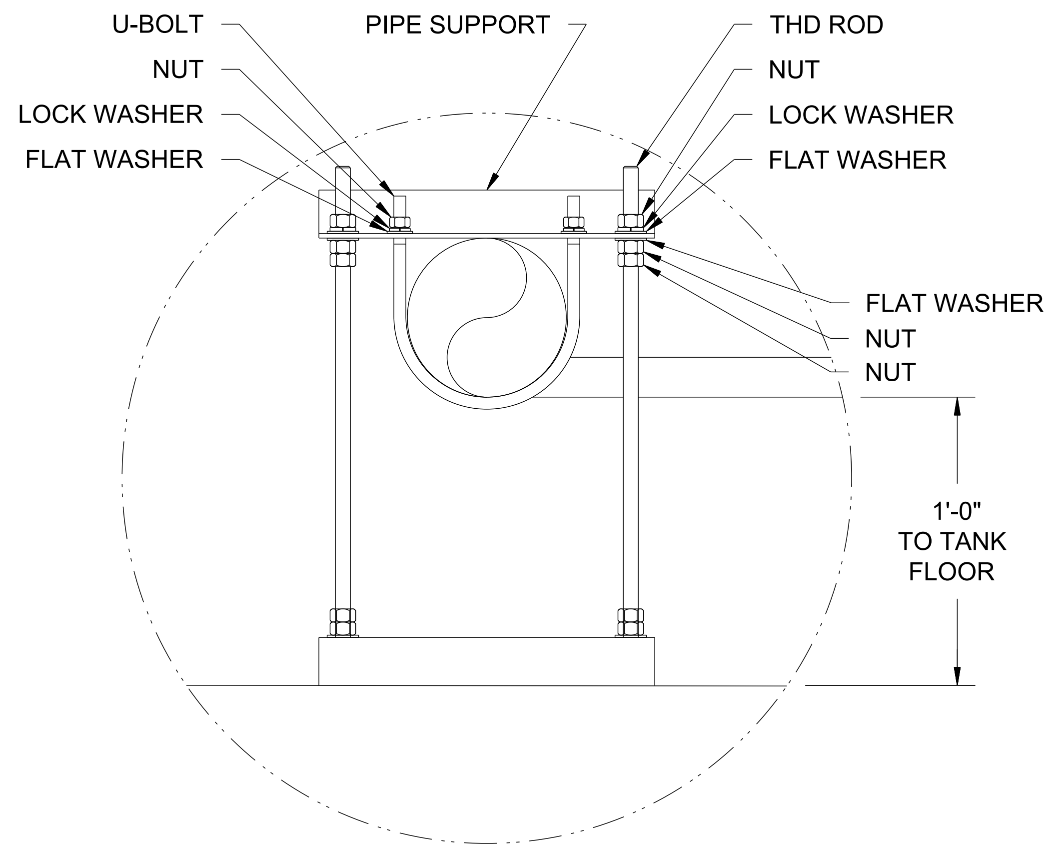
ANOXKALDNES
DETAILS, MECHANICAL, PLAN AND SECTIONS

5700217059
ARIZONA MINERALS

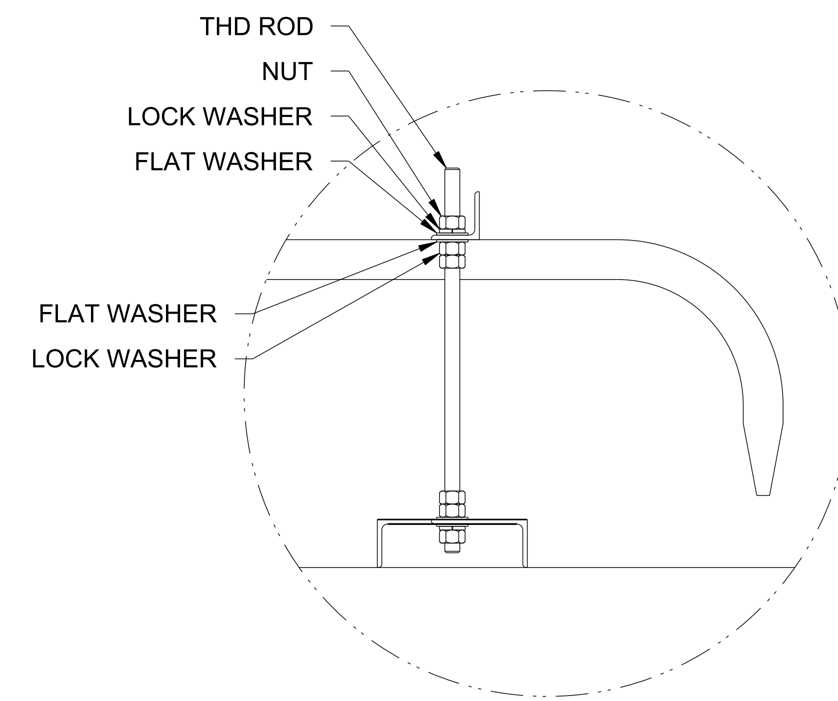
SCALE	DRAWING NO	SHEET	REV
1:36	1886476	6 of 7	2



TYP FLANGE FASTENERS
SCALE 1:4
904 905



TYP AERATION PIPE SUPPORT
ATTACHMENT & FLOOR
ATTACHMENT DETAIL
SCALE 1:8
901 902



TYP DIFFUSER SUPPORT
ATTACHMENT & FLOOR
ATTACHMENT DETAIL
SCALE 1:8
903

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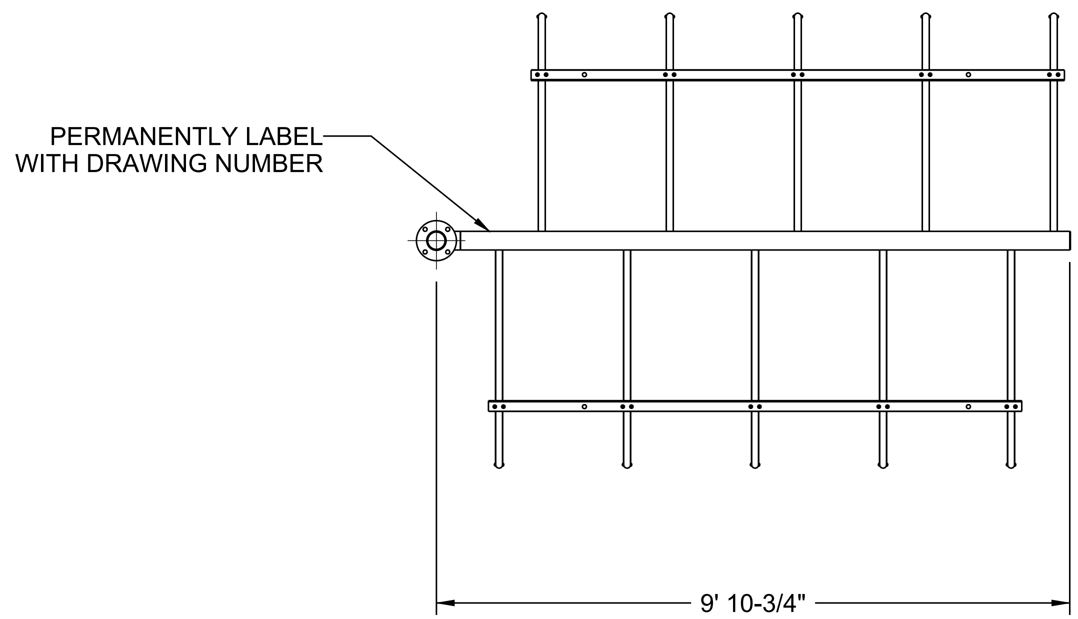
ANOXKALDNES
DETAILS, MECHANICAL, PLAN AND SECTIONS

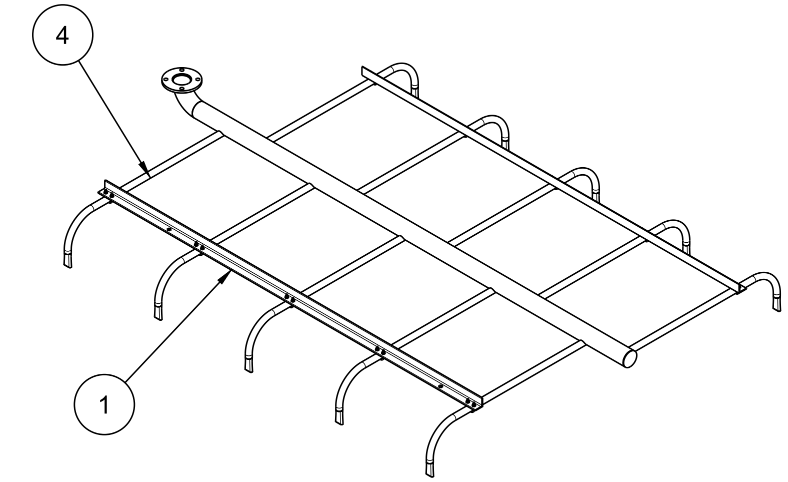
5700217059
ARIZONA MINERALS

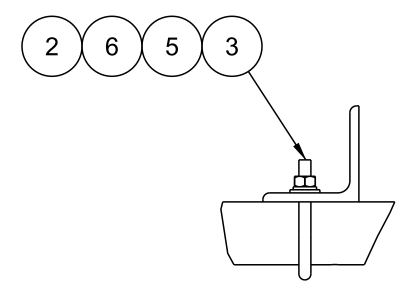
SCALE	DRAWING NO	SHEET	REV
1:120	1886476	7 of 7	2

EST. WT. = 129 LBS.

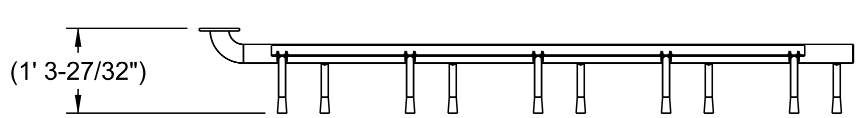
ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	2	AISI_304	1886483	AIR GRID SUPPORT, 2.00" SQ X .19"THK X 100.00"LG, (5) 1-1/4" LATERALS @ 2"OC
2	20	AISI_304	-	NUT, HEX, 1/4-20, ANSI
3	10	AISI_304	-	U-BOLT, 1", 1/4-20, DALE Co. #US5 OR EQUIV, W/O NUTS
4	1	SEE BOM	1886479	WLDMT, AIR GRID, 3", (5) 1" LATERALS @ 24" OC, 7" W, FLG/CAP
5	20	AISI_304	-	WSHR, FLAT, 1/4", .313"ID, .625"OD, .051"THK, SAE
6	20	AISI_304	-	WSHR, LOCK, 1/4", ANSI

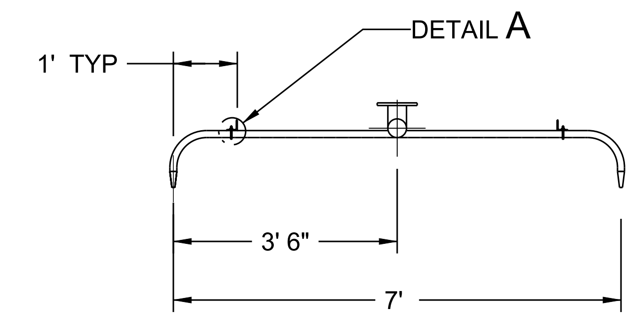






DETAIL A
TYP U-BOLT ATTACHMENT
SCALE 1:4





NOTES:
1. CLEAN AND DEGREASE PARTS BEFORE ASSEMBLY.
2. ANTI-SEIZE TO BE APPLIED TO ALL HDWR UNLESS OTHERWISE SPECIFIED.
3. ALL HDWR TO BE TIGHTENED TO APPROPRIATE TORQUE VALUES.

1886478 | 0.0 | In Work | 1886478 | 0.0 | In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.25.18

VEOLIA
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±1/8" ON LINEAR DIMENSIONS
±1/32" ON HOLE Ø & LOCATIONS
±1° ON ANGULAR DIMENSIONS

.030 = .X
.015 = .XX
.005 = .XXX

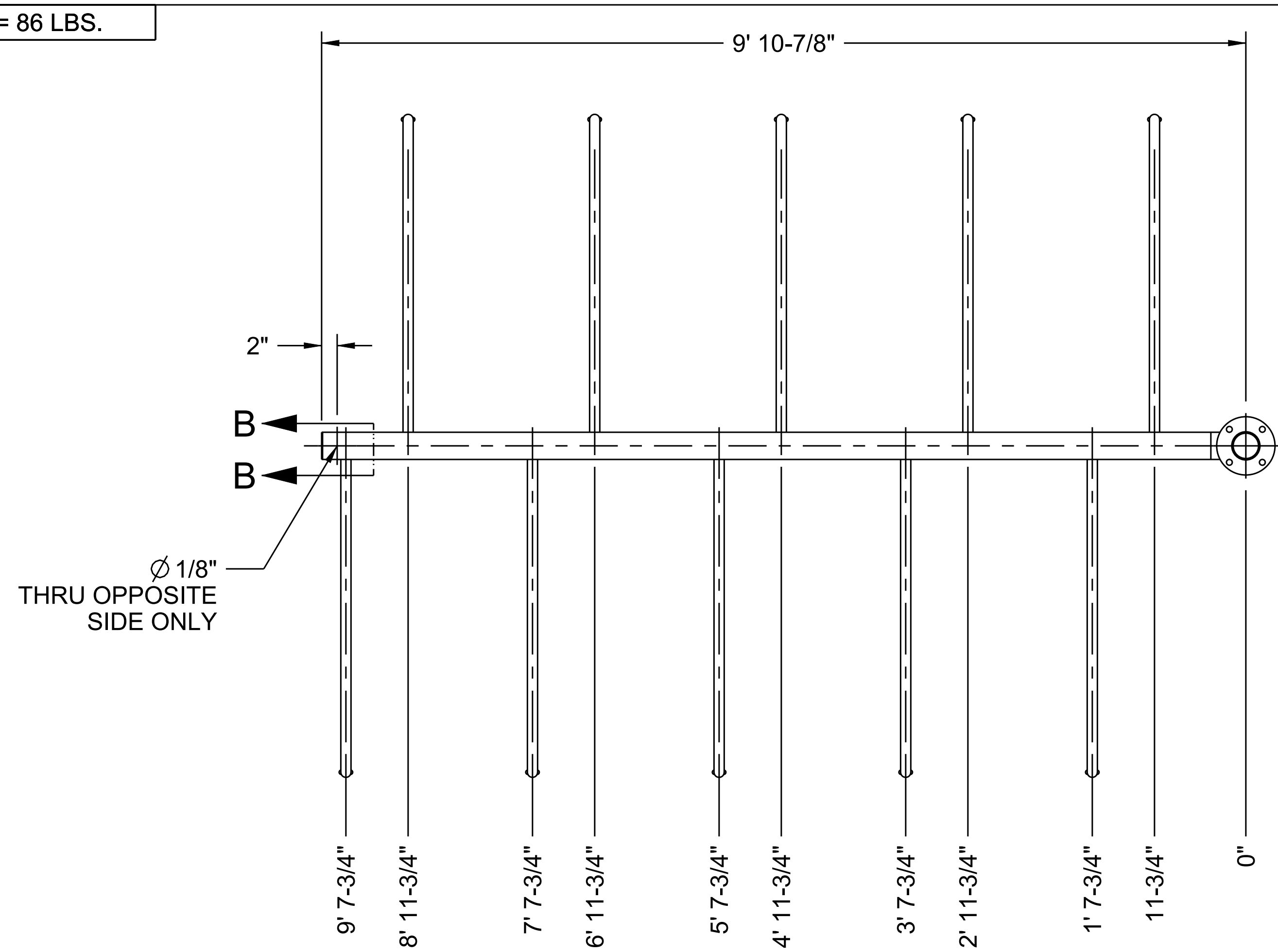
(X.XXX) = REFERENCE
(X.XXX) = INSPECTION
BREAK SHARP EDGES

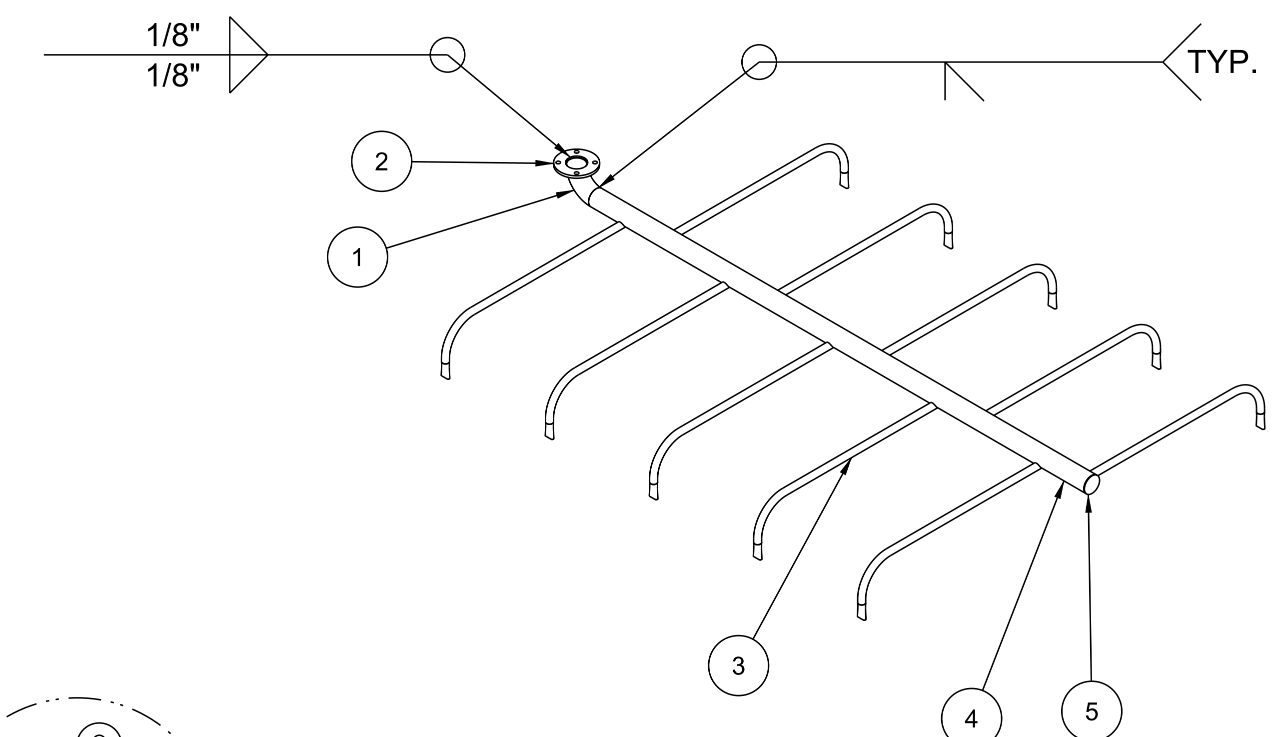
ANOXKALDNES
ASSY, AIR GRID, 3", (5) 1" LATERALS @ 24" OC, 7" W, FLG/CAP

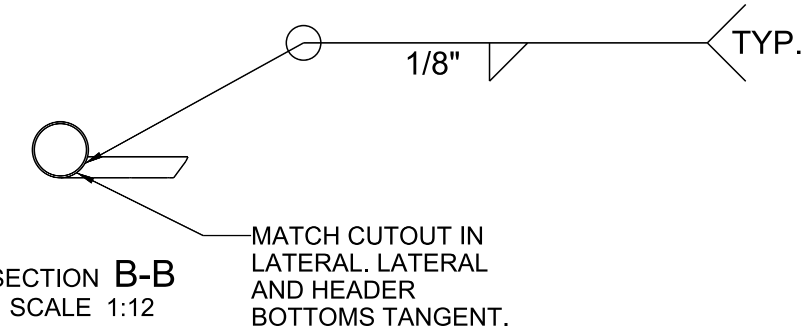
SCALE	DRAWING NO	SHEET	REV
1:36	1886478	1 of 1	0

EST. WT. = 86 LBS.

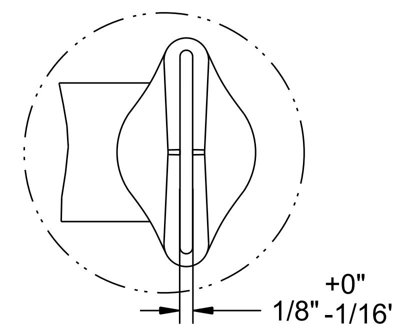
ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	1	AISI_304	-	ELB, PIPE, LR, 3", SCH 10, BW
2	1	AISI_304L	-	FLG, PIPE, PL, 3", 1/2" THK, 125LB
3	10	AISI_304L	-	PIPE, 1", SCH 5, 49.75"LG
4	1	AISI_304L	-	PIPE, 3", SCH 10, 114.25"LG
5	1	AISI_304L	-	SHEET, 11 GA, Ø3.50"



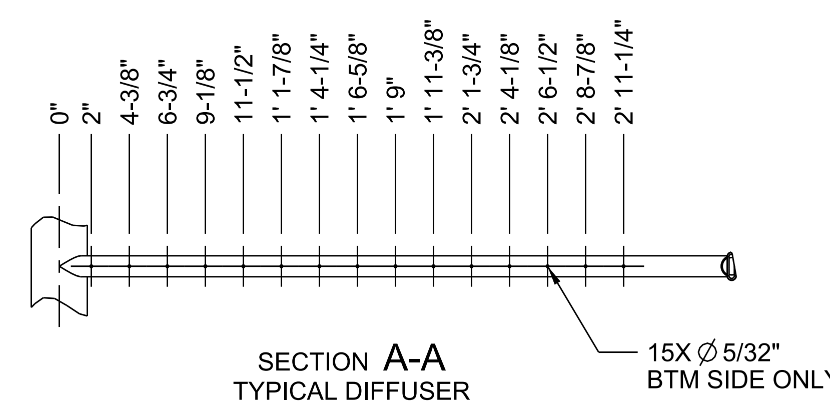




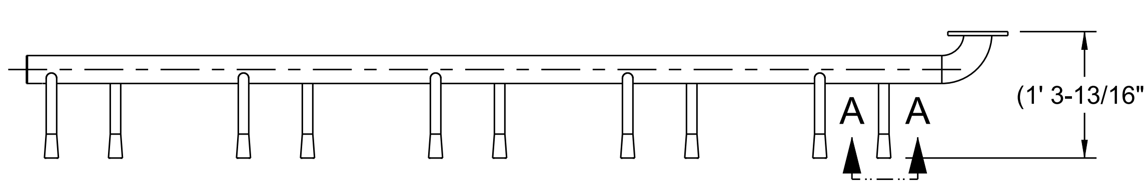
SECTION B-B
SCALE 1:12

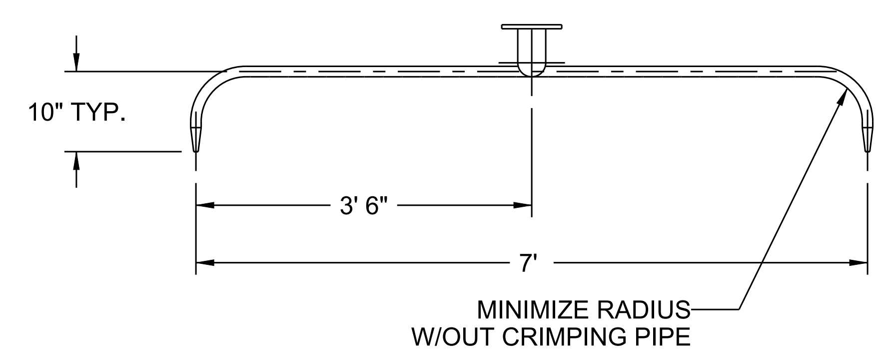


TYP DIFFUSER CRIMP DETAIL
SCALE 1:2



SECTION A-A
TYPICAL DIFFUSER
HOLE SPACING
SCALE 1:12





NOTES:
1. REFER TO KRUGER "WELDING FABRICATION PROCEDURE" FOR WELD SPECIFICATIONS.
2. REMOVE WELD SLAG, CLEAN AND DEGREASE BEFORE PASSIVATION OR PAINTING.

REV	DESCRIPTION	DRAWN	APPR	DATE
1	ADDED Ø1/8" HOLE	JCC	.	02.05.18
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18

1886479 | 1.1 | Released | 1886479 | 1.1 | Released

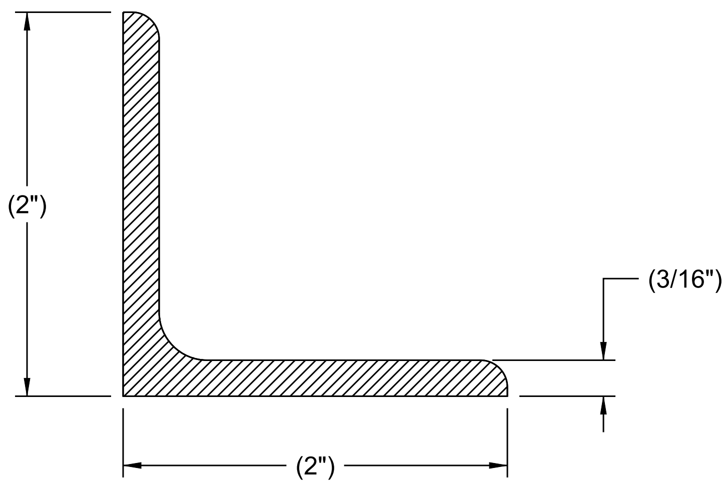
VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

ANOXKALDNES
WLDMT, AIR GRID, 3", (5) 1" LATERALS @ 24" OC, 7" W, FLG/CAP

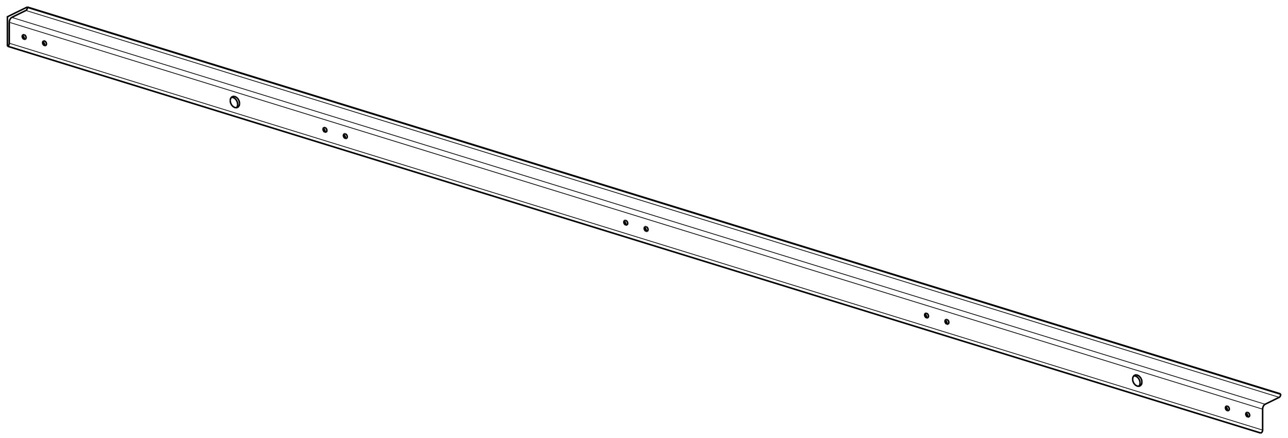
±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE Ø & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

SCALE	DRAWING NO	SHEET	REV
1:24	1886479	1 of 1	1

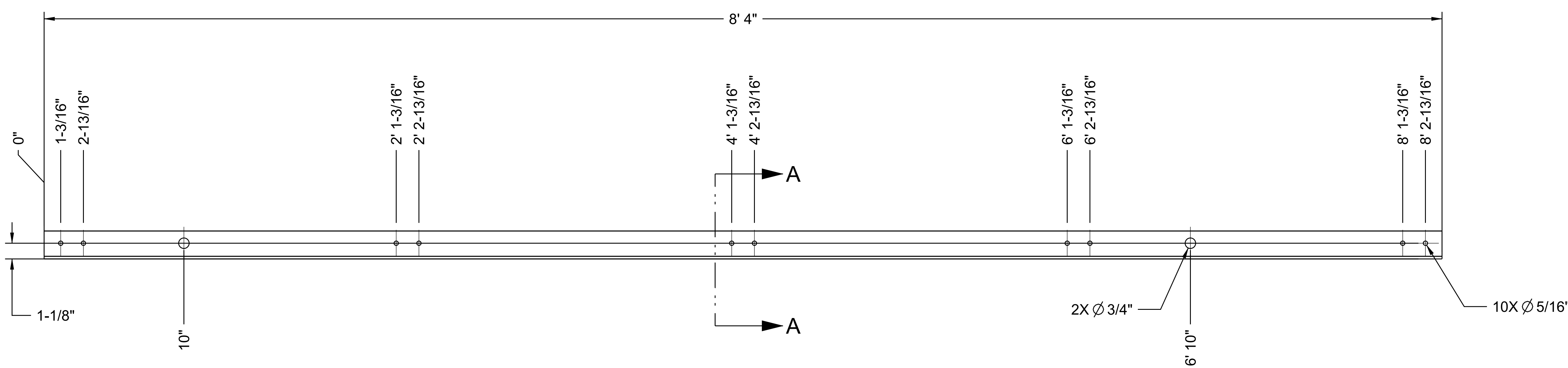
EST. WT. = 21 LBS.	
MAT'L = AISI_304	



SECTION A-A
SCALE 1:1



SCALE 1:12



1886483	0.0	In Work	1886483	0.0	In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18

VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

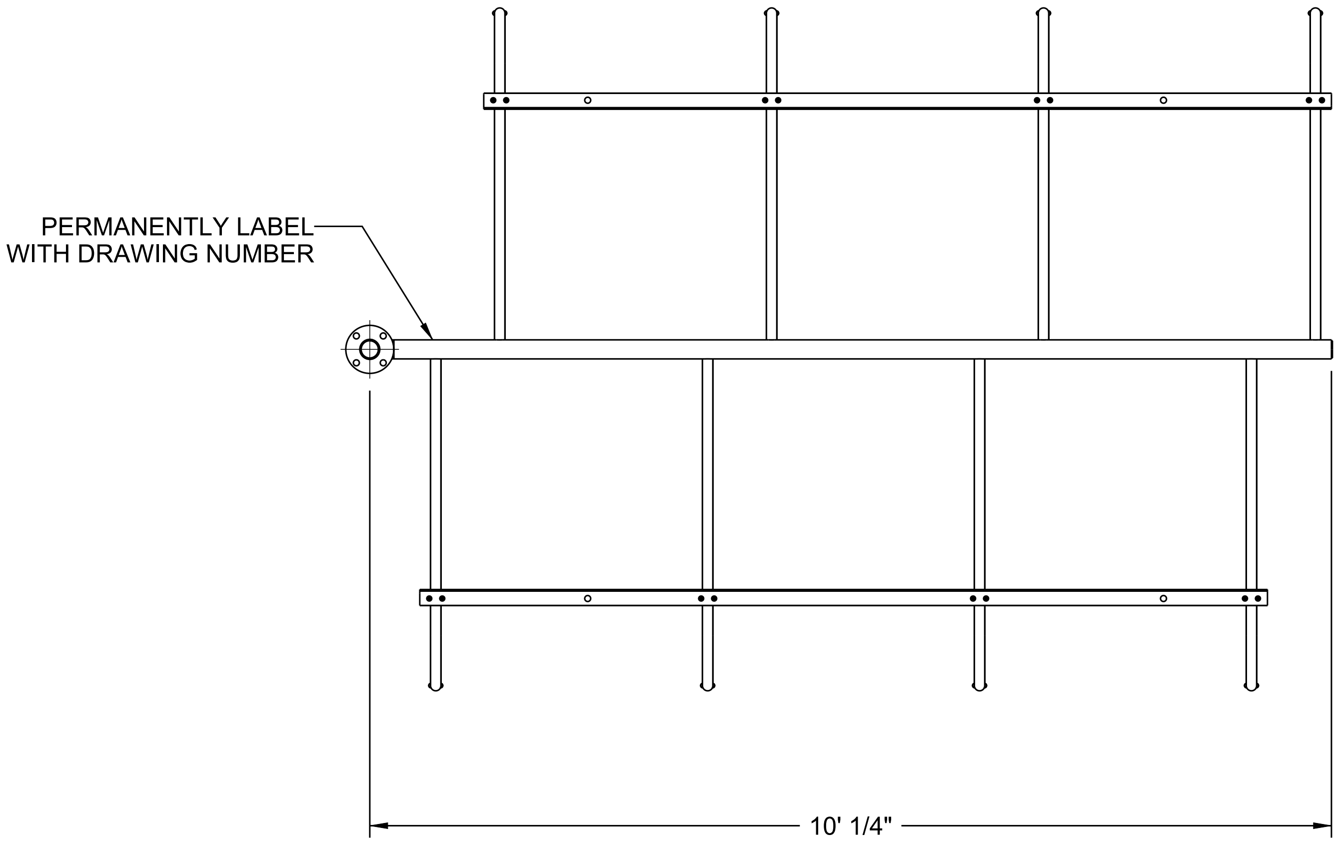
ANOXKALDNES
AIR GRID SUPPORT, 2.00" SQ X .19"THK X 100.00"LG,
(5) 1-1/4" LATERALS @ 2"OC

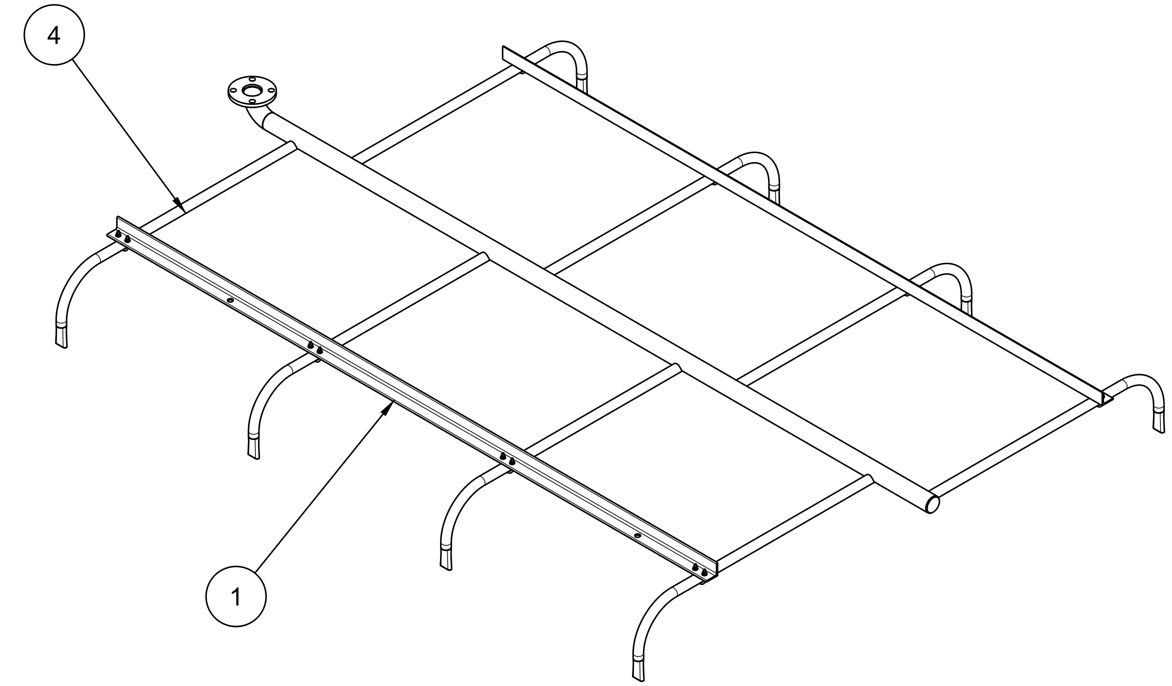
±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE ∅ & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

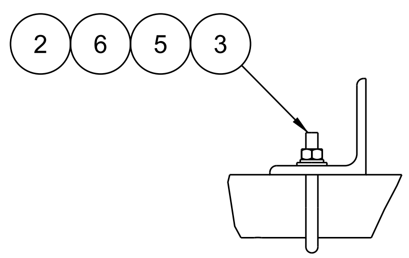
SCALE	DRAWING NO	SHEET	REV
1:8	1886483	1 of 1	0

EST. WT. = 107 LBS.

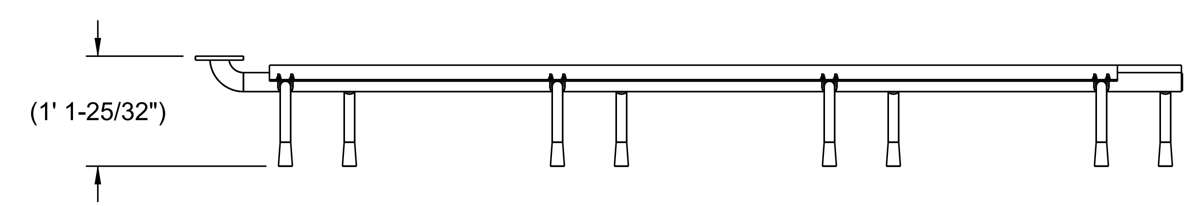
ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	2	AISI_304	1886518	AIR GRID SUPPORT, 2.00" SQ X .19"THK X 106.00"LG, (4) 1-1/4" LATERALS @ 3"OC
2	16	AISI_304	-	NUT, HEX, 1/4-20, ANSI
3	8	AISI_304	-	U-BOLT, 1", 1/4-20, DALE Co. #US5 OR EQUIV, W/O NUTS
4	1	SEE BOM	1886515	WLDMT, AIR GRID, 2", (4) 1" LATERALS @ 36" OC, 7" W, FLG/CAP
5	16	AISI_304	-	WSHR, FLAT, 1/4", .313"ID, .625"OD, .051"THK, SAE
6	16	AISI_304	-	WSHR, LOCK, 1/4", ANSI

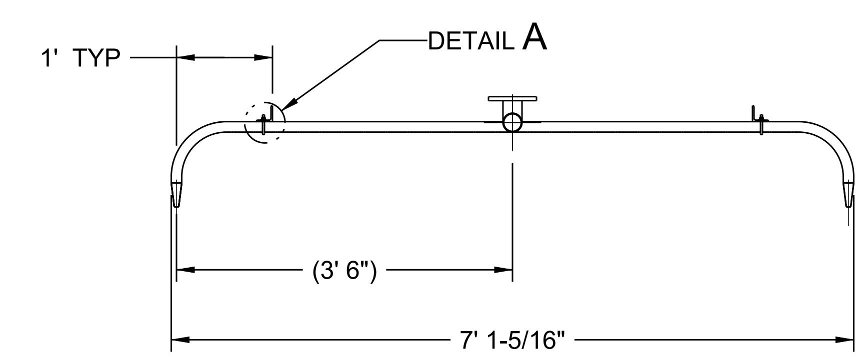






DETAIL A
TYP U-BOLT ATTACHMENT
SCALE 1:4





NOTES:
1. CLEAN AND DEGREASE PARTS BEFORE ASSEMBLY.
2. ANTI-SEIZE TO BE APPLIED TO ALL HDWR UNLESS OTHERWISE SPECIFIED.
3. ALL HDWR TO BE TIGHTENED TO APPROPRIATE TORQUE VALUES.

1886514 0.0 In Work 1886514 0.0 In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.25.18

VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

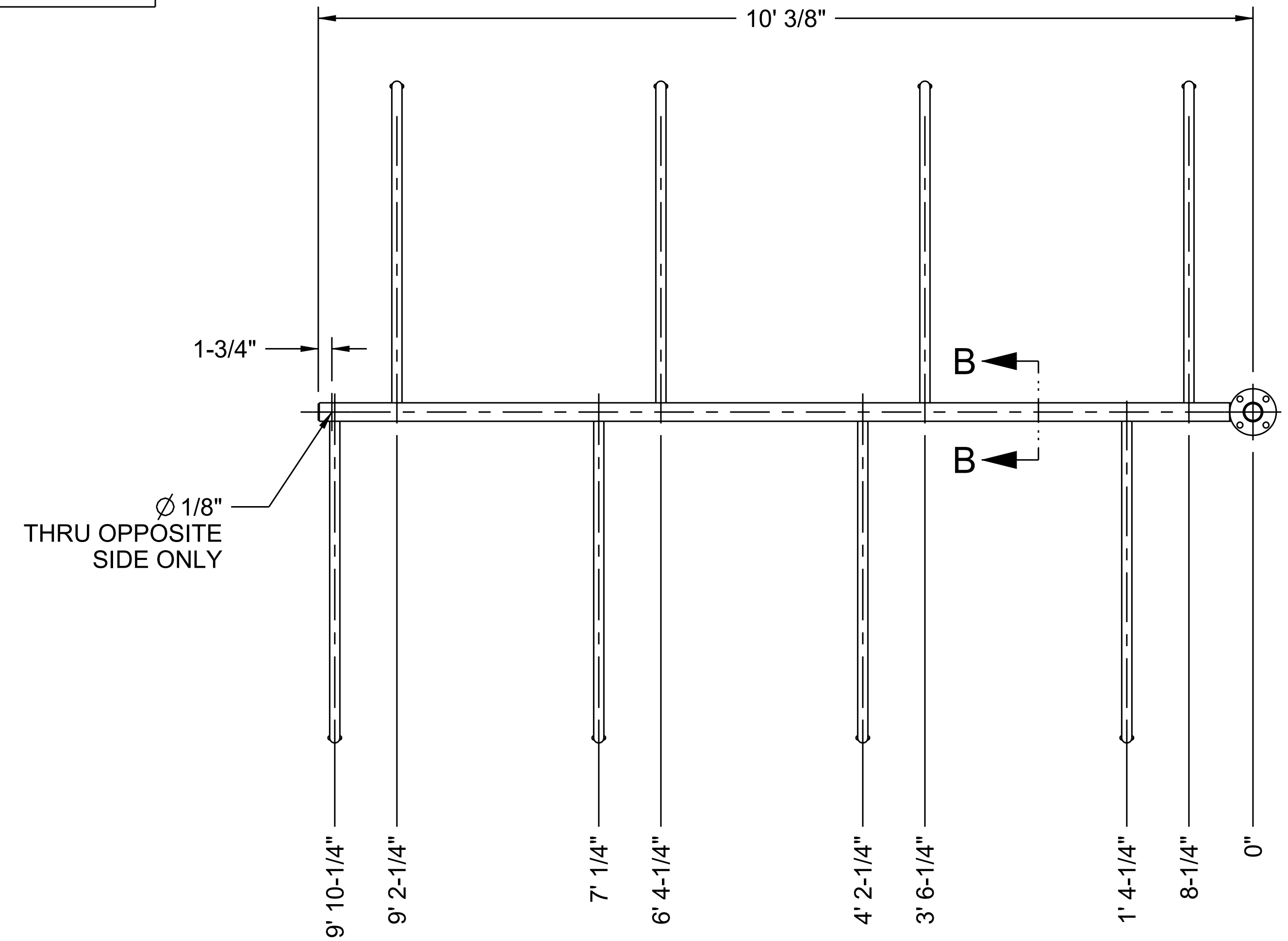
±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE Ø & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

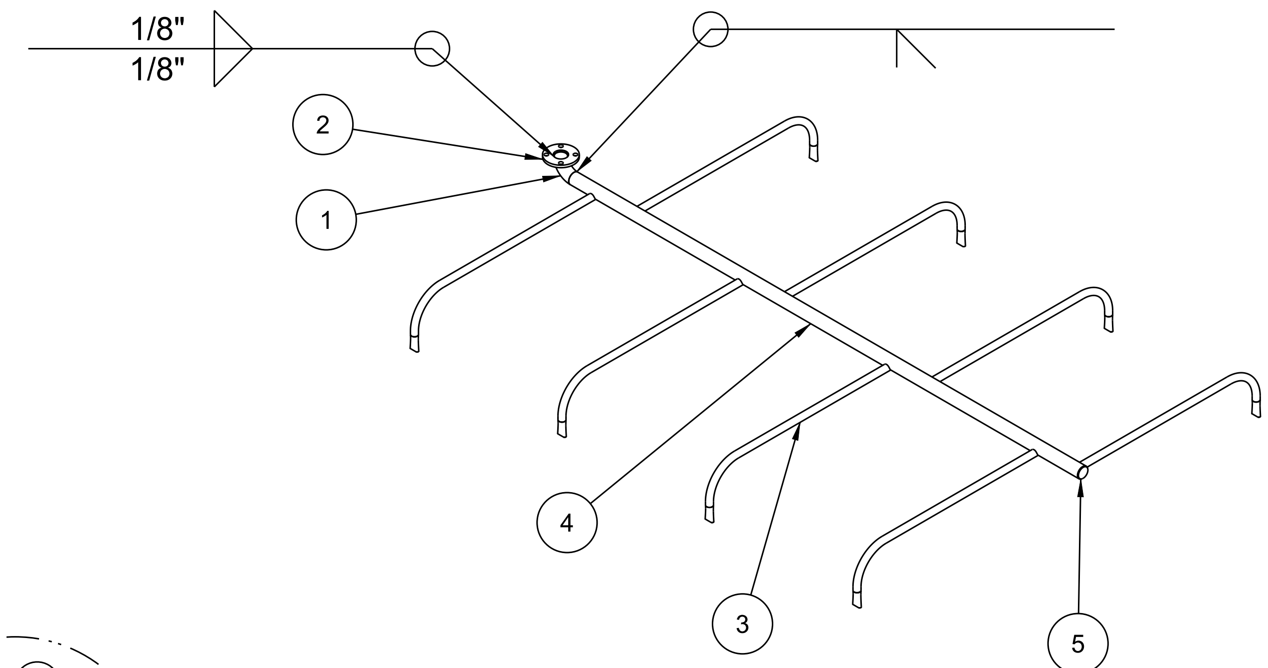
ANOXKALDNES
ASSY, AIR GRID, 2", (4) 1" LATERALS @ 36" OC, 7" W, FLG/CAP

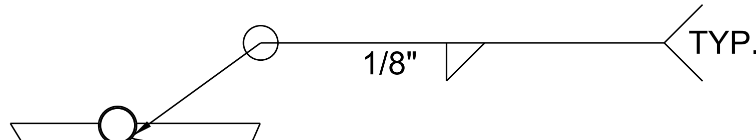
SCALE	DRAWING NO	SHEET	REV
1:24	1886514	1 of 1	0

EST. WT. = 63 LBS.

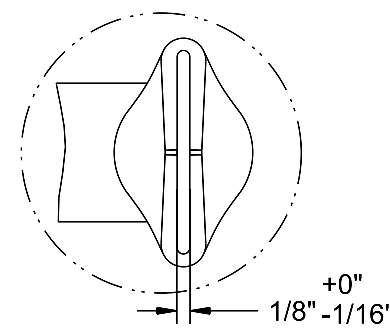
ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	1	AISI_304	-	ELB, PIPE, LR, 2", SCH 10, BW
2	1	AISI_304L	-	FLG, PIPE, PL, 2", 1/2" THK, 125LB
3	8	AISI_304L	-	PIPE, 1", SCH 5, 49.75"LG
4	1	AISI_304L	-	PIPE, 2", SCH 10, 117.25"LG
5	1	AISI_304L	-	SHEET, 11 GA, Ø3.50"



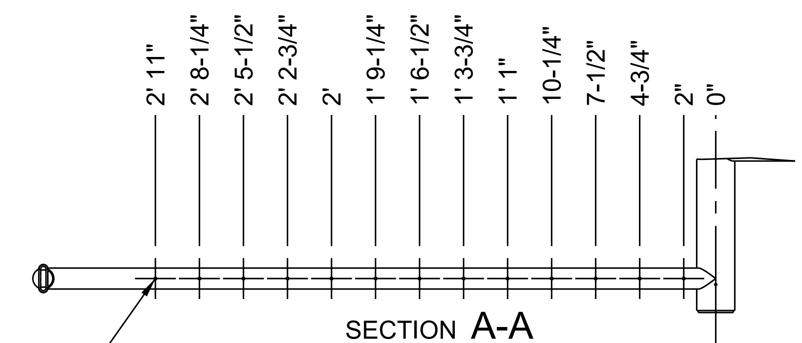




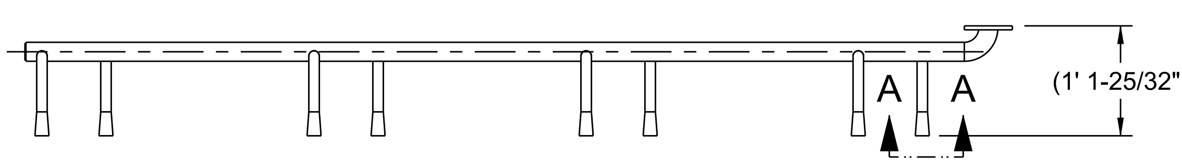
SECTION B-B
SCALE 1:12

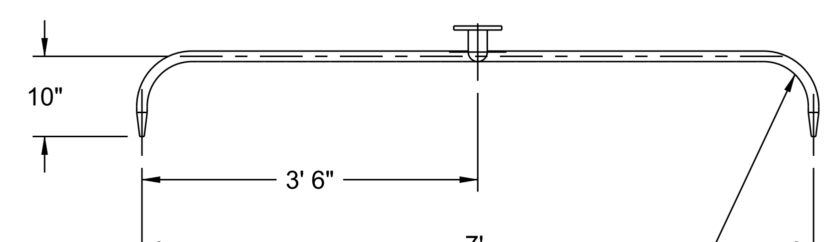


TYP DIFFUSER CRIMP DETAIL
SCALE 1:2



SECTION A-A
TYPICAL DIFFUSER
HOLE SPACING
SCALE 1:12





NOTES:

1. REFER TO KRUGER "WELDING FABRICATION PROCEDURE" FOR WELD SPECIFICATIONS.
2. REMOVE WELD SLAG, CLEAN AND DEGREASE BEFORE PASSIVATION OR PAINTING.

		1886515 | 1.1 | Released	1886515 | 1.1 | Released	
1	ADDED Ø1/8" HOLE	JCC	.	02.05.18
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18
REV	DESCRIPTION	DRAWN	APPR	DATE

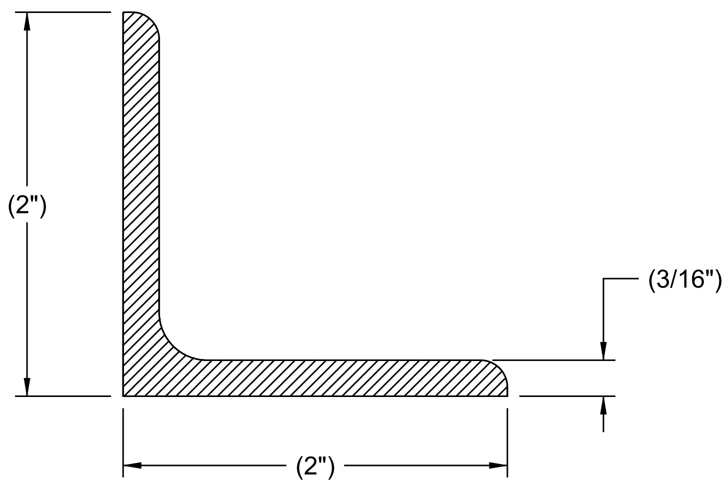
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

ANOXKALDNES
WLDMT, AIR GRID, 2", (4) 1" LATERALS @ 36" OC, 7" W, FLG/CAP

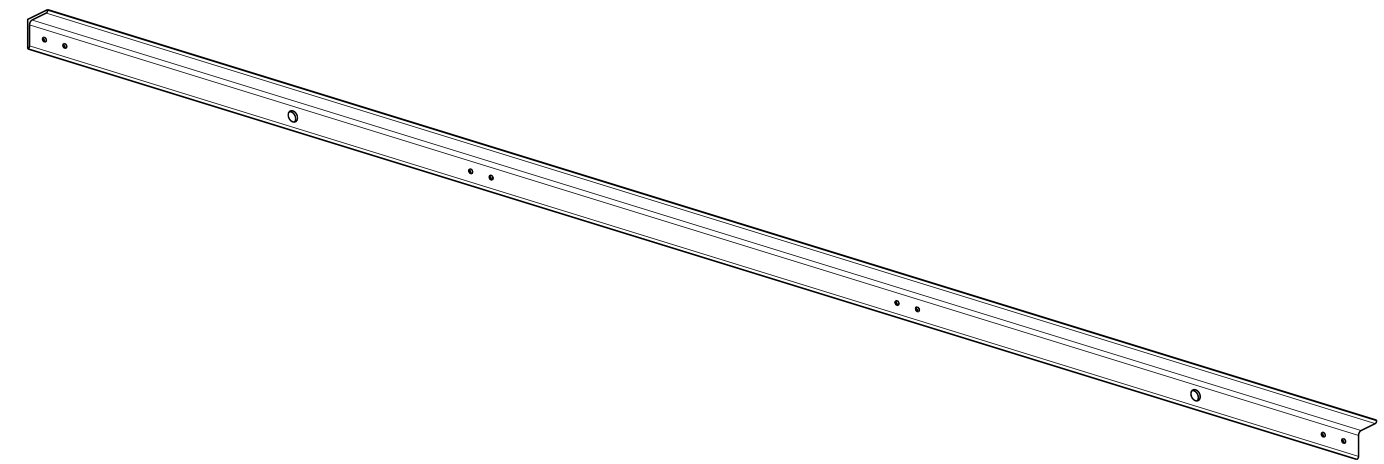
±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE Ø & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

SCALE	DRAWING NO	SHEET	REV
1:24	1886515	1 of 1	1

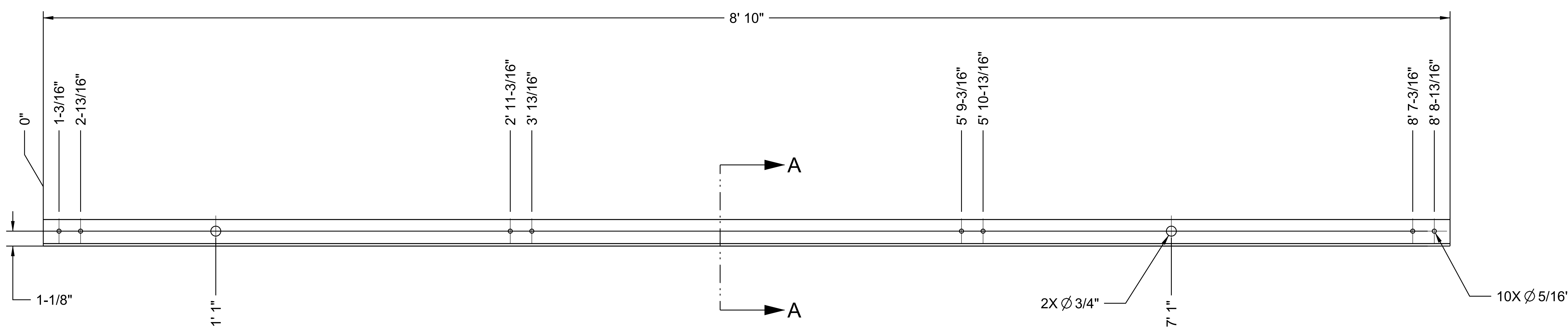
EST. WT. = 22 LBS.	
MAT'L = AISI_304	



SECTION A-A
SCALE 1:1



SCALE 1:12



1886518	0.0	In Work	1886518	0.0	In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18

VEOLIA
KRUGER INC.

4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

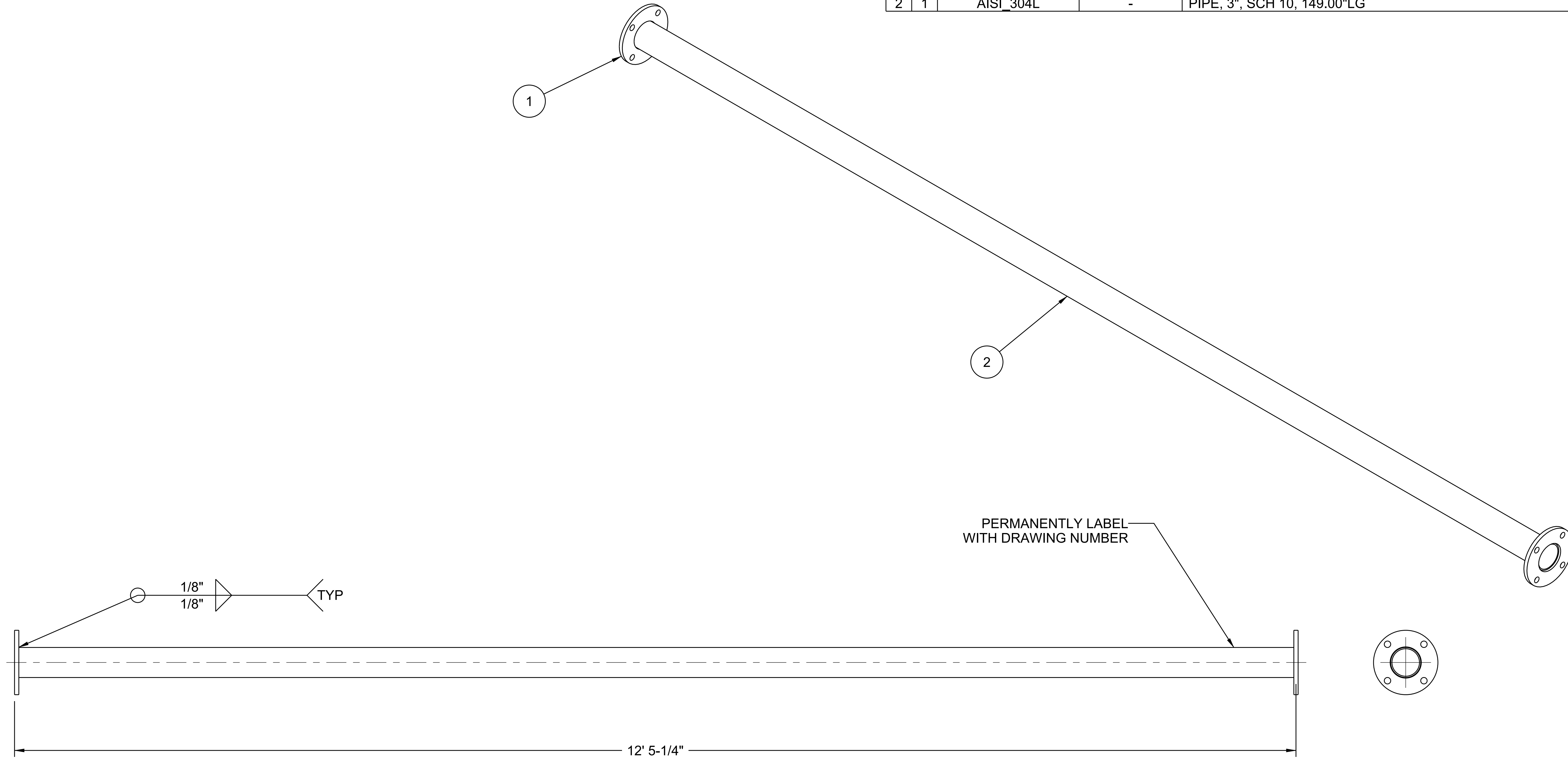
ANOXKALDNES
AIR GRID SUPPORT, 2.00" SQ X .19"THK X 106.00"LG,
(4) 1-1/4" LATERALS @ 3"OC

±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE ∅ & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

SCALE	DRAWING NO	SHEET	REV
1:8	1886518	1 of 1	0

EST. WT. = 76 LBS.

ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	2	AISI_304L	-	FLG, PIPE, PL, 3", 1/2" THK, 125LB
2	1	AISI_304L	-	PIPE, 3", SCH 10, 149.00"LG



NOTES:
1. REFER TO KRUGER "WELDING FABRICATION PROCEDURE" FOR WELD SPECIFICATIONS.
2. REMOVE WELD SLAG, CLEAN AND DEGREASE BEFORE PASSIVATION OR PAINTING.

1886542 | 0.0 | In Work | 1886542 | 0.0 | In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18

VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

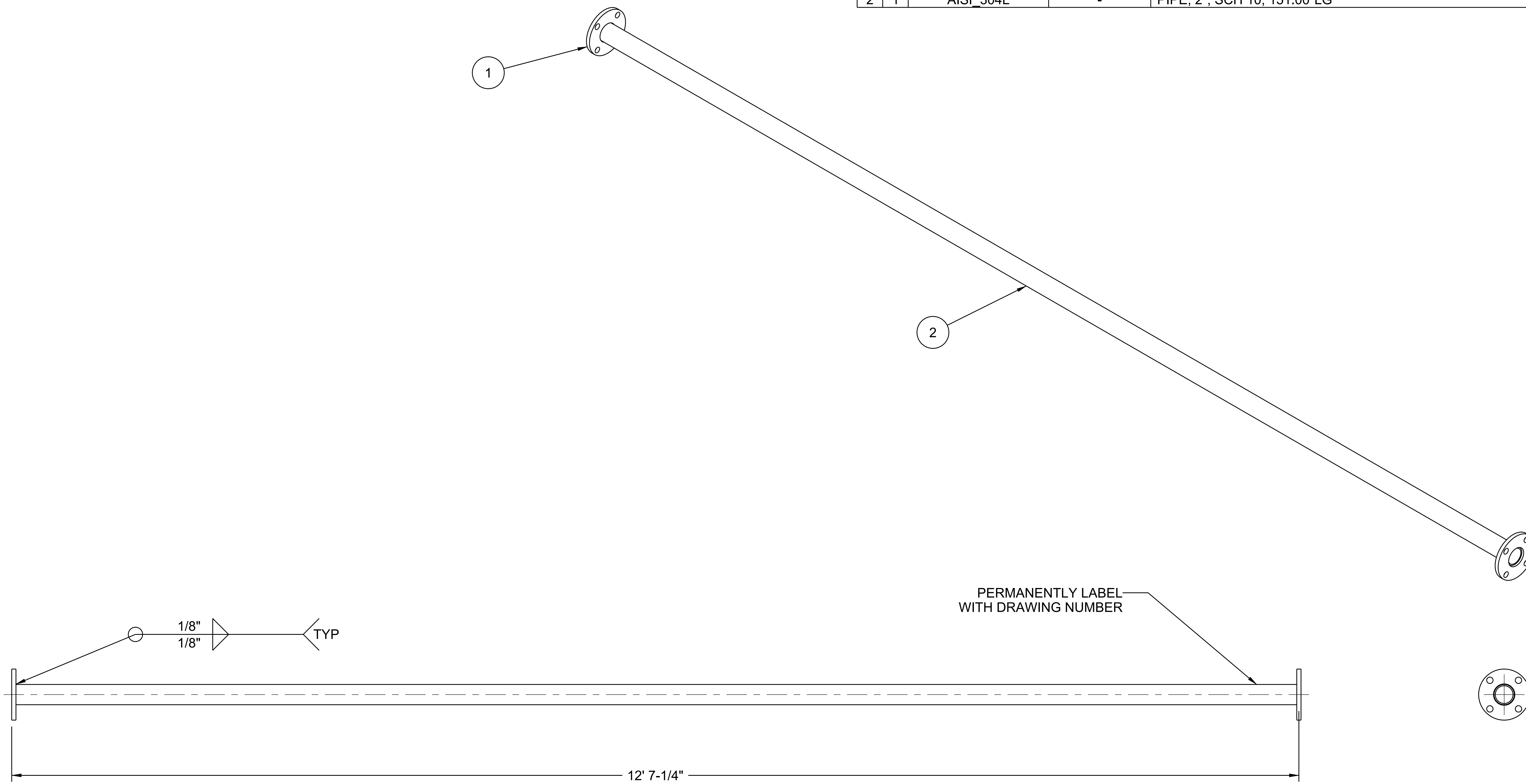
ANOXKALDNES
WLDMT, DROP PIPE, 3", 149"LG

±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE Ø & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

SCALE	DRAWING NO	SHEET	REV
1:12	1886542	1 of 1	0

EST. WT. = 52 LBS.

ITEM	QTY	MATERIAL	DRAWING NO.	DESCRIPTION
1	2	AISI_304L	-	FLG, PIPE, PL, 2", 1/2" THK, 125LB
2	1	AISI_304L	-	PIPE, 2", SCH 10, 151.00"LG



NOTES:

1. REFER TO KRUGER "WELDING FABRICATION PROCEDURE" FOR WELD SPECIFICATIONS.
2. REMOVE WELD SLAG, CLEAN AND DEGREASE BEFORE PASSIVATION OR PAINTING.

1886546	0.0	In Work	1886546	0.0	In Work

REV	DESCRIPTION	DRAWN	APPR	DATE
0	RELEASED FOR FABRICATION	SRW	JJM	01.26.18

VEOLIA
KRUGER INC.
4001 WESTON PKWY CARY, NC 27513 | (919) 677-8310

ANOXKALDNES
WLDMT, DROP PIPE, 2", 151"LG

±1/8" ON LINEAR DIMENSIONS .030 = .X (X.XXX) = REFERENCE
±1/32" ON HOLE Ø & LOCATIONS .015 = .XX (X.XXX) = INSPECTION
±1° ON ANGULAR DIMENSIONS .005 = .XXX BREAK SHARP EDGES

SCALE	DRAWING NO	SHEET	REV
1:12	1886546	1 of 1	0

APPENDIX F: LABORATORY RESULTS

(Provided on Physical Jump Drive)

August 05, 2019

TURNER LABORATORIES INC.

Michael Taylor
Veolia Water Technologies
6981 N. Park Dr.
Pennsauken Township, NJ 08109

TEL (856) 438-1765
FAX -

Work Order No.: 19G0441
Order Name: South 32

RE: Arizona Minerals

Dear Michael Taylor,

Turner Laboratories, Inc. received 5 sample(s) on 07/16/2019 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Elizabeth Kasik
Laboratory Director

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

Order: South 32

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
19G0441-01	JA RO Brine	Wastewater	07/15/2019 1300
19G0441-02	JA 100 RO	Wastewater	07/15/2019 1300
19G0441-03	JA 25/RO 75	Wastewater	07/15/2019 1300
19G0441-04	JA 50/RO 50	Wastewater	07/15/2019 1300
19G0441-05	JA 75/RO 25	Wastewater	07/15/2019 1300

Client:	Veolia Water Technologies
Project:	Arizona Minerals
Work Order:	19G0441
Date Received:	07/16/2019

Case Narrative

The Cyanide analysis was performed by TestAmerica Laboratories, Inc. in Phoenix, AZ.

The radiochemistry analysis was performed by Radiation Safety Engineering, Inc. in Chandler, AZ.

B5	Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
D5	Minimum Reporting Limit (MRL) is adjusted due to sample dilution; analyte was non-detect in the sample.
E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
M2	Matrix spike recovery was low; the associated LCS/LCSD was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
Q9	Insufficient sample received to meet method QC requirements.
R12	RPD/RSD exceeded the method acceptance limit. Result less than 5 times the PQL.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Client:	Veolia Water Technologies	**Client Sample ID:**	JA RO Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-01	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	3500		110		mg/L	5	07/26/2019 1005	07/26/2019 1419	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	3400				mg/L	10	07/19/2019 1145	07/23/2019 1020	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1450	EJ
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.50	D5	mg/L	5	07/26/2019 1005	07/26/2019 1420	MH
Calcium	1300		20		mg/L	5	07/26/2019 1005	07/26/2019 1419	MH
Iron	ND		1.5	D5	mg/L	5	07/26/2019 1005	07/26/2019 1420	MH
Magnesium	67		15		mg/L	5	07/26/2019 1005	07/26/2019 1419	MH
Potassium	ND		25	D5	mg/L	5	07/26/2019 1005	07/26/2019 1419	MH
Sodium	150		25		mg/L	5	07/26/2019 1005	07/26/2019 1420	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.0050	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Arsenic	ND		0.0050	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Barium	0.0062		0.0050		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Beryllium	ND		0.0025	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Cadmium	ND		0.0025	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Chromium	0.0054		0.0050		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Copper	0.12		0.0050		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Lead	0.0054		0.0050		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Manganese	0.13		0.0025		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Nickel	0.14		0.0050		mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Selenium	0.0062	0.0025	0.025	E4	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Silver	ND		0.0050	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Thallium	ND		0.0050	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
Zinc	ND		0.40	D5	mg/L	10	07/26/2019 1005	07/26/2019 1233	MH
CVAA Dissolved Mercury-E 245.1									

Turner Laboratories, Inc.

Date: 08/05/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA RO Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-01	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Mercury	ND		0.0010	B5	mg/L	1	07/26/2019 1235	07/26/2019 1642	MH
ICP Total Metals-E200.7 (4.4)									
Boron	0.11		0.10		mg/L	1	07/19/2019 1145	07/22/2019 1624	MH
Calcium	1200		40		mg/L	10	07/19/2019 1145	07/23/2019 1020	MH
Iron	ND		0.30		mg/L	1	07/19/2019 1145	07/22/2019 1623	MH
Magnesium	65		3.0		mg/L	1	07/19/2019 1145	07/22/2019 1623	MH
Potassium	14		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1623	MH
Sodium	140		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1623	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.0029		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1117	MH
Arsenic	ND		0.0050	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Barium	0.0028		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1117	MH
Beryllium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 2028	MH
Cadmium	ND		0.0025	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Chromium	ND		0.0050	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Copper	0.093		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1117	MH
Lead	0.0045		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1117	MH
Manganese	0.11		0.0013		mg/L	5	07/24/2019 1015	07/25/2019 1117	MH
Nickel	0.15		0.0050		mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Selenium	0.0036	0.0025	0.025	E4	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Silver	ND		0.0050	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Thallium	ND		0.0050	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
Zinc	ND		0.40	D5	mg/L	10	07/24/2019 1015	07/25/2019 1658	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	07/19/2019 1145	07/19/2019 1646	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	140		100		mg/L	100	07/16/2019 1635	07/16/2019 1946	EJ
Fluoride	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1450	EJ
Nitrogen, Nitrate (As N)	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1450	EJ
Nitrogen, Nitrite (As N)	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1450	EJ
Sulfate	3500		500		mg/L	100	07/16/2019 1635	07/16/2019 1946	EJ
Alkalinity-SM2320B									

Turner Laboratories, Inc.

Date: 08/05/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA RO Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-01	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Bicarbonate (As CaCO3)	22		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Total (As CaCO3)	22		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Specific Conductance-SM2510 B									
Conductivity	6900		1.0		µmhos/cm	10	07/25/2019 1630	07/25/2019 1715	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	5400		20		mg/L	1	07/22/2019 0818	07/25/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	07/22/2019 0821	07/22/2019 1645	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	9.6		0.50		mg/L	1	07/17/2019 0828	07/17/2019 1417	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-02	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	24		22		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	24				mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Calcium	9.6		4.0		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Iron	ND		0.30		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Magnesium	ND		3.0		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Potassium	ND		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
Sodium	ND		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1358	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Arsenic	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Barium	0.00083		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Beryllium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Cadmium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Chromium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Copper	0.0029		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Lead	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Manganese	0.0011		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Nickel	0.0021		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Silver	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Thallium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
Zinc	ND		0.040		mg/L	1	07/26/2019 1005	07/26/2019 1238	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010	B5	mg/L	1	07/26/2019 1235	07/26/2019 1645	MH

Turner Laboratories, Inc.

Date: 08/05/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-02	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/19/2019 1145	07/22/2019 1628	MH
Calcium	9.8		4.0		mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
Iron	ND		0.30		mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
Magnesium	ND		3.0		mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
Potassium	ND		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
Sodium	ND		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1627	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Arsenic	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1924	MH
Barium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1924	MH
Beryllium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Cadmium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Chromium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1924	MH
Copper	0.0029		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Lead	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Manganese	0.0015		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1924	MH
Nickel	0.0023		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1924	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Silver	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Thallium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
Zinc	ND		0.040		mg/L	1	07/24/2019 1015	07/25/2019 1337	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	07/19/2019 1145	07/19/2019 1649	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	2.7		1.0		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
Fluoride	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
Nitrogen, Nitrate (As N)	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
Nitrogen, Nitrite (As N)	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
Sulfate	29		5.0		mg/L	1	07/16/2019 1440	07/16/2019 1509	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-02	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Total (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Specific Conductance-SM2510 B									
Conductivity	110		0.10		µmhos/cm	1	07/25/2019 1630	07/25/2019 1715	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	49		20		mg/L	1	07/22/2019 0818	07/24/2019 1815	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	07/22/2019 0821	07/22/2019 1645	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.8		0.50		mg/L	1	07/17/2019 0828	07/17/2019 1437	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 25/RO 75
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-03	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	490		22		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	500				mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1527	EJ
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/26/2019 1005	07/26/2019 1416	MH
Calcium	180		4.0		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
Iron	ND		0.30		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
Magnesium	9.6		3.0		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
Potassium	ND		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
Sodium	21		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1415	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00050		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Arsenic	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Barium	0.0024		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Beryllium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Cadmium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Chromium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Copper	0.0027		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Lead	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Manganese	0.019		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Nickel	0.013		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Selenium	0.00088	0.00025	0.0025	E4	mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Silver	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Thallium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
Zinc	ND		0.040		mg/L	1	07/26/2019 1005	07/26/2019 1254	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010	B5	mg/L	1	07/26/2019 1235	07/26/2019 1647	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 25/RO 75
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-03	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/19/2019 1145	07/22/2019 1632	MH
Calcium	180		4.0		mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
Iron	ND		0.30		mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
Magnesium	9.6		3.0		mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
Potassium	ND		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
Sodium	21		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1631	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.00050		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Arsenic	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Barium	0.013		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1149	MH
Beryllium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Cadmium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Chromium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Copper	0.0064		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1149	MH
Lead	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Manganese	0.050		0.0013		mg/L	5	07/24/2019 1015	07/25/2019 1149	MH
Nickel	0.015		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Silver	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Thallium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
Zinc	ND		0.040		mg/L	1	07/24/2019 1015	07/25/2019 1940	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	07/19/2019 1145	07/19/2019 1651	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	18		1.0		mg/L	1	07/16/2019 1440	07/16/2019 1527	EJ
Fluoride	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1527	EJ
Nitrogen, Nitrate (As N)	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1527	EJ
Nitrogen, Nitrite (As N)	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1527	EJ
Sulfate	500		100		mg/L	20	07/16/2019 1635	07/16/2019 2004	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	3.5		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 25/RO 75
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-03	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Total (As CaCO3)	3.5		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Specific Conductance-SM2510 B									
Conductivity	990		0.10		µmhos/cm	1	07/25/2019 1630	07/25/2019 1715	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	800		20		mg/L	1	07/22/2019 0818	07/24/2019 1815	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	07/22/2019 0821	07/22/2019 1645	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.4		0.50		mg/L	1	07/17/2019 0828	07/17/2019 1519	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-04	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	860		22		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	900				mg/L	1	07/19/2019 1145	07/22/2019 1635	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1546	EJ
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Calcium	320		4.0		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Iron	ND		0.30		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Magnesium	16		3.0		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Potassium	ND		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
Sodium	36		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1424	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00080		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Arsenic	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Barium	0.0018		0.0010		mg/L	2	07/26/2019 1005	07/26/2019 1538	MH
Beryllium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Cadmium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Chromium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Copper	0.0024		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Lead	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Manganese	0.030		0.00050		mg/L	2	07/26/2019 1005	07/26/2019 1538	MH
Nickel	0.022		0.0010		mg/L	2	07/26/2019 1005	07/26/2019 1538	MH
Selenium	0.0013	0.00025	0.0025	E4	mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Silver	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Thallium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
Zinc	ND		0.040		mg/L	1	07/26/2019 1005	07/26/2019 1310	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010	B5	mg/L	1	07/26/2019 1235	07/26/2019 1650	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-04	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/19/2019 1145	07/22/2019 1636	MH
Calcium	330		4.0		mg/L	1	07/19/2019 1145	07/22/2019 1635	MH
Iron	ND		0.30		mg/L	1	07/19/2019 1145	07/22/2019 1636	MH
Magnesium	17		3.0		mg/L	1	07/19/2019 1145	07/22/2019 1635	MH
Potassium	ND		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1635	MH
Sodium	36		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1636	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.00080		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Arsenic	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Barium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Beryllium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Cadmium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Chromium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Copper	0.0022		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Lead	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Manganese	0.037		0.0013		mg/L	5	07/24/2019 1015	07/25/2019 1254	MH
Nickel	0.023		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Silver	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Thallium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
Zinc	ND		0.040		mg/L	1	07/24/2019 1015	07/25/2019 1956	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	07/19/2019 1145	07/19/2019 1654	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	28		2.0		mg/L	2	07/17/2019 1705	07/18/2019 0133	EJ
Fluoride	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1546	EJ
Nitrogen, Nitrate (As N)	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1546	EJ
Nitrogen, Nitrite (As N)	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1546	EJ
Sulfate	910		500		mg/L	100	07/16/2019 1635	07/16/2019 2023	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	4.0		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-04	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Total (As CaCO3)	4.0		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Specific Conductance-SM2510 B									
Conductivity	2000		0.50		µmhos/cm	5	07/25/2019 1630	07/25/2019 1715	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	1400		20		mg/L	1	07/22/2019 0818	07/25/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	07/22/2019 0821	07/22/2019 1645	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.3		0.50		mg/L	1	07/17/2019 0828	07/17/2019 1540	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 75/RO 25
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-05	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	1200		22		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	1300				mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1604	EJ
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Calcium	450		4.0		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Iron	ND		0.30		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Magnesium	24		3.0		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Potassium	ND		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
Sodium	48		5.0		mg/L	1	07/26/2019 1005	07/26/2019 1428	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.0011		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Arsenic	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Barium	0.00070		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Beryllium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Cadmium	ND		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Chromium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Copper	0.0042		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Lead	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Manganese	0.045		0.00025		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Nickel	0.032		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Selenium	0.0018	0.00025	0.0025	E4	mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Silver	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
Thallium	ND		0.00050		mg/L	1	07/26/2019 1005	07/26/2019 1554	MH
Zinc	ND		0.040		mg/L	1	07/26/2019 1005	07/26/2019 1326	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010	B5	mg/L	1	07/26/2019 1235	07/26/2019 1652	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 75/RO 25
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-05	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Calcium	490		4.0		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Iron	ND		0.30		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Magnesium	26		3.0		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Potassium	ND		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
Sodium	53		5.0		mg/L	1	07/19/2019 1145	07/22/2019 1640	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.0011		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Arsenic	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Barium	0.011		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Beryllium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Cadmium	ND		0.00025		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Chromium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Copper	0.0058		0.0025		mg/L	5	07/24/2019 1015	07/25/2019 1300	MH
Lead	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Manganese	0.092		0.0013		mg/L	5	07/24/2019 1015	07/25/2019 1300	MH
Nickel	0.034		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Selenium	0.00041	0.00025	0.0025	E4	mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Silver	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Thallium	ND		0.00050		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
Zinc	ND		0.040		mg/L	1	07/24/2019 1015	07/25/2019 2012	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	07/19/2019 1145	07/19/2019 1656	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	40		5.0		mg/L	5	07/17/2019 1705	07/18/2019 0151	EJ
Fluoride	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1604	EJ
Nitrogen, Nitrate (As N)	ND		0.50		mg/L	1	07/16/2019 1440	07/16/2019 1604	EJ
Nitrogen, Nitrite (As N)	ND		0.10		mg/L	1	07/16/2019 1440	07/16/2019 1604	EJ
Sulfate	1300		500		mg/L	100	07/16/2019 1635	07/16/2019 2118	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	4.5		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR

Turner Laboratories, Inc.

Date: 08/05/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 75/RO 25
Project:	Arizona Minerals	**Collection Date/Time:**	07/15/2019 1300
Work Order:	19G0441	**Matrix:**	Wastewater
Lab Sample ID:	19G0441-05	**Order Name:**	South 32

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Alkalinity, Total (As CaCO3)	4.5		2.0		mg/L	1	07/17/2019 1346	07/17/2019 1525	CR
Specific Conductance-SM2510 B									
Conductivity	3000		1.0		µmhos/cm	10	07/25/2019 1630	07/25/2019 1715	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	2100		20		mg/L	1	07/18/2019 0915	07/22/2019 1610	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	07/22/2019 0821	07/22/2019 1645	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.0		0.50		mg/L	1	07/17/2019 0828	07/17/2019 1600	MH

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907242 - E245.1										
Blank (1907242-BLK1)				Prepared & Analyzed: 07/19/2019						
Mercury	ND	0.0010	mg/L							
LCS (1907242-BS1)				Prepared & Analyzed: 07/19/2019						
Mercury	0.0053	0.0010	mg/L	0.005000		106	85-115			
LCS Dup (1907242-BSD1)				Prepared & Analyzed: 07/19/2019						
Mercury	0.0051	0.0010	mg/L	0.005000		101	85-115	4	20	
Matrix Spike (1907242-MS1)	**Source: 19G0459-02**			Prepared & Analyzed: 07/19/2019						
Mercury	0.0051	0.0010	mg/L	0.005000	ND	102	70-130			
Matrix Spike (1907242-MS2)	**Source: 19G0432-01**			Prepared & Analyzed: 07/19/2019						
Mercury	0.0049	0.0010	mg/L	0.005000	ND	98	70-130			
Matrix Spike Dup (1907242-MSD1)	**Source: 19G0459-02**			Prepared & Analyzed: 07/19/2019						
Mercury	0.0052	0.0010	mg/L	0.005000	ND	104	70-130	2	20	
Matrix Spike Dup (1907242-MSD2)	**Source: 19G0432-01**			Prepared & Analyzed: 07/19/2019						
Mercury	0.0047	0.0010	mg/L	0.005000	ND	94	70-130	5	20	
Batch 1907260 - E200.7 (4.4)										
Blank (1907260-BLK1)				Prepared: 07/19/2019 Analyzed: 07/22/2019						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (1907260-BS1)				Prepared: 07/19/2019 Analyzed: 07/22/2019						
Boron	1.1	0.10	mg/L	1.000		106	85-115			
Calcium	10	4.0	mg/L	10.00		101	85-115			
Iron	1.0	0.30	mg/L	1.000		104	85-115			
Magnesium	10	3.0	mg/L	10.00		101	85-115			
Potassium	10	5.0	mg/L	10.00		101	85-115			
Sodium	10	5.0	mg/L	10.00		100	85-115			
LCS Dup (1907260-BSD1)				Prepared: 07/19/2019 Analyzed: 07/22/2019						
Boron	1.1	0.10	mg/L	1.000		107	85-115	1	20	
Calcium	10	4.0	mg/L	10.00		101	85-115	0.4	20	
Iron	1.0	0.30	mg/L	1.000		104	85-115	0.04	20	
Magnesium	10	3.0	mg/L	10.00		101	85-115	0.09	20	
Potassium	10	5.0	mg/L	10.00		100	85-115	0.3	20	
Sodium	11	5.0	mg/L	10.00		105	85-115	5	20	

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907260 - E200.7 (4.4)										
Matrix Spike (1907260-MS1)		**Source: 19G0464-01**		Prepared: 07/19/2019 Analyzed: 07/22/2019						
Boron	1.1	0.10	mg/L	1.000	0.089	105	70-130			
Calcium	77	4.0	mg/L	10.00	72	56	70-130			M3
Iron	1.0	0.30	mg/L	1.000	0.039	101	70-130			
Magnesium	24	3.0	mg/L	10.00	15	91	70-130			
Potassium	12	5.0	mg/L	10.00	2.0	98	70-130			
Sodium	48	5.0	mg/L	10.00	41	65	70-130			M3
Matrix Spike (1907260-MS2)		**Source: 19G0464-05**		Prepared: 07/19/2019 Analyzed: 07/22/2019						
Boron	1.2	0.10	mg/L	1.000	0.11	107	70-130			
Calcium	110	4.0	mg/L	10.00	100	75	70-130			
Iron	6.0	0.30	mg/L	1.000	4.2	177	70-130			M3
Magnesium	31	3.0	mg/L	10.00	21	103	70-130			
Potassium	15	5.0	mg/L	10.00	4.3	103	70-130			
Sodium	51	5.0	mg/L	10.00	42	94	70-130			
Batch 1907301 - E200.8 (5.4)										
Blank (1907301-BLK1)				Prepared: 07/24/2019 Analyzed: 07/25/2019						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0015	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1907301-BS1)				Prepared: 07/24/2019 Analyzed: 07/25/2019						
Antimony	0.049	0.00050	mg/L	0.05000		98	85-115			
Arsenic	0.049	0.00050	mg/L	0.05000		98	85-115			
Barium	0.049	0.00050	mg/L	0.05000		98	85-115			
Beryllium	0.052	0.00025	mg/L	0.05000		104	85-115			
Cadmium	0.050	0.00025	mg/L	0.05000		100	85-115			
Chromium	0.049	0.00050	mg/L	0.05000		98	85-115			
Copper	0.048	0.00050	mg/L	0.05000		96	85-115			
Lead	0.051	0.00050	mg/L	0.05000		103	85-115			
Manganese	0.049	0.00025	mg/L	0.05000		97	85-115			
Nickel	0.053	0.00050	mg/L	0.05000		106	85-115			
Selenium	0.047	0.0015	mg/L	0.05000		95	85-115			
Silver	0.049	0.00050	mg/L	0.05000		97	85-115			
Thallium	0.049	0.00050	mg/L	0.05000		97	85-115			
Zinc	0.090	0.040	mg/L	0.1000		90	85-115			

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907301 - E200.8 (5.4)										
LCS Dup (1907301-BSD1)				Prepared: 07/24/2019 Analyzed: 07/25/2019						
Antimony	0.051	0.00050	mg/L	0.05000		101	85-115	4	20	
Arsenic	0.048	0.00050	mg/L	0.05000		97	85-115	1	20	
Barium	0.051	0.00050	mg/L	0.05000		101	85-115	3	20	
Beryllium	0.052	0.00025	mg/L	0.05000		104	85-115	0.2	20	
Cadmium	0.050	0.00025	mg/L	0.05000		100	85-115	0.6	20	
Chromium	0.050	0.00050	mg/L	0.05000		100	85-115	2	20	
Copper	0.049	0.00050	mg/L	0.05000		98	85-115	2	20	
Lead	0.051	0.00050	mg/L	0.05000		103	85-115	0.04	20	
Manganese	0.049	0.00025	mg/L	0.05000		99	85-115	1	20	
Nickel	0.051	0.00050	mg/L	0.05000		102	85-115	4	20	
Selenium	0.047	0.0015	mg/L	0.05000		95	85-115	0.2	20	
Silver	0.050	0.00050	mg/L	0.05000		100	85-115	2	20	
Thallium	0.050	0.00050	mg/L	0.05000		100	85-115	3	20	
Zinc	0.093	0.040	mg/L	0.1000		93	85-115	2	20	
Matrix Spike (1907301-MS1)		**Source: 19G0441-01**		Prepared: 07/24/2019 Analyzed: 07/25/2019						
Antimony	0.050	0.0025	mg/L	0.05000	0.0029	94	70-130			
Arsenic	0.046	0.0050	mg/L	0.05000	ND	93	70-130			
Barium	0.048	0.0025	mg/L	0.05000	0.0028	91	70-130			
Beryllium	0.046	0.0025	mg/L	0.05000	ND	92	70-130			
Cadmium	0.048	0.0025	mg/L	0.05000	0.00055	94	70-130			
Chromium	0.049	0.0050	mg/L	0.05000	0.00029	97	70-130			
Copper	0.14	0.0025	mg/L	0.05000	0.093	98	70-130			
Lead	0.057	0.0025	mg/L	0.05000	0.0045	104	70-130			
Manganese	0.17	0.0013	mg/L	0.05000	0.11	114	70-130			
Nickel	0.19	0.0050	mg/L	0.05000	0.15	87	70-130			
Selenium	0.063	0.015	mg/L	0.05000	0.0036	118	70-130			
Silver	0.040	0.0050	mg/L	0.05000	ND	80	70-130			
Thallium	0.046	0.0050	mg/L	0.05000	0.0011	90	70-130			
Zinc	0.27	0.40	mg/L	0.1000	0.19	84	70-130			
Batch 1907332 - E 200.8 (5.4)										
Blank (1907332-BLK1)				Prepared & Analyzed: 07/26/2019						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							

Turner Laboratories, Inc.

Date: 08/05/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907332 - E 200.8 (5.4)										
LCS (1907332-BS1)				Prepared & Analyzed: 07/26/2019						
Antimony	0.051	0.00050	mg/L	0.05000		103	85-115			
Arsenic	0.049	0.00050	mg/L	0.05000		99	85-115			
Barium	0.051	0.00050	mg/L	0.05000		103	85-115			
Beryllium	0.051	0.00025	mg/L	0.05000		102	85-115			
Cadmium	0.050	0.00025	mg/L	0.05000		99	85-115			
Chromium	0.051	0.00050	mg/L	0.05000		103	85-115			
Copper	0.050	0.00050	mg/L	0.05000		100	85-115			
Lead	0.050	0.00050	mg/L	0.05000		101	85-115			
Manganese	0.051	0.00025	mg/L	0.05000		102	85-115			
Nickel	0.051	0.00050	mg/L	0.05000		102	85-115			
Selenium	0.049	0.0025	mg/L	0.05000		98	85-115			
Silver	0.051	0.00050	mg/L	0.05000		101	85-115			
Thallium	0.050	0.00050	mg/L	0.05000		100	85-115			
Zinc	0.10	0.040	mg/L	0.1000		103	85-115			
LCS Dup (1907332-BSD1)				Prepared & Analyzed: 07/26/2019						
Antimony	0.050	0.00050	mg/L	0.05000		100	85-115	2	20	
Arsenic	0.049	0.00050	mg/L	0.05000		99	85-115	0.2	20	
Barium	0.051	0.00050	mg/L	0.05000		101	85-115	2	20	
Beryllium	0.050	0.00025	mg/L	0.05000		100	85-115	2	20	
Cadmium	0.050	0.00025	mg/L	0.05000		101	85-115	1	20	
Chromium	0.051	0.00050	mg/L	0.05000		101	85-115	2	20	
Copper	0.050	0.00050	mg/L	0.05000		99	85-115	1	20	
Lead	0.051	0.00050	mg/L	0.05000		101	85-115	0.3	20	
Manganese	0.050	0.00025	mg/L	0.05000		101	85-115	0.8	20	
Nickel	0.051	0.00050	mg/L	0.05000		103	85-115	0.4	20	
Selenium	0.049	0.0025	mg/L	0.05000		98	85-115	0.2	20	
Silver	0.050	0.00050	mg/L	0.05000		99	85-115	2	20	
Thallium	0.050	0.00050	mg/L	0.05000		101	85-115	0.5	20	
Zinc	0.10	0.040	mg/L	0.1000		101	85-115	2	20	
Matrix Spike (1907332-MS1)		**Source: 19G0485-01**		Prepared & Analyzed: 07/26/2019						
Antimony	0.051	0.00050	mg/L	0.05000	0.00025	101	70-130			
Arsenic	0.058	0.00050	mg/L	0.05000	0.0018	112	70-130			
Barium	0.16	0.00050	mg/L	0.05000	0.11	96	70-130			
Beryllium	0.048	0.00025	mg/L	0.05000	0.00016	95	70-130			
Cadmium	0.048	0.00025	mg/L	0.05000	0.00017	96	70-130			
Chromium	0.050	0.00050	mg/L	0.05000	0.0024	96	70-130			
Copper	0.045	0.00050	mg/L	0.05000	0.0012	89	70-130			
Lead	0.051	0.00050	mg/L	0.05000	0.00038	100	70-130			
Manganese	0.052	0.00025	mg/L	0.05000	0.0054	94	70-130			
Nickel	0.050	0.00050	mg/L	0.05000	0.0036	93	70-130			
Selenium	0.062	0.0025	mg/L	0.05000	0.0028	119	70-130			
Silver	0.043	0.00050	mg/L	0.05000	0.00016	86	70-130			
Thallium	0.050	0.00050	mg/L	0.05000	0.00020	99	70-130			
Zinc	1.4	0.40	mg/L	0.1000	1.3	104	70-130			
Batch 1907335 - E 200.7 (4.4)										

Turner Laboratories, Inc.

Date: 08/05/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907335 - E 200.7 (4.4)										
Blank (1907335-BLK1)				Prepared & Analyzed: 07/26/2019						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (1907335-BS1)				Prepared & Analyzed: 07/26/2019						
Boron	0.99	0.10	mg/L	1.000		99	85-115			
Calcium	10	4.0	mg/L	10.00		101	85-115			
Iron	0.98	0.30	mg/L	1.000		98	85-115			
Magnesium	9.9	3.0	mg/L	10.00		99	85-115			
Potassium	10	5.0	mg/L	10.00		101	85-115			
Sodium	10	5.0	mg/L	10.00		104	85-115			
LCS Dup (1907335-BSD1)				Prepared & Analyzed: 07/26/2019						
Boron	0.99	0.10	mg/L	1.000		99	85-115	0.5	20	
Calcium	10	4.0	mg/L	10.00		102	85-115	0.9	20	
Iron	0.99	0.30	mg/L	1.000		99	85-115	2	20	
Magnesium	10	3.0	mg/L	10.00		101	85-115	1	20	
Potassium	10	5.0	mg/L	10.00		102	85-115	0.3	20	
Sodium	11	5.0	mg/L	10.00		105	85-115	1	20	
Matrix Spike (1907335-MS1)	**Source: 19G0441-02**			Prepared & Analyzed: 07/26/2019						
Boron	1.0	0.10	mg/L	1.000	0.055	95	70-130			
Calcium	19	4.0	mg/L	10.00	9.6	96	70-130			
Iron	0.97	0.30	mg/L	1.000	ND	97	70-130			
Magnesium	10	3.0	mg/L	10.00	0.53	98	70-130			
Potassium	10	5.0	mg/L	10.00	0.23	98	70-130			
Sodium	13	5.0	mg/L	10.00	2.9	103	70-130			
Batch 1907339 - E 245.1										
Blank (1907339-BLK1)				Prepared & Analyzed: 07/26/2019						
Mercury	ND	0.0010	mg/L							B5
LCS (1907339-BS1)				Prepared & Analyzed: 07/26/2019						
Mercury	0.0050	0.0010	mg/L	0.005000		101	85-115			
LCS Dup (1907339-BSD1)				Prepared & Analyzed: 07/26/2019						
Mercury	0.0050	0.0010	mg/L	0.005000		101	85-115	0.2	20	
Matrix Spike (1907339-MS1)	**Source: 19G0648-01**			Prepared & Analyzed: 07/26/2019						
Mercury	0.0049	0.0010	mg/L	0.005000	0.00011	96	85-115			
Matrix Spike Dup (1907339-MSD1)	**Source: 19G0648-01**			Prepared & Analyzed: 07/26/2019						
Mercury	0.0050	0.0010	mg/L	0.005000	0.00011	97	85-115	1	20	

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907191 - SM5310 C										
Blank (1907191-BLK1)				Prepared & Analyzed: 07/17/2019						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1907191-BS1)				Prepared & Analyzed: 07/17/2019						
Organic Carbon, Total	10	0.50	mg/L	10.00		100	90-110			
LCS Dup (1907191-BSD1)				Prepared & Analyzed: 07/17/2019						
Organic Carbon, Total	10	0.50	mg/L	10.00		100	90-110	0.07	10	
Matrix Spike (1907191-MS1)	**Source: 19G0423-01**			Prepared & Analyzed: 07/17/2019						
Organic Carbon, Total	10	0.50	mg/L	10.00	0.34	97	80-120			
Matrix Spike Dup (1907191-MSD1)	**Source: 19G0423-01**			Prepared & Analyzed: 07/17/2019						
Organic Carbon, Total	10	0.50	mg/L	10.00	0.34	97	80-120	0.2	15	
Batch 1907212 - SM2320B										
Blank (1907212-BLK1)				Prepared & Analyzed: 07/17/2019						
Alkalinity, Bicarbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Total (As CaCO3)	ND	2.0	mg/L							
LCS (1907212-BS1)				Prepared & Analyzed: 07/17/2019						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		94	90-110			
LCS Dup (1907212-BSD1)				Prepared & Analyzed: 07/17/2019						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		95	90-110	0.8	10	
Matrix Spike (1907212-MS1)	**Source: 19G0464-01**			Prepared & Analyzed: 07/17/2019						
Alkalinity, Total (As CaCO3)	340	2.0	mg/L	250.0	110	94	70-130			
Matrix Spike Dup (1907212-MSD1)	**Source: 19G0464-01**			Prepared & Analyzed: 07/17/2019						
Alkalinity, Total (As CaCO3)	340	2.0	mg/L	250.0	110	95	70-130	0.6	10	
Batch 1907213 - SM2540 C										
Duplicate (1907213-DUP1)	**Source: 19G0441-05**			Prepared: 07/18/2019 Analyzed: 07/22/2019						
Total Dissolved Solids (Residue, Filterable)	2100	20	mg/L		2100			4	5	
Duplicate (1907213-DUP2)	**Source: 19G0464-02**			Prepared: 07/18/2019 Analyzed: 07/24/2019						
Total Dissolved Solids (Residue, Filterable)	370	20	mg/L		360			3	5	
Batch 1907257 - SM2540 C										
Duplicate (1907257-DUP1)	**Source: 19G0441-02**			Prepared: 07/22/2019 Analyzed: 07/24/2019						
Total Dissolved Solids (Residue, Filterable)	49	20	mg/L		49			0	5	
Duplicate (1907257-DUP2)	**Source: 19G0496-01**			Prepared: 07/22/2019 Analyzed: 07/24/2019						
Total Dissolved Solids (Residue, Filterable)	260	20	mg/L		270			3	5	
Batch 1907258 - SM2540 D										

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907258 - SM2540 D										
Duplicate (1907258-DUP1)		**Source: 19G0305-01**		Prepared & Analyzed: 07/22/2019						
Total Suspended Solids	ND	10	mg/L		1.0			200	5	Q9, R12
Duplicate (1907258-DUP2)		**Source: 19G0456-03**		Prepared & Analyzed: 07/22/2019						
Total Suspended Solids	3600	10	mg/L		3400			5	5	
Batch 1907328 - SM2510 B										
LCS (1907328-BS1)				Prepared & Analyzed: 07/25/2019						
Conductivity	150	0.10	µmhos/cm	141.2		105	0-200			
LCS Dup (1907328-BSD1)				Prepared & Analyzed: 07/25/2019						
Conductivity	150	0.10	µmhos/cm	141.2		104	0-200	0.7	200	
Duplicate (1907328-DUP1)		**Source: 19G0441-05**		Prepared & Analyzed: 07/25/2019						
Conductivity	2900	1.0	µmhos/cm		3000			4	10	

Turner Laboratories, Inc.

Date: 08/05/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19G0441
Date Received: 07/16/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1907170 - E300.0 (2.1)										
Blank (1907170-BLK1)				Prepared & Analyzed: 07/16/2019						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Nitrogen, Nitrate (As N)	ND	0.50	mg/L							
Nitrogen, Nitrite (As N)	ND	0.10	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (1907170-BS1)				Prepared & Analyzed: 07/16/2019						
Chloride	12	1.0	mg/L	12.50		94	90-110			
Fluoride	2.0	0.50	mg/L	2.000		100	90-110			
Nitrogen, Nitrate (As N)	4.8	0.50	mg/L	5.000		97	90-110			
Nitrogen, Nitrite (As N)	2.4	0.10	mg/L	2.500		94	90-110			
Sulfate	12	5.0	mg/L	12.50		96	90-110			
LCS Dup (1907170-BSD1)				Prepared & Analyzed: 07/16/2019						
Chloride	12	1.0	mg/L	12.50		94	90-110	0.7	10	
Fluoride	2.0	0.50	mg/L	2.000		99	90-110	0.5	10	
Nitrogen, Nitrate (As N)	4.8	0.50	mg/L	5.000		96	90-110	0.6	10	
Nitrogen, Nitrite (As N)	2.3	0.10	mg/L	2.500		94	90-110	0.5	10	
Sulfate	12	5.0	mg/L	12.50		95	90-110	0.6	10	
Matrix Spike (1907170-MS1)	**Source: 19G0432-01**			Prepared & Analyzed: 07/16/2019						
Chloride	22	1.0	mg/L	12.50	10	99	80-120			
Fluoride	2.6	0.50	mg/L	2.000	0.57	101	80-120			
Nitrogen, Nitrate (As N)	6.9	0.50	mg/L	5.000	1.9	99	80-120			
Nitrogen, Nitrite (As N)	2.3	0.10	mg/L	2.500	ND	93	80-120			
Sulfate	24	5.0	mg/L	12.50	13	88	80-120			
Matrix Spike (1907170-MS2)	**Source: 19G0441-02**			Prepared & Analyzed: 07/16/2019						
Chloride	15	1.0	mg/L	12.50	2.7	96	80-120			
Fluoride	2.1	0.50	mg/L	2.000	ND	104	80-120			
Nitrogen, Nitrate (As N)	5.0	0.50	mg/L	5.000	0.10	97	80-120			
Nitrogen, Nitrite (As N)	2.4	0.10	mg/L	2.500	ND	94	80-120			
Sulfate	38	5.0	mg/L	12.50	29	72	80-120			M2
Matrix Spike Dup (1907170-MSD1)	**Source: 19G0432-01**			Prepared & Analyzed: 07/16/2019						
Chloride	23	1.0	mg/L	12.50	10	100	80-120	0.3	10	
Fluoride	2.6	0.50	mg/L	2.000	0.57	102	80-120	0.5	10	
Nitrogen, Nitrate (As N)	6.9	0.50	mg/L	5.000	1.9	99	80-120	0.5	10	
Nitrogen, Nitrite (As N)	2.3	0.10	mg/L	2.500	ND	93	80-120	0.4	10	
Sulfate	24	5.0	mg/L	12.50	13	88	80-120	0.02	10	
Matrix Spike Dup (1907170-MSD2)	**Source: 19G0441-02**			Prepared & Analyzed: 07/16/2019						
Chloride	15	1.0	mg/L	12.50	2.7	96	80-120	0.5	10	
Fluoride	2.1	0.50	mg/L	2.000	ND	104	80-120	0.3	10	
Nitrogen, Nitrate (As N)	4.9	0.50	mg/L	5.000	0.10	97	80-120	0.1	10	
Nitrogen, Nitrite (As N)	2.4	0.10	mg/L	2.500	ND	94	80-120	0.4	10	
Sulfate	38	5.0	mg/L	12.50	29	68	80-120	1	10	M2

TURNER LABORATORIES INC.
2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 19G0441 DATE 7/15/19 PAGE 1 OF 1

PROJECT NAME South 32 #

CONTACT NAME Michael Taylor

COMPANY NAME Veolia Water Technologies

ADDRESS 6981 N. Park Dr.

ZIP 08109 PHONE 856 438-1765 EMAIL michael.Taylor@veolia.com

SAMPLER'S SIGNATURE Michael Taylor

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Base Neutrals 625/8270 ☐ / Acids ☒	Volatile Organics ☐ 624 ☐ 524.2 ☐ 8260	TTHMS ☐ / HAA5 ☐	☒ Chloride / ☒ Sulfate / ☒ Resistivity	NO_2 ☒ / NO_3 ☒ / TKN ☐	☐ TPH / 1664 ☐ Oil & Grease	TCLP Analysis VOA ☐ / Semi-VOA ☐ / Pest. ☐	Metals TCLP ☐ / Dissolved ☒ / Total ☒ / RCRA8 ☐		Cyanide Total ☒ / Amen. ☐ / WAD ☒	SDWA-INORGANICS PRIMARY ☐ / SECONDARY ☐	Coliform MPN ☐ / P/A ☐ / Fecal ☐	pH ☐ / Cr_6 ☐ / Cl_2 ☐ / Turb ☐	COD ☐ / TSS ☒ / BOD ☐				
JA RO Brine	7/15/19	13:00		WW	6	X			X	X			X	X	X				X				
JA 100 RO	7/15/19	↓		↓	6	X			X	X			X	X	X				X				
JA 25/RO 75	7/15/19				6	X			X	X			X	X	X				X				
JA 50/RO 50	7/15/19				6	X			X	X			X	X	X				X				
JA 75/RO 25	7/15/19				6	X			X	X			X	X	X				X				

1. RELINQUISHED BY:
Signature: Michael Taylor
Printed Name: Michael Taylor
Firm: Veolia
Date/Time: 7/15/19 1:30 PM

2. RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx. 10 days)*
___ Next Day ___ 2 Day ___ 5 Day*
___ Email Preliminary Results
* Working Days

REPORT REQUIREMENTS:
X I. Routine Report
___ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
___ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ___ Y ___ N
P.O. #
Bill to:

SAMPLE RECEIPT:
Total Containers
Temperature 24.9
☐ Wet Ice
☒ Ambient
☐ Blue Ice

3. RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature
Printed Name: Joseph Catala
Firm: TURNER LABORATORIES, INC.
Date/Time: 7/15/19 1018

* LEGEND
SAMPLE MATRIX
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

Compliance Analysis: ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms: ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Forms: ☐ Yes ☐ No	COC / Labels Agree ☒	Received Within Hold Time ☒

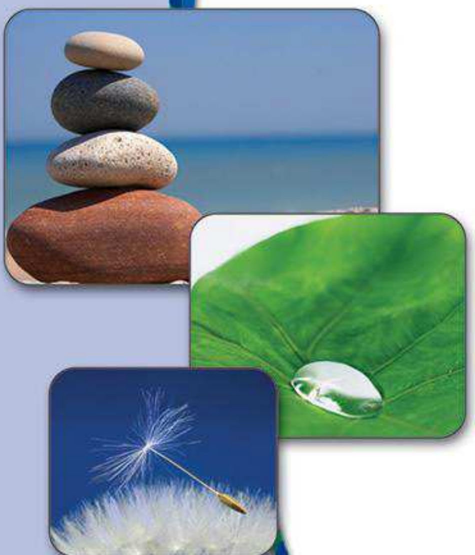
SPECIAL INSTRUCTIONS/COMMENTS:
See Attached analyte list

Attachment A
Sample Analysis Program

Analyte	Total	Dissolved	Other
Metals			
Antimony	X	X	
Arsenic	X	X	
Barium	X	X	
Beryllium	X	X	
Boron	X	X	
Cadmium	X	X	
Chromium, total	X	X	
Copper	X	X	
Iron	X	X	
Lead	X	X	
Manganese		X	
Mercury	X	X	
Nickel	X	X	
Selenium	X	X	
Silver	X	X	
Thallium	X	X	
Zinc	X	X	
Major Cations			
Hardness ($CaCO_3$)	X	X	
Calcium	X	X	
Magnesium	X	X	
Potassium	X	X	
Sodium	X	X	
Major Anions			
Total Alkalinity	X		
Acidity	X		
Fluoride	X	X	
Nitrate – Nitrite as N	X	X	
Nitrite - N	X	X	
Nitrate – N	X	X	
Sulfate	X		
Chloride	X		
Parameters			
Total Dissolved Solids		X	
Total Suspended Solids	X		
Total Organic Carbon	X		
Conductivity	X		

RadChem			
Gross Alpha Particle Activity	X	X	X
Radium 226 + Radium 228	X	X	X
Cyanide			
Free CN	X	X	
WAD CN	X	X	

eurofins | Environment Testing TestAmerica



ANALYTICAL REPORT

Eurofins TestAmerica, Phoenix
4625 East Cotton Ctr Blvd
Suite 189
Phoenix, AZ 85040
Tel: (602)437-3340

Laboratory Job ID: 550-126452-1
Client Project/Site: 19G0441

For:
Turner Laboratories, Inc.
2445 North Coyote Drive
Suite 104
Tucson, Arizona 85745

Attn: Elizabeth Kasik

Authorized for release by:
7/29/2019 12:25:50 PM

Ken Baker, Project Manager II
(602)659-7624
ken.baker@testamericainc.com

LINKS

Review your project results through TotalAccess

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Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Definitions/Glossary

Client: Turner Laboratories, Inc. Job ID: 550-126452-1
Project/Site: 19G0441

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Qualifiers

General Chemistry

Qualifier	Qualifier Description
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Job ID: 550-126452-1

Laboratory: Eurofins TestAmerica, Phoenix

Narrative

Job Narrative
550-126452-1

Comments
No additional comments.

Receipt
The samples were received on 7/22/2019 10:20 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 32.8º C.

Receipt Exceptions
The following samples were received at the laboratory outside the required temperature criteria: 19G0441-01 (550-126452-1), 19G0441-02 (550-126452-2), 19G0441-03 (550-126452-3), 19G0441-04 (550-126452-4) and 19G0441-05 (550-126452-5). The client was contacted regarding this issue, and the laboratory was instructed to <CHOOSE_ONE> proceed with/cancel analysis.

General Chemistry
Method(s) SM 4500 CN I: Total cyanide analysis was performed for sample 19G0441-01 (550-126452-1), 19G0441-02 (550-126452-2), 19G0441-03 (550-126452-3), 19G0441-04 (550-126452-4) and 19G0441-05 (550-126452-5), and the result obtained was a non-detect. As such, the weak acid dissociable cyanide analysis was not performed, and the result for this analyte was reported as non-detect.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: Turner Laboratories, Inc.
Project/Site: 19G0441

Job ID: 550-126452-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
550-126452-1	19G0441-01	Water	07/15/19 13:00	07/22/19 10:20	
550-126452-2	19G0441-02	Water	07/15/19 13:00	07/22/19 10:20	
550-126452-3	19G0441-03	Water	07/15/19 13:00	07/22/19 10:20	
550-126452-4	19G0441-04	Water	07/15/19 13:00	07/22/19 10:20	
550-126452-5	19G0441-05	Water	07/15/19 13:00	07/22/19 10:20	

Detection Summary

Client: Turner Laboratories, Inc.
Project/Site: 19G0441

Job ID: 550-126452-1

Client Sample ID: 19G0441-01 — Lab Sample ID: 550-126452-1

No Detections.

Client Sample ID: 19G0441-02 — Lab Sample ID: 550-126452-2

No Detections.

Client Sample ID: 19G0441-03 — Lab Sample ID: 550-126452-3

No Detections.

Client Sample ID: 19G0441-04 — Lab Sample ID: 550-126452-4

No Detections.

Client Sample ID: 19G0441-05 — Lab Sample ID: 550-126452-5

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Turner Laboratories, Inc.
Job ID: 550-126452-1
Project/Site: 19G0441

Client Sample ID: 19G0441-01
Lab Sample ID: 550-126452-1
Date Collected: 07/15/19 13:00
Matrix: Water
Date Received: 07/22/19 10:20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:11	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		07/26/19 18:39	07/26/19 18:43	1

Client Sample ID: 19G0441-02
Lab Sample ID: 550-126452-2
Date Collected: 07/15/19 13:00
Matrix: Water
Date Received: 07/22/19 10:20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:11	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		07/26/19 18:39	07/26/19 18:43	1

Client Sample ID: 19G0441-03
Lab Sample ID: 550-126452-3
Date Collected: 07/15/19 13:00
Matrix: Water
Date Received: 07/22/19 10:20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:12	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		07/26/19 18:39	07/26/19 18:43	1

Client Sample ID: 19G0441-04
Lab Sample ID: 550-126452-4
Date Collected: 07/15/19 13:00
Matrix: Water
Date Received: 07/22/19 10:20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:12	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		07/26/19 18:39	07/26/19 18:43	1

Client Sample ID: 19G0441-05
Lab Sample ID: 550-126452-5
Date Collected: 07/15/19 13:00
Matrix: Water
Date Received: 07/22/19 10:20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:12	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		07/26/19 18:39	07/26/19 18:43	1

Method: SM 4500 CN E - Cyanide, Total (Low Level)

Lab Sample ID: MB 440-559816/1-A **Client Sample ID: Method Blank**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 559894 **Prep Batch: 559816**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		07/26/19 11:59	07/26/19 18:11	1

Lab Sample ID: LCS 440-559816/2-A **Client Sample ID: Lab Control Sample**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 559894 **Prep Batch: 559816**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyanide, Total	0.100	0.107		mg/L		107	80 - 120

Lab Sample ID: LCSD 440-559816/3-A **Client Sample ID: Lab Control Sample Dup**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 559894 **Prep Batch: 559816**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cyanide, Total	0.100	0.0959		mg/L		96	80 - 120	11	20

Lab Sample ID: 550-126452-1 MS **Client Sample ID: 19G0441-01**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 559894 **Prep Batch: 559816**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyanide, Total	ND	E8	0.100	0.0995		mg/L		100	75 - 125

Lab Sample ID: 550-126452-1 MSD **Client Sample ID: 19G0441-01**
Matrix: Water **Prep Type: Total/NA**
Analysis Batch: 559894 **Prep Batch: 559816**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cyanide, Total	ND	E8	0.100	0.0995		mg/L		99	75 - 125	0	20

QC Association Summary

Client: Turner Laboratories, Inc.
Project/Site: 19G0441

Job ID: 550-126452-1

General Chemistry

Prep Batch: 559816

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-126452-1	19G0441-01	Total/NA	Water	Distill/CN	
550-126452-2	19G0441-02	Total/NA	Water	Distill/CN	
550-126452-3	19G0441-03	Total/NA	Water	Distill/CN	
550-126452-4	19G0441-04	Total/NA	Water	Distill/CN	
550-126452-5	19G0441-05	Total/NA	Water	Distill/CN	
MB 440-559816/1-A	Method Blank	Total/NA	Water	Distill/CN	
LCS 440-559816/2-A	Lab Control Sample	Total/NA	Water	Distill/CN	
LCSD 440-559816/3-A	Lab Control Sample Dup	Total/NA	Water	Distill/CN	
550-126452-1 MS	19G0441-01	Total/NA	Water	Distill/CN	
550-126452-1 MSD	19G0441-01	Total/NA	Water	Distill/CN	

Analysis Batch: 559894

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-126452-1	19G0441-01	Total/NA	Water	SM 4500 CN E	559816
550-126452-2	19G0441-02	Total/NA	Water	SM 4500 CN E	559816
550-126452-3	19G0441-03	Total/NA	Water	SM 4500 CN E	559816
550-126452-4	19G0441-04	Total/NA	Water	SM 4500 CN E	559816
550-126452-5	19G0441-05	Total/NA	Water	SM 4500 CN E	559816
MB 440-559816/1-A	Method Blank	Total/NA	Water	SM 4500 CN E	559816
LCS 440-559816/2-A	Lab Control Sample	Total/NA	Water	SM 4500 CN E	559816
LCSD 440-559816/3-A	Lab Control Sample Dup	Total/NA	Water	SM 4500 CN E	559816
550-126452-1 MS	19G0441-01	Total/NA	Water	SM 4500 CN E	559816
550-126452-1 MSD	19G0441-01	Total/NA	Water	SM 4500 CN E	559816

Prep Batch: 559903

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-126452-1	19G0441-01	Total/NA	Water	SM 4500 CN I	
550-126452-2	19G0441-02	Total/NA	Water	SM 4500 CN I	
550-126452-3	19G0441-03	Total/NA	Water	SM 4500 CN I	
550-126452-4	19G0441-04	Total/NA	Water	SM 4500 CN I	
550-126452-5	19G0441-05	Total/NA	Water	SM 4500 CN I	

Analysis Batch: 559908

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-126452-1	19G0441-01	Total/NA	Water	SM 4500 CN I	559903
550-126452-2	19G0441-02	Total/NA	Water	SM 4500 CN I	559903
550-126452-3	19G0441-03	Total/NA	Water	SM 4500 CN I	559903
550-126452-4	19G0441-04	Total/NA	Water	SM 4500 CN I	559903
550-126452-5	19G0441-05	Total/NA	Water	SM 4500 CN I	559903

Lab Chronicle

Client: Turner Laboratories, Inc. Job ID: 550-126452-1
Project/Site: 19G0441

Client Sample ID: 19G0441-01 Lab Sample ID: 550-126452-1

Date Collected: 07/15/19 13:00 **Matrix: Water**
Date Received: 07/22/19 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			559816	07/26/19 11:59	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	559894	07/26/19 18:11	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			559903	07/26/19 18:39	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	559908	07/26/19 18:43	KMY	TAL IRV

Client Sample ID: 19G0441-02 Lab Sample ID: 550-126452-2

Date Collected: 07/15/19 13:00 **Matrix: Water**
Date Received: 07/22/19 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			559816	07/26/19 11:59	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	559894	07/26/19 18:11	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			559903	07/26/19 18:39	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	559908	07/26/19 18:43	KMY	TAL IRV

Client Sample ID: 19G0441-03 Lab Sample ID: 550-126452-3

Date Collected: 07/15/19 13:00 **Matrix: Water**
Date Received: 07/22/19 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			559816	07/26/19 11:59	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	559894	07/26/19 18:12	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			559903	07/26/19 18:39	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	559908	07/26/19 18:43	KMY	TAL IRV

Client Sample ID: 19G0441-04 Lab Sample ID: 550-126452-4

Date Collected: 07/15/19 13:00 **Matrix: Water**
Date Received: 07/22/19 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			559816	07/26/19 11:59	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	559894	07/26/19 18:12	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			559903	07/26/19 18:39	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	559908	07/26/19 18:43	KMY	TAL IRV

Client Sample ID: 19G0441-05 Lab Sample ID: 550-126452-5

Date Collected: 07/15/19 13:00 **Matrix: Water**
Date Received: 07/22/19 10:20

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			559816	07/26/19 11:59	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	559894	07/26/19 18:12	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			559903	07/26/19 18:39	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	559908	07/26/19 18:43	KMY	TAL IRV

Laboratory References:

TAL IRV = Eurofins TestAmerica, Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Accreditation/Certification Summary

Client: Turner Laboratories, Inc.
Job ID: 550-126452-1
Project/Site: 19G0441

Laboratory: Eurofins TestAmerica, Phoenix

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Arizona	State Program	9	AZ0728	06-09-20

Laboratory: Eurofins TestAmerica, Irvine

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Arizona	State Program	9	AZ0671	10-14-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 4500 CN I	SM 4500 CN I	Water	Cyanide, Weak Acid Dissociable

Method Summary

Client: Turner Laboratories, Inc.
Project/Site: 19G0441

Job ID: 550-126452-1

Method	Method Description	Protocol	Laboratory
SM 4500 CN E	Cyanide, Total (Low Level)	SM	TAL IRV
SM 4500 CN I	Cyanide, Weak Acid Dissociable	SM	TAL IRV
Distill/CN	Distillation, Cyanide	None	TAL IRV
SM 4500 CN I	Cyanide, Distillation for Weak Acid Dissociable	SM	TAL IRV

Protocol References:

None = None

SM = "Standard Methods For The Examination Of Water And Wastewater"

Laboratory References:

TAL IRV = Eurofins TestAmerica, Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

SUBCONTRACT ORDER

126452

Turner Laboratories, Inc.

19G0441

SENDING LABORATORY:

Turner Laboratories, Inc.
2445 N. Coyote Drive, Ste #104
Tucson, AZ 85745
Phone: 520.882.5880
Fax: 520.882.9788
Project Manager: Elizabeth Kasik

RECEIVING LABORATORY:

TestAmerica Phoenix
4625 East Cotton Center Boulevard Suite 189
Phoenix, AZ 85540
Phone :(602) 437-3340
Fax:
Please CC Kevin Brim Kbrim@turnerlabs.com

Analysis	Expires	Laboratory ID	Comments
-01			
Sample ID: 19G0441-01 Non-Potable Wa Sampled:07/15/2019 13:00			
Cyanide WAD	07/29/2019 13:00		
Cyanide	07/29/2019 13:00		
Containers Supplied:			
-02			
Sample ID: 19G0441-02 Non-Potable Wa Sampled:07/15/2019 13:00			
Cyanide WAD	07/29/2019 13:00		
Cyanide	07/29/2019 13:00		
Containers Supplied:			
-03			
Sample ID: 19G0441-03 Non-Potable Wa Sampled:07/15/2019 13:00			
Cyanide WAD	07/29/2019 13:00		
Cyanide	07/29/2019 13:00		
Containers Supplied:			
-04			
Sample ID: 19G0441-04 Non-Potable Wa Sampled:07/15/2019 13:00			
Cyanide WAD	07/29/2019 13:00		
Cyanide	07/29/2019 13:00		
Containers Supplied:			
-05			
Sample ID: 19G0441-05 Non-Potable Wa Sampled:07/15/2019 13:00			
Cyanide WAD	07/29/2019 13:00		
Cyanide	07/29/2019 13:00		
Containers Supplied:			

550-126452 Chain of Custody

Released By	Date		Received By	Date	
[signature]	7/17/19	16:00	UPS	7/17/19	16:00
UPS			[signature]	7/22/19	10:20

TA-PHX 32.8° melted Ice

Eurofins TestAmerica, Phoenix
4625 East Cotton Ctr Blvd Suite 189
Phoenix, AZ 85040
Phone. 602-437-3340 Fax 602-454-9303

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler	Lab PM: Baker, Ken	Carrier Tracking No(s)	COC No: 550-25175.1
Client Contact: Shipping/Receiving	Phone	E-Mail: ken.baker@testamericainc.com	State of Origin: Arizona	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc		Accreditations Required (See note): State Program - Arizona		Job #: 550-126452-1
Address: 17461 Derian Ave, Suite 100,	Due Date Requested: 7/29/2019	Analysis Requested		Preservation Codes:
City: Irvine	TAT Requested (days):			
State, Zip: CA, 92614-5817				
Phone: 949-261-1022(Tel) 949-260-3297(Fax)	PO #.			
Email	WO #			
Project Name: 19G0441	Project #: 55003219			
Site	SSOW#			Other:

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	[redacted]	4500_CN_I/4500_CN_I_Prep Cyanide, Weak Acid Dissociable	4500_CN_E_LL/Distill_CN LL Cyanide	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
19G0441-01 (550-126452-1)	7/15/19	13:00 Arizona		Water			X	X	1	, AZ Sample
19G0441-02 (550-126452-2)	7/15/19	13 00 Arizona		Water			X	X	1	, AZ Sample
19G0441-03 (550-126452-3)	7/15/19	13 00 Arizona		Water			X	X	1	, AZ Sample
19G0441-04 (550-126452-4)	7/15/19	13.00 Arizona		Water			X	X	1	, AZ Sample
19G0441-05 (550-126452-5)	7/15/19	13:00 Arizona		Water			X	X	1	, AZ Sample

Note Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said complicance to TestAmerica Laboratories, Inc

Possible Hazard Identification
Unconfirmed

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For ____ Months*

Deliverable Requested: I, II, III, IV, Other (specify) | Primary Deliverable Rank 2 | Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time	Method of Shipment

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Eric	07-23-19 15:10	TA-PHX LAB			
				7/24/19 1025	TA IRV

Custody Seals Intact: Yes / No	Custody Seal No.:	Cooler Temperature(s) °C and Other Remarks: 1288 4.0/4.2

Ver 01/16/2019

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Login Sample Receipt Checklist

Client: Turner Laboratories, Inc. Job Number: 550-126452-1

Login Number: 126452 **List Source: Eurofins TestAmerica, Phoenix**
List Number: 1
Creator: Gravlin, Andrea

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	False	Cooler temperature outside required temperature criteria.
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	False	Check done at department level as required.

Login Sample Receipt Checklist

Client: Turner Laboratories, Inc.

Job Number: 550-126452-1

Login Number: 126452
List Number: 2
Creator: Ornelas, Olga

List Source: Eurofins TestAmerica, Irvine
List Creation: 07/24/19 01:39 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Radiation Safety Engineering, Inc.

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121 (480) 897-9459
Website: www.radsafe.com FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 15, 2019
Sample Received: July 23, 2019
Analysis Completed: August 05, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19G0441-01	< 2.0	< 0.5	< 0.7	< 0.7

Date of Analysis	7/31/2019	7/26/2019	7/26/2019	7/26/2019

Robert L. Metzger 8/5/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.
3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121 (480) 897-9459
Website: www.radsafe.com FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 15, 2019
Sample Received: July 15, 2019
Analysis Completed: August 05, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19G0441-02	< 0.7	< 0.5	< 0.7	< 0.7

Date of Analysis	7/29/2019	7/26/2019	7/26/2019	7/26/2019

Robert L. Metzger 8/5/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.

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Website: www.radsafe.com FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 15, 2019
Sample Received: July 15, 2019
Analysis Completed: August 05, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19G0441-03	< 0.7	< 0.5	< 0.7	< 0.7

Date of Analysis	7/29/2019	7/26/2019	7/26/2019	7/26/2019

Robert L. Metzger 8/5/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121
Website: www.radsafe.com

(480) 897-9459
FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 15, 2019
Sample Received: July 15, 2019
Analysis Completed: August 05, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19G0441-04	< 0.8	< 0.4	< 0.7	< 0.7

Date of Analysis	7/29/2019	7/26/2019	7/26/2019	7/26/2019

8/5/2019

Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121 (480) 897-9459
Website: www.radsafe.com FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 15, 2019
Sample Received: July 23, 2019
Analysis Completed: August 05, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19G0441-05	< 0.8	< 0.4	< 0.7	< 0.7

Date of Analysis	7/29/2019	7/26/2019	7/26/2019	7/26/2019

8/5/2019

Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19G0441

SENDING LABORATORY:

Turner Laboratories, Inc.
2445 N. Coyote Drive, Ste #104
Tucson, AZ 85745
Phone: 520.882.5880
Fax: 520.882.9788
Project Manager: Elizabeth Kasik

RECEIVING LABORATORY:

Radiation Safety Engineering, Inc.
3245 N. Washington St.
Chandler, AZ 85225-1121
Phone :(480) 897-9459
Fax: (480) 892-5446
Please CC Kevin Brim Kbrim@turnerlabs.com

Analysis	Expires	Laboratory ID	Comments
Sample ID: 19G0441-01 Non-Potable Wa Sampled:07/15/2019 13:00			
Radiochemistry, Radium 226/228	08/14/2019 13:00		Total and Dissolved
Radiochemistry. Gross Alpha	01/11/2020 13:00		Total and Dissloved 62550
Containers Supplied:			
Sample ID: 19G0441-02 Non-Potable Wa Sampled:07/15/2019 13:00			
Radiochemistry, Radium 226/228	08/14/2019 13:00		Total and Dissolved
Radiochemistry, Gross Alpha	01/11/2020 13:00		Total and Dissolved 62551
Containers Supplied:			
Sample ID: 19G0441-03 Non-Potable Wa Sampled:07/15/2019 13:00			
Radiochemistry, Radium 226/228	08/14/2019 13:00		Total and Dissolved
Radiochemistry, Gross Alpha	01/11/2020 13:00		Total and Dissolved 62552
Containers Supplied:			
Sample ID: 19G0441-04 Non-Potable Wa Sampled:07/15/2019 13:00			
Radiochemistry, Radium 226/228	08/14/2019 13:00		Total and Dissolved
Radiochemistry, Gross Alpha	01/11/2020 13:00		Total and Dissolved 62553
Containers Supplied:			
Sample ID: 19G0441-05 Non-Potable Wa Sampled:07/15/2019 13:00			
Radiochemistry, Radium 226/228	08/14/2019 13:00		Total and Dissolved
Radiochemistry, Gross Alpha	01/11/2020 13:00		Total and Dissolved 62554
Containers Supplied:			

Released By	Date	Received By	Date
[signature]	7/22/19 16:00	UPS	7/22/19 16:00

Released By Date Received By Date

August 22, 2019

TURNER
LABORATORIES INC.

Michael Taylor
Veolia Water Technologies
6981 N. Park Dr.
Pennsauken Township, NJ 08109

TEL (856) 438-1765
FAX -

Work Order No.: 19H0053

RE: Arizona Minerals

Dear Michael Taylor,

Turner Laboratories, Inc. received 7 sample(s) on 08/01/2019 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Elizabeth Kasik
Laboratory Director

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Date Received: 08/01/2019

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
19H0053-01	UDCP 100	Wastewater	07/30/2019 1000
19H0053-02	UDCP 75/RO25	Wastewater	07/30/2019 1000
19H0053-03	UDCP 50/RO 50	Wastewater	07/30/2019 1000
19H0053-04	UDCP 25/RO 75	Wastewater	07/30/2019 1000
19H0053-05	UDCP 100 RO	Wastewater	07/30/2019 1000
19H0053-06	UDCP Ro Brine	Wastewater	07/30/2019 1000
19H0053-07	JA 40 RO/60 Desat	Wastewater	07/30/2019 1000

Client:	Veolia Water Technologies
Project:	Arizona Minerals
Work Order:	19H0053
Date Received:	08/01/2019

Case Narrative

The Cyanide and Cyanide WAD analyses was performed by TestAmerica Laboratories, Inc. in Phoenix, AZ.

The radiochemistry analysis was performed by Radiation Safety Engineering, Inc. in Chandler, AZ.

D5	Minimum Reporting Limit (MRL) is adjusted due to sample dilution; analyte was non-detect in the sample.
E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
H3	Sample was received and/or analysis requested past holding time.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
Q9	Insufficient sample received to meet method QC requirements.
V1	CCV recovery was above method acceptance limits. This target analyte was not detected in the sample.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	1800		45		mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	1600				mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	16		0.10		mg/L	5	08/01/2019 1650	08/02/2019 1345	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.20	D5	mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Calcium	710		8.0		mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Iron	ND		0.60	D5	mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Magnesium	16		6.0		mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Potassium	ND		10	D5	mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
Sodium	96		10		mg/L	2	08/05/2019 1135	08/08/2019 1457	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00070		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Arsenic	0.0023		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Barium	0.0015		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/06/2019 1118	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Chromium	0.0025		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Copper	0.011		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Lead	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Manganese	0.011		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Nickel	0.024		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Selenium	0.014		0.0025		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1847	MH
CVAA Dissolved Mercury-E 245.1									

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1550	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1302	MH
Calcium	600		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
Magnesium	14		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
Potassium	5.1		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
Sodium	92		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1301	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.00063		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Barium	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/08/2019 1300	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Chromium	ND		0.0050	D5	mg/L	10	08/06/2019 1100	08/08/2019 1648	MH
Copper	0.0012		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Lead	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Manganese	0.013		0.0013		mg/L	5	08/06/2019 1100	08/08/2019 1300	MH
Nickel	0.029		0.0025		mg/L	5	08/06/2019 1100	08/08/2019 1300	MH
Selenium	0.012		0.0025		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
Thallium	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/08/2019 1300	MH
Zinc	ND		0.040	V1	mg/L	1	08/06/2019 1100	08/08/2019 1431	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1612	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	26		5.0		mg/L	5	08/01/2019 1650	08/02/2019 1345	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2017	MH
Nitrogen, Nitrate (As N)	16		2.5	H3	mg/L	5	08/01/2019 1650	08/02/2019 1345	MH
Nitrogen, Nitrite (As N)	0.41		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2017	MH
Sulfate	1700		1000		mg/L	200	08/01/2019 1650	08/08/2019 0223	EJ
Alkalinity-SM2320B									

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Bicarbonate (As CaCO3)	7.5		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	7.5		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	3600		0.50		µmhos/cm	5	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	2700		20		mg/L	1	08/06/2019 0819	08/08/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	2.1		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1315	MH

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Lab Sample ID: 19H0053-02

Client Sample ID: UDCP 75/RO25
Collection Date/Time: 07/30/2019 1000
Matrix: Wastewater

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	1000		22		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	1200				mg/L	1	08/08/2019 1220	08/12/2019 1306	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	13		0.10		mg/L	5	08/01/2019 1650	08/02/2019 1404	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/05/2019 1135	08/08/2019 1502	MH
Calcium	400		4.0		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
Iron	ND		0.30		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
Magnesium	8.7		3.0		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
Potassium	ND		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
Sodium	53		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1501	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00052		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Arsenic	0.0014		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Barium	0.0010		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/06/2019 1134	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Chromium	0.0020		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Copper	0.0073		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Lead	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Manganese	0.0089		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Nickel	0.023		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Selenium	0.0092		0.0025		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1852	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1553	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 75/RO25
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-02		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1306	MH
Calcium	460		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1305	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1306	MH
Magnesium	10		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1306	MH
Potassium	ND		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1305	MH
Sodium	70		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1306	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Barium	0.00093		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1749	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Chromium	ND		0.0050	D5	mg/L	10	08/06/2019 1100	08/08/2019 1654	MH
Copper	0.0020		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Lead	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Manganese	0.0098		0.0013		mg/L	5	08/06/2019 1100	08/08/2019 1305	MH
Nickel	0.021		0.0025		mg/L	5	08/06/2019 1100	08/08/2019 1305	MH
Selenium	0.0080		0.0025		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
Thallium	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/08/2019 1305	MH
Zinc	ND		0.040	V1	mg/L	1	08/06/2019 1100	08/08/2019 1437	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1614	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	19		1.0		mg/L	1	08/01/2019 1650	08/01/2019 2036	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2036	MH
Nitrogen, Nitrate (As N)	12		2.5	H3	mg/L	5	08/01/2019 1650	08/02/2019 1404	MH
Nitrogen, Nitrite (As N)	0.34		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2036	MH
Sulfate	1300		1000		mg/L	200	08/01/2019 1650	08/08/2019 0242	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	4.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 75/RO25
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-02		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	4.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	2800		0.50		µmhos/cm	5	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	2000		20		mg/L	1	08/06/2019 0819	08/09/2019 1620	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	3.9		2.5		mg/L	5	08/08/2019 0845	08/08/2019 1331	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	800		22		mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	790				mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	9.1		0.10		mg/L	1	08/01/2019 1650	08/01/2019 2055	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Calcium	310		4.0	M3	mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Iron	ND		0.30		mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Magnesium	6.5		3.0		mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Potassium	ND		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
Sodium	46		5.0	M3	mg/L	1	08/05/2019 1135	08/08/2019 1241	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Arsenic	0.0012		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Barium	0.0012		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Chromium	0.0014		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Copper	0.019		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Lead	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Manganese	0.0063		0.0013		mg/L	5	08/05/2019 1135	08/05/2019 1658	MH
Nickel	0.020		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1658	MH
Selenium	0.0059		0.0025		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1908	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1555	MH

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Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Calcium	310		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Magnesium	6.8		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Potassium	ND		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
Sodium	49		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1310	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Barium	0.00059		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1805	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Chromium	ND		0.0050	D5	mg/L	10	08/06/2019 1100	08/08/2019 1711	MH
Copper	0.0033		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Lead	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Manganese	0.0066		0.0013		mg/L	5	08/06/2019 1100	08/08/2019 1327	MH
Nickel	0.015		0.0025		mg/L	5	08/06/2019 1100	08/08/2019 1327	MH
Selenium	0.0048		0.0025		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Thallium	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
Zinc	ND		0.040	V1	mg/L	1	08/06/2019 1100	08/08/2019 1458	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1622	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	13		1.0		mg/L	1	08/01/2019 1650	08/01/2019 2055	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2055	MH
Nitrogen, Nitrate (As N)	8.8		0.50	H3	mg/L	1	08/01/2019 1650	08/01/2019 2055	MH
Nitrogen, Nitrite (As N)	0.22		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2055	MH
Sulfate	830		500		mg/L	100	08/01/2019 1650	08/08/2019 0300	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	3.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

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Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 50/RO 50
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	3.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	1900		0.50		µmhos/cm	5	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	1300		20		mg/L	1	08/06/2019 0819	08/08/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	2.5		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1350	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 25/RO 75
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-04		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	440		22		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	430				mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	5.7		0.10		mg/L	1	08/01/2019 1650	08/01/2019 2114	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
Calcium	170		4.0		mg/L	1	08/05/2019 1135	08/08/2019 1436	MH
Iron	ND		0.30		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
Magnesium	3.6		3.0		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
Potassium	ND		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
Sodium	27		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1437	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Arsenic	0.00057		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Barium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Chromium	0.00094		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Copper	0.0055		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Lead	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Manganese	0.0036		0.0013		mg/L	5	08/05/2019 1135	08/05/2019 1714	MH
Nickel	0.011		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1714	MH
Selenium	0.0027		0.0025		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1913	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1558	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Lab Sample ID: 19H0053-04

Client Sample ID: UDCP 25/RO 75
Collection Date/Time: 07/30/2019 1000
Matrix: Wastewater

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Calcium	170		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Magnesium	3.5		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Potassium	ND		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
Sodium	27		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1314	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Barium	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1821	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Chromium	ND		0.0050	D5	mg/L	10	08/06/2019 1100	08/08/2019 1717	MH
Copper	0.0050		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Lead	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Manganese	0.0039		0.0013		mg/L	5	08/06/2019 1100	08/08/2019 1332	MH
Nickel	0.0087		0.0025		mg/L	5	08/06/2019 1100	08/08/2019 1332	MH
Selenium	0.0021	0.00025	0.0025	E4	mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Thallium	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
Zinc	ND		0.040	V1	mg/L	1	08/06/2019 1100	08/08/2019 1503	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1625	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	7.4		1.0		mg/L	1	08/01/2019 1650	08/01/2019 2114	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2114	MH
Nitrogen, Nitrate (As N)	5.6		0.50	H3	mg/L	1	08/01/2019 1650	08/01/2019 2114	MH
Nitrogen, Nitrite (As N)	0.13		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2114	MH
Sulfate	440		250		mg/L	50	08/01/2019 1650	08/08/2019 0319	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	3.5		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 25/RO 75
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-04		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	3.5		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	940		0.10		µmhos/cm	1	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	710		20		mg/L	1	08/06/2019 0819	08/08/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.8		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1407	MH

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Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-05		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	25		22		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	25				mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	2.7		0.10		mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/05/2019 1135	08/08/2019 1433	MH
Calcium	10		4.0		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
Iron	ND		0.30		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
Magnesium	ND		3.0		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
Potassium	ND		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
Sodium	6.7		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1432	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Arsenic	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Barium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/06/2019 1056	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Chromium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Copper	0.0051		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Lead	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Manganese	0.00057		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Nickel	0.0018		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Selenium	0.00031	0.00025	0.0025	E4	mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1825	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1600	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-05		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Calcium	10		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Magnesium	ND		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Potassium	ND		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
Sodium	7.8		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1318	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1206	MH
Barium	ND		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Chromium	0.00085		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Copper	0.0043		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1206	MH
Lead	ND		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Manganese	0.00044		0.00025		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Nickel	0.0016		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	08/06/2019 1100	08/08/2019 1206	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Thallium	ND		0.00050		mg/L	1	08/06/2019 1100	08/07/2019 1338	MH
Zinc	ND		0.040		mg/L	1	08/06/2019 1100	08/08/2019 1206	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1627	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	2.6		1.0		mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
Nitrogen, Nitrate (As N)	2.7		0.50	H3	mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
Nitrogen, Nitrite (As N)	ND		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
Sulfate	25		5.0		mg/L	1	08/01/2019 1650	08/01/2019 2132	MH
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP 100 RO
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-05		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	100		0.10		µmhos/cm	1	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	55		20		mg/L	1	08/06/2019 0819	08/08/2019 1600	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	1.8		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1425	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP Ro Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	3200		110		mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	3500				mg/L	10	08/08/2019 1220	08/12/2019 1351	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	28		0.10		mg/L	10	08/01/2019 1650	08/02/2019 1519	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.50	D5	mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Calcium	1200		20		mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Iron	ND		1.5	D5	mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Magnesium	26		15		mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Potassium	ND		25	D5	mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
Sodium	200		25		mg/L	5	08/05/2019 1135	08/09/2019 1224	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.0025	D5	mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Arsenic	0.0033		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Barium	0.0035		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Beryllium	ND		0.0013	D5	mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Cadmium	ND		0.0013	D5	mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Chromium	0.0068		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Copper	0.067		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Lead	0.0093		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Manganese	0.039		0.0013		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Nickel	0.25		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Selenium	0.022		0.013		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Silver	ND		0.0025	D5	mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Thallium	ND		0.0025	D5	mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
Zinc	0.28		0.20		mg/L	5	08/05/2019 1135	08/05/2019 1719	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1515	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP Ro Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	0.12		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1323	MH
Calcium	1400		40		mg/L	10	08/08/2019 1220	08/12/2019 1351	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1322	MH
Magnesium	27		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1322	MH
Potassium	10		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1322	MH
Sodium	190		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1322	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Arsenic	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Barium	0.0035		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Beryllium	ND		0.00025	V1	mg/L	1	08/06/2019 1100	08/07/2019 1447	MH
Cadmium	ND		0.0013	D5	mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Chromium	0.019		0.010		mg/L	20	08/06/2019 1100	08/08/2019 1232	MH
Copper	0.061		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Lead	0.0088		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Manganese	0.030		0.0013		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Nickel	0.18		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Selenium	0.020		0.013		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Silver	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Thallium	ND		0.0025	D5	mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
Zinc	0.30		0.20		mg/L	5	08/06/2019 1100	08/07/2019 1301	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1630	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	90		10		mg/L	10	08/01/2019 1650	08/02/2019 1519	MH
Fluoride	ND		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2151	MH
Nitrogen, Nitrate (As N)	28		5.0	H3	mg/L	10	08/01/2019 1650	08/02/2019 1519	MH
Nitrogen, Nitrite (As N)	ND		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2151	MH
Sulfate	3500		2500		mg/L	500	08/01/2019 1650	08/08/2019 0338	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	9.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	UDCP Ro Brine
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	9.0		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	6600		0.50		µmhos/cm	5	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	5500		20		mg/L	1	08/06/2019 0819	08/09/2019 1620	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	16		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1446	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 40 RO/60 Desat
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-07		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness, Dissolved-[CALC]									
Hardness, Calcium/Magnesium (As CaCO3) Dissolved	1300		22		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	1300				mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
Nitrate + Nitrite Sum-Calculation									
Nitrate and Nitrite Sum	ND		0.10		mg/L	1	08/01/2019 1650	08/01/2019 2210	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Calcium	520		4.0		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Iron	ND		0.30		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Magnesium	ND		3.0		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Potassium	6.6		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
Sodium	290		5.0		mg/L	1	08/05/2019 1135	08/08/2019 1412	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00054		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Arsenic	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Barium	0.0076		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Beryllium	ND		0.00025		mg/L	1	08/05/2019 1135	08/06/2019 1153	MH
Cadmium	ND		0.00025		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Chromium	ND		0.00050	V1	mg/L	1	08/05/2019 1135	08/06/2019 1153	MH
Copper	0.020		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Lead	0.014		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Manganese	0.0023		0.0013		mg/L	5	08/05/2019 1135	08/05/2019 1725	MH
Nickel	0.045		0.0025		mg/L	5	08/05/2019 1135	08/05/2019 1725	MH
Selenium	0.00087	0.00025	0.0025	E4	mg/L	1	08/05/2019 1135	08/06/2019 1153	MH
Silver	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Thallium	ND		0.00050		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
Zinc	ND		0.040		mg/L	1	08/05/2019 1135	08/05/2019 1935	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	08/06/2019 1005	08/06/2019 1523	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 40 RO/60 Desat
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-07		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	08/08/2019 1220	08/12/2019 1327	MH
Calcium	540		4.0		mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
Iron	ND		0.30		mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
Magnesium	ND		3.0		mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
Potassium	7.0		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
Sodium	290		5.0		mg/L	1	08/08/2019 1220	08/12/2019 1326	MH
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Arsenic	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Barium	0.0093		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1256	MH
Beryllium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Cadmium	ND		0.00025		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Chromium	ND		0.0050	D5	mg/L	10	08/06/2019 1100	08/08/2019 1733	MH
Copper	0.022		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1256	MH
Lead	0.028		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1256	MH
Manganese	0.0024		0.0013		mg/L	5	08/06/2019 1100	08/07/2019 1256	MH
Nickel	0.044		0.0025		mg/L	5	08/06/2019 1100	08/07/2019 1256	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Silver	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Thallium	ND		0.00050		mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
Zinc	ND		0.040	V1	mg/L	1	08/06/2019 1100	08/08/2019 1509	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	08/07/2019 1130	08/07/2019 1632	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	1000		100		mg/L	100	08/01/2019 1650	08/08/2019 0357	EJ
Fluoride	0.53		0.50		mg/L	1	08/01/2019 1650	08/01/2019 2210	MH
Nitrogen, Nitrate (As N)	ND		0.50	H3	mg/L	1	08/01/2019 1650	08/01/2019 2210	MH
Nitrogen, Nitrite (As N)	ND		0.10	H3	mg/L	1	08/01/2019 1650	08/01/2019 2210	MH
Sulfate	640		500		mg/L	100	08/01/2019 1650	08/08/2019 0357	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	15		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	JA 40 RO/60 Desat
Project:	Arizona Minerals	**Collection Date/Time:**	07/30/2019 1000
Work Order:	19H0053	**Matrix:**	Wastewater
Lab Sample ID:	19H0053-07		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Alkalinity, Total (As CaCO3)	15		2.0		mg/L	1	08/06/2019 1437	08/06/2019 1645	CR
Specific Conductance-SM2510 B									
Conductivity	4800		0.50		µmhos/cm	5	08/12/2019 1055	08/12/2019 1215	LXM
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	3000		20		mg/L	1	08/06/2019 0819	08/14/2019 1420	CR
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	08/05/2019 0851	08/06/2019 1725	CR
Total Organic Carbon-SM5310 C									
Organic Carbon, Total	0.56		0.50		mg/L	1	08/08/2019 0845	08/08/2019 1506	MH

Turner Laboratories, Inc.

Date: 08/22/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Date Received: 08/01/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908037 - E 200.8 (5.4)										
Blank (1908037-BLK1)				Prepared & Analyzed: 08/05/2019						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (1908037-BS1)				Prepared & Analyzed: 08/05/2019						
Antimony	0.047	0.00050	mg/L	0.05000		95	85-115			
Arsenic	0.047	0.00050	mg/L	0.05000		93	85-115			
Barium	0.046	0.00050	mg/L	0.05000		93	85-115			
Beryllium	0.044	0.00025	mg/L	0.05000		88	85-115			
Cadmium	0.049	0.00025	mg/L	0.05000		97	85-115			
Chromium	0.051	0.00050	mg/L	0.05000		103	85-115			
Copper	0.051	0.00050	mg/L	0.05000		101	85-115			
Lead	0.050	0.00050	mg/L	0.05000		100	85-115			
Manganese	0.052	0.00025	mg/L	0.05000		104	85-115			
Nickel	0.053	0.00050	mg/L	0.05000		106	85-115			
Selenium	0.051	0.0025	mg/L	0.05000		102	85-115			
Silver	0.047	0.00050	mg/L	0.05000		94	85-115			
Thallium	0.049	0.00050	mg/L	0.05000		97	85-115			
Zinc	0.11	0.040	mg/L	0.1000		105	85-115			
LCS Dup (1908037-BSD1)				Prepared & Analyzed: 08/05/2019						
Antimony	0.049	0.00050	mg/L	0.05000		98	85-115	3	20	
Arsenic	0.048	0.00050	mg/L	0.05000		95	85-115	2	20	
Barium	0.049	0.00050	mg/L	0.05000		97	85-115	5	20	
Beryllium	0.045	0.00025	mg/L	0.05000		90	85-115	2	20	
Cadmium	0.048	0.00025	mg/L	0.05000		97	85-115	0.4	20	
Chromium	0.051	0.00050	mg/L	0.05000		102	85-115	0.7	20	
Copper	0.049	0.00050	mg/L	0.05000		98	85-115	3	20	
Lead	0.048	0.00050	mg/L	0.05000		97	85-115	3	20	
Manganese	0.052	0.00025	mg/L	0.05000		103	85-115	0.7	20	
Nickel	0.050	0.00050	mg/L	0.05000		101	85-115	6	20	
Selenium	0.054	0.0025	mg/L	0.05000		108	85-115	6	20	
Silver	0.048	0.00050	mg/L	0.05000		95	85-115	2	20	
Thallium	0.047	0.00050	mg/L	0.05000		95	85-115	3	20	
Zinc	0.10	0.040	mg/L	0.1000		103	85-115	2	20	

Turner Laboratories, Inc.

Date: 08/22/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Date Received: 08/01/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908037 - E 200.8 (5.4)										
Matrix Spike (1908037-MS1)		**Source: 19H0053-05**		Prepared & Analyzed: 08/05/2019						
Antimony	0.050	0.00050	mg/L	0.05000	0.000076	101	70-130			
Arsenic	0.050	0.00050	mg/L	0.05000	0.00011	100	70-130			
Barium	0.055	0.00050	mg/L	0.05000	0.00039	110	70-130			
Beryllium	0.049	0.00025	mg/L	0.05000	ND	98	70-130			
Cadmium	0.049	0.00025	mg/L	0.05000	ND	97	70-130			
Chromium	0.048	0.00050	mg/L	0.05000	0.00023	95	70-130			
Copper	0.049	0.00050	mg/L	0.05000	0.0051	88	70-130			
Lead	0.052	0.00050	mg/L	0.05000	0.00014	105	70-130			
Manganese	0.047	0.00025	mg/L	0.05000	0.00057	93	70-130			
Nickel	0.048	0.00050	mg/L	0.05000	0.0018	93	70-130			
Selenium	0.057	0.0025	mg/L	0.05000	0.00031	113	70-130			
Silver	0.047	0.00050	mg/L	0.05000	0.000035	94	70-130			
Thallium	0.051	0.00050	mg/L	0.05000	0.000073	103	70-130			
Zinc	0.10	0.040	mg/L	0.1000	0.0058	95	70-130			
Batch 1908038 - E 200.7 (4.4)										
Blank (1908038-BLK1)				Prepared & Analyzed: 08/08/2019						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (1908038-BS1)				Prepared & Analyzed: 08/08/2019						
Boron	0.96	0.10	mg/L	1.000		96	85-115			
Calcium	10	4.0	mg/L	10.00		103	85-115			
Iron	0.99	0.30	mg/L	1.000		99	85-115			
Magnesium	10	3.0	mg/L	10.00		100	85-115			
Potassium	9.9	5.0	mg/L	10.00		99	85-115			
Sodium	9.6	5.0	mg/L	10.00		96	85-115			
LCS Dup (1908038-BSD1)				Prepared & Analyzed: 08/08/2019						
Boron	0.95	0.10	mg/L	1.000		95	85-115	1	20	
Calcium	10	4.0	mg/L	10.00		103	85-115	0.008	20	
Iron	0.99	0.30	mg/L	1.000		99	85-115	0.5	20	
Magnesium	10	3.0	mg/L	10.00		101	85-115	0.3	20	
Potassium	10	5.0	mg/L	10.00		100	85-115	0.4	20	
Sodium	9.7	5.0	mg/L	10.00		97	85-115	1	20	
Matrix Spike (1908038-MS1)		**Source: 19H0053-03**		Prepared & Analyzed: 08/08/2019						
Boron	1.0	0.10	mg/L	1.000	0.061	98	70-130			
Calcium	290	4.0	mg/L	10.00	310	NR	70-130			M3
Iron	0.90	0.30	mg/L	1.000	0.0097	89	70-130			
Magnesium	15	3.0	mg/L	10.00	6.5	88	70-130			
Potassium	12	5.0	mg/L	10.00	2.2	94	70-130			
Sodium	50	5.0	mg/L	10.00	46	34	70-130			M3

Client:	Veolia Water Technologies
Project:	Arizona Minerals
Work Order:	19H0053
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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908038 - E 200.7 (4.4)										
Matrix Spike (1908038-MS2)		**Source: 19G0643-03**		Prepared & Analyzed: 08/08/2019						
Boron	1.8	0.10	mg/L	1.000	0.94	90	70-130			
Calcium	180	4.0	mg/L	10.00	170	75	70-130			
Iron	1.0	0.30	mg/L	1.000	0.019	98	70-130			
Magnesium	27	3.0	mg/L	10.00	17	98	70-130			
Potassium	35	5.0	mg/L	10.00	23	118	70-130			
Sodium	1300	50	mg/L	10.00	1300	NR	70-130			M3
Batch 1908054 - E 245.1										
Blank (1908054-BLK1)				Prepared & Analyzed: 08/06/2019						
Mercury	ND	0.0010	mg/L							
LCS (1908054-BS1)				Prepared & Analyzed: 08/06/2019						
Mercury	0.0048	0.0010	mg/L	0.005000		95	85-115			
LCS Dup (1908054-BSD1)				Prepared & Analyzed: 08/06/2019						
Mercury	0.0048	0.0010	mg/L	0.005000		97	85-115	2	20	
Matrix Spike (1908054-MS1)		**Source: 19H0053-06**		Prepared & Analyzed: 08/06/2019						
Mercury	0.0048	0.0010	mg/L	0.005000	0.00013	94	85-115			
Matrix Spike (1908054-MS2)		**Source: 19H0053-07**		Prepared & Analyzed: 08/06/2019						
Mercury	0.0051	0.0010	mg/L	0.005000	ND	102	85-115			
Matrix Spike Dup (1908054-MSD1)		**Source: 19H0053-06**		Prepared & Analyzed: 08/06/2019						
Mercury	0.0050	0.0010	mg/L	0.005000	0.00013	97	85-115	3	20	
Matrix Spike Dup (1908054-MSD2)		**Source: 19H0053-07**		Prepared & Analyzed: 08/06/2019						
Mercury	0.0052	0.0010	mg/L	0.005000	ND	103	85-115	1	20	
Batch 1908070 - E200.8 (5.4)										
Blank (1908070-BLK1)				Prepared: 08/06/2019 Analyzed: 08/07/2019						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							

Client: Veolia Water Technologies
Project: Arizona Minerals
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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908070 - E200.8 (5.4)										
LCS (1908070-BS1)				Prepared: 08/06/2019 Analyzed: 08/07/2019						
Antimony	0.049	0.00050	mg/L	0.05000		98	85-115			
Arsenic	0.050	0.00050	mg/L	0.05000		99	85-115			
Barium	0.049	0.00050	mg/L	0.05000		98	85-115			
Beryllium	0.052	0.00025	mg/L	0.05000		104	85-115			
Cadmium	0.050	0.00025	mg/L	0.05000		101	85-115			
Chromium	0.051	0.00050	mg/L	0.05000		103	85-115			
Copper	0.051	0.00050	mg/L	0.05000		102	85-115			
Lead	0.050	0.00050	mg/L	0.05000		101	85-115			
Manganese	0.052	0.00025	mg/L	0.05000		104	85-115			
Nickel	0.050	0.00050	mg/L	0.05000		100	85-115			
Selenium	0.049	0.0025	mg/L	0.05000		98	85-115			
Silver	0.051	0.00050	mg/L	0.05000		102	85-115			
Thallium	0.048	0.00050	mg/L	0.05000		95	85-115			
Zinc	0.10	0.040	mg/L	0.1000		103	85-115			
LCS Dup (1908070-BSD1)				Prepared: 08/06/2019 Analyzed: 08/07/2019						
Antimony	0.047	0.00050	mg/L	0.05000		95	85-115	3	20	
Arsenic	0.047	0.00050	mg/L	0.05000		94	85-115	5	20	
Barium	0.047	0.00050	mg/L	0.05000		94	85-115	4	20	
Beryllium	0.050	0.00025	mg/L	0.05000		99	85-115	4	20	
Cadmium	0.049	0.00025	mg/L	0.05000		97	85-115	4	20	
Chromium	0.050	0.00050	mg/L	0.05000		100	85-115	3	20	
Copper	0.049	0.00050	mg/L	0.05000		98	85-115	5	20	
Lead	0.048	0.00050	mg/L	0.05000		97	85-115	4	20	
Manganese	0.050	0.00025	mg/L	0.05000		100	85-115	4	20	
Nickel	0.048	0.00050	mg/L	0.05000		96	85-115	4	20	
Selenium	0.046	0.0025	mg/L	0.05000		91	85-115	8	20	
Silver	0.050	0.00050	mg/L	0.05000		100	85-115	3	20	
Thallium	0.045	0.00050	mg/L	0.05000		91	85-115	4	20	
Zinc	0.097	0.040	mg/L	0.1000		97	85-115	6	20	
Matrix Spike (1908070-MS1)	**Source: 19G0601-01RE1**			Prepared: 08/06/2019 Analyzed: 08/07/2019						
Antimony	0.047	0.0010	mg/L	0.05000	ND	93	70-130			
Arsenic	0.052	0.0010	mg/L	0.05000	0.0013	102	70-130			
Barium	0.079	0.0010	mg/L	0.05000	0.034	89	70-130			
Beryllium	0.045	0.00050	mg/L	0.05000	ND	91	70-130			
Cadmium	0.047	0.00050	mg/L	0.05000	ND	95	70-130			
Chromium	0.056	0.0010	mg/L	0.05000	0.0047	103	70-130			
Copper	0.049	0.0010	mg/L	0.05000	0.0030	91	70-130			
Lead	0.049	0.0010	mg/L	0.05000	ND	99	70-130			
Manganese	0.051	0.00050	mg/L	0.05000	0.0013	100	70-130			
Nickel	0.059	0.0010	mg/L	0.05000	0.014	89	70-130			
Selenium	0.052	0.0050	mg/L	0.05000	0.0015	102	70-130			
Silver	0.042	0.0010	mg/L	0.05000	0.00012	83	70-130			
Thallium	0.046	0.0010	mg/L	0.05000	0.00022	91	70-130			
Zinc	0.098	0.080	mg/L	0.1000	ND	98	70-130			
Batch 1908082 - E245.1										

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 19H0053
Date Received: 08/01/2019

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908082 - E245.1										
Blank (1908082-BLK1)				Prepared & Analyzed: 08/07/2019						
Mercury	ND	0.0010	mg/L							
LCS (1908082-BS1)				Prepared & Analyzed: 08/07/2019						
Mercury	0.0051	0.0010	mg/L	0.005000		102	85-115			
LCS Dup (1908082-BSD1)				Prepared & Analyzed: 08/07/2019						
Mercury	0.0051	0.0010	mg/L	0.005000		103	85-115	0.03	20	
Matrix Spike (1908082-MS1)	**Source: 19G0758-01RE1**			Prepared & Analyzed: 08/07/2019						
Mercury	0.0051	0.0010	mg/L	0.005000	ND	103	70-130			
Matrix Spike (1908082-MS2)	**Source: 19H0106-01**			Prepared & Analyzed: 08/07/2019						
Mercury	0.0050	0.0010	mg/L	0.005000	ND	99	70-130			
Matrix Spike Dup (1908082-MSD1)	**Source: 19G0758-01RE1**			Prepared & Analyzed: 08/07/2019						
Mercury	0.0052	0.0010	mg/L	0.005000	ND	104	70-130	1	20	
Matrix Spike Dup (1908082-MSD2)	**Source: 19H0106-01**			Prepared & Analyzed: 08/07/2019						
Mercury	0.0049	0.0010	mg/L	0.005000	ND	98	70-130	1	20	
Batch 1908126 - E200.7 (4.4)										
Blank (1908126-BLK1)				Prepared: 08/09/2019 Analyzed: 08/12/2019						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (1908126-BS1)				Prepared: 08/09/2019 Analyzed: 08/12/2019						
Boron	1.1	0.10	mg/L	1.000		105	85-115			
Calcium	10	4.0	mg/L	10.00		102	85-115			
Iron	1.0	0.30	mg/L	1.000		101	85-115			
Magnesium	10	3.0	mg/L	10.00		101	85-115			
Potassium	10	5.0	mg/L	10.00		101	85-115			
Sodium	9.7	5.0	mg/L	10.00		97	85-115			
LCS Dup (1908126-BSD1)				Prepared: 08/09/2019 Analyzed: 08/12/2019						
Boron	1.1	0.10	mg/L	1.000		106	85-115	0.7	20	
Calcium	10	4.0	mg/L	10.00		103	85-115	1	20	
Iron	1.0	0.30	mg/L	1.000		101	85-115	0.4	20	
Magnesium	10	3.0	mg/L	10.00		101	85-115	0.7	20	
Potassium	10	5.0	mg/L	10.00		103	85-115	1	20	
Sodium	9.8	5.0	mg/L	10.00		98	85-115	1	20	

Turner Laboratories, Inc.

Date: 08/22/2019

Client: Veolia Water Technologies
Project: Arizona Minerals
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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908126 - E200.7 (4.4)										
Matrix Spike (1908126-MS1)	**Source: 19G0699-02**			Prepared: 08/09/2019 Analyzed: 08/12/2019						
Boron	1.4	0.10	mg/L	1.000	0.39	103	70-130			
Calcium	200	4.0	mg/L	10.00	210	NR	70-130			M3
Iron	1.5	0.30	mg/L	1.000	0.54	92	70-130			
Magnesium	49	3.0	mg/L	10.00	41	77	70-130			
Potassium	51	5.0	mg/L	10.00	43	81	70-130			
Sodium	210	5.0	mg/L	10.00	220	NR	70-130			M3
Matrix Spike (1908126-MS2)	**Source: 19G0734-01**			Prepared: 08/09/2019 Analyzed: 08/12/2019						
Boron	1.6	0.10	mg/L	1.000	0.50	109	70-130			
Calcium	66	4.0	mg/L	10.00	55	103	70-130			
Iron	1.2	0.30	mg/L	1.000	0.21	103	70-130			
Magnesium	12	3.0	mg/L	10.00	2.2	102	70-130			
Potassium	130	5.0	mg/L	10.00	120	94	70-130			
Sodium	210	5.0	mg/L	10.00	200	37	70-130			M3

Client: Veolia Water Technologies
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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908035 - SM2540 D										
Duplicate (1908035-DUP1)		**Source: 19G0750-02**		Prepared: 08/05/2019 Analyzed: 08/06/2019						
Total Suspended Solids	2.0	10	mg/L		3.0			40	5	Q9
Duplicate (1908035-DUP2)		**Source: 19H0039-01**		Prepared: 08/05/2019 Analyzed: 08/06/2019						
Total Suspended Solids	17	10	mg/L		17			0	5	Q9
Batch 1908052 - SM2540 C										
Duplicate (1908052-DUP1)		**Source: 19H0038-01**		Prepared: 08/06/2019 Analyzed: 08/09/2019						
Total Dissolved Solids (Residue, Filterable)	800	20	mg/L		840			4	5	
Duplicate (1908052-DUP2)		**Source: 19H0053-05**		Prepared: 08/06/2019 Analyzed: 08/08/2019						
Total Dissolved Solids (Residue, Filterable)	55	20	mg/L		55			0	5	
Batch 1908072 - SM2320B										
Blank (1908072-BLK1)				Prepared & Analyzed: 08/06/2019						
Alkalinity, Bicarbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Total (As CaCO3)	ND	2.0	mg/L							
LCS (1908072-BS1)				Prepared & Analyzed: 08/06/2019						
Alkalinity, Total (As CaCO3)	230	2.0	mg/L	250.0		94	90-110			
LCS Dup (1908072-BSD1)				Prepared & Analyzed: 08/06/2019						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		96	90-110	3	10	
Matrix Spike (1908072-MS1)		**Source: 19G0758-01**		Prepared & Analyzed: 08/06/2019						
Alkalinity, Total (As CaCO3)	340	2.0	mg/L	250.0	110	93	70-130			
Matrix Spike Dup (1908072-MSD1)		**Source: 19G0758-01**		Prepared & Analyzed: 08/06/2019						
Alkalinity, Total (As CaCO3)	340	2.0	mg/L	250.0	110	93	70-130	0	10	
Batch 1908099 - SM5310 C										
Blank (1908099-BLK1)				Prepared & Analyzed: 08/08/2019						
Organic Carbon, Total	ND	0.50	mg/L							
LCS (1908099-BS1)				Prepared & Analyzed: 08/08/2019						
Organic Carbon, Total	9.9	0.50	mg/L	10.00		99	90-110			
LCS Dup (1908099-BSD1)				Prepared & Analyzed: 08/08/2019						
Organic Carbon, Total	9.8	0.50	mg/L	10.00		98	90-110	0.5	10	
Matrix Spike (1908099-MS1)		**Source: 19H0011-01**		Prepared & Analyzed: 08/08/2019						
Organic Carbon, Total	11		mg/L	10.00	1.3	98	80-120			
Matrix Spike Dup (1908099-MSD1)		**Source: 19H0011-01**		Prepared & Analyzed: 08/08/2019						
Organic Carbon, Total	11		mg/L	10.00	1.3	99	80-120	0.8	15	
Batch 1908142 - SM2510 B										
LCS (1908142-BS1)				Prepared & Analyzed: 08/12/2019						
Conductivity	150	0.10	µmhos/cm	141.2		106	0-200			

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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908142 - SM2510 B										
LCS Dup (1908142-BSD1)				Prepared & Analyzed: 08/12/2019						
Conductivity	150	0.10	µmhos/cm	141.2		104	0-200	1	200	
Duplicate (1908142-DUP1)		**Source: 19H0053-07**		Prepared & Analyzed: 08/12/2019						
Conductivity	4800	0.50	µmhos/cm		4800			0.2	10	

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QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 1908004 - E300.0 (2.1)										
Blank (1908004-BLK1)				Prepared & Analyzed: 08/01/2019						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Nitrogen, Nitrate (As N)	ND	0.50	mg/L							
Nitrogen, Nitrite (As N)	ND	0.10	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (1908004-BS1)				Prepared & Analyzed: 08/01/2019						
Chloride	12	1.0	mg/L	12.50		99	90-110			
Fluoride	2.1	0.50	mg/L	2.000		103	90-110			
Nitrogen, Nitrate (As N)	5.0	0.50	mg/L	5.000		100	90-110			
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500		102	90-110			
Sulfate	13	5.0	mg/L	12.50		103	90-110			
LCS Dup (1908004-BSD1)				Prepared & Analyzed: 08/01/2019						
Chloride	12	1.0	mg/L	12.50		99	90-110	0.4	10	
Fluoride	2.0	0.50	mg/L	2.000		102	90-110	0.4	10	
Nitrogen, Nitrate (As N)	5.0	0.50	mg/L	5.000		100	90-110	0.4	10	
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500		102	90-110	0.2	10	
Sulfate	13	5.0	mg/L	12.50		102	90-110	0.2	10	
Matrix Spike (1908004-MS1)	**Source: 19H0030-01**			Prepared & Analyzed: 08/01/2019						
Fluoride	2.0	0.50	mg/L	2.000	0.12	96	80-120			
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500	ND	100	80-120			
Sulfate	35	5.0	mg/L	12.50	24	90	80-120			
Matrix Spike (1908004-MS2)	**Source: 19H0030-01**			Prepared & Analyzed: 08/01/2019						
Chloride	20		mg/L	12.50	5.2	118	80-120			
Nitrogen, Nitrate (As N)	7.5		mg/L	5.000	1.6	119	80-120			
Matrix Spike (1908004-MS3)	**Source: 19H0041-01**			Prepared & Analyzed: 08/01/2019						
Fluoride	2.4	0.50	mg/L	2.000	0.44	98	80-120			
Nitrogen, Nitrate (As N)	5.0	0.50	mg/L	5.000	0.22	96	80-120			
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500	ND	101	80-120			
Sulfate	35	5.0	mg/L	12.50	23	95	80-120			
Matrix Spike Dup (1908004-MSD1)	**Source: 19H0030-01**			Prepared & Analyzed: 08/01/2019						
Fluoride	2.0	0.50	mg/L	2.000	0.12	94	80-120	2	10	
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500	ND	99	80-120	1	10	
Sulfate	35	5.0	mg/L	12.50	24	93	80-120	1	10	
Matrix Spike Dup (1908004-MSD2)	**Source: 19H0030-01**			Prepared & Analyzed: 08/01/2019						
Chloride	19		mg/L	12.50	5.2	114	80-120	3	10	
Nitrogen, Nitrate (As N)	7.3		mg/L	5.000	1.6	115	80-120	3	10	
Matrix Spike Dup (1908004-MSD3)	**Source: 19H0041-01**			Prepared & Analyzed: 08/01/2019						
Fluoride	2.4	0.50	mg/L	2.000	0.44	99	80-120	0.7	10	
Nitrogen, Nitrate (As N)	5.0	0.50	mg/L	5.000	0.22	96	80-120	0.2	10	
Nitrogen, Nitrite (As N)	2.5	0.10	mg/L	2.500	ND	101	80-120	0.2	10	
Sulfate	35	5.0	mg/L	12.50	23	96	80-120	0.1	10	

2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

TURNER LABORATORIES INC.

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 19H0053 DATE 7/30/19 PAGE 1 OF 1

PROJECT NAME South 32 #

CONTACT NAME Michael Taylor

COMPANY NAME Veolia Water Technologies

ADDRESS 6981 N. Park Dr.

ZIP 08109 PHONE 856 438-1765 EMAIL michael.Taylor@veolia...

SAMPLER'S SIGNATURE [signature]

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Base Neutrals 625/8270 ☐ / Acids ☒	Volatile Organics ☐ 624 ☐ 524.2	TTHMS ☐ / ☐ 8260 / HAA5 ☐	☒ Chloride / ☒ Sulfate / ☒ Resistivity	NO_2 ☒ / NO_3 ☒ / TKN ☐	☐ TPH / 1664 ☐ Oil & Grease	TCLP Analysis: VOA ☐ / Semi-VOA ☐ / Pest. ☐	Metals: TCLP ☐ / Dissolved ☒	Metals: Total ☒ / RCRA8 ☐	Cyanide: Total ☒ / Amen. ☐ / WAD ☒	SDWA-INORGANICS PRIMARY ☐ / SECONDARY ☐	Coliform: MPN ☐ / PIA ☐	pH ☐ / Cr_6 ☐ / Cl_2 ☐ / Fecal ☐	COD ☐ / TSS ☒ / ☐ Turb	BOD ☐			
UDCP 100	7/30	10:00		WW	6	X			X	X			X	X	X				X				
UDCP 75/RO 25	↓	↓		↓	6	X			X	X			X	X	X				X				
UDCP 50/RO 50					6	X			X	X			X	X	X				X				
UDCP 25/RO 75					6	X			X	X			X	X	X				X				
UDCP 100 RO					6	X			X	X			X	X	X				X				
UDCP RO Brine					5	X			X	X			X	X	X				X				
JA 40 RO/60 Desat					6	X			X	X			X	X	X				X				

1. RELINQUISHED BY:
[signature]
Signature
Michael Taylor
Printed Name
Veolia
Firm
7/30/19 11:00 AM
Date/Time

2. RECEIVED BY:
Fedex
Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx. 10 days)*
___ Next Day ___ 2 Day ___ 5 Day*
___ Email Preliminary Results
* Working Days

REPORT REQUIREMENTS:
X I. Routine Report
___ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
___ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ___ Y ___ N
P.O. #
Bill to:

SAMPLE RECEIPT:
Total Containers 41
Temperature 26.3
☐ Wet Ice
☒ Ambient
☐ Blue Ice

3. RELINQUISHED BY:
Fedex
Signature
Printed Name
Firm
Date/Time

4. RECEIVED BY:
[signature]
Signature
Joseph Catalan
Printed Name
TURNER LABORATORIES, INC.
Firm
8/1/19 1448
Date/Time

* LEGEND
SAMPLE MATRIX
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

Compliance Analysis: ☐ Yes ☐ No
ADEQ Forms: ☐ Yes ☐ No
Mail ADEQ Forms: ☐ Yes ☐ No

Custody Seals ☐
Container Intact ☒
COC / Labels Agree ☒

Preservation Confirmation ☒
Appropriate Head Space ☒
Received Within Hold Time ☒

SPECIAL INSTRUCTIONS/COMMENTS:

Attachment A
Sample Analysis Program

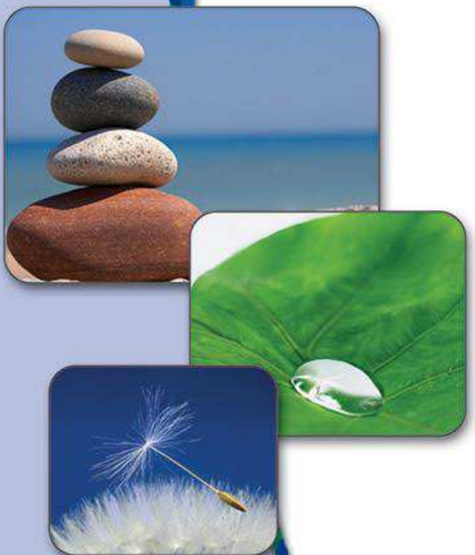
Analyte	Total	Dissolved	Other
Metals			
Antimony	X	X	
Arsenic	X	X	
Barium	X	X	
Beryllium	X	X	
Boron	X	X	
Cadmium	X	X	
Chromium, total	X	X	
Copper	X	X	
Iron	X	X	
Lead	X	X	
Manganese		X	
Mercury	X	X	
Nickel	X	X	
Selenium	X	X	
Silver	X	X	
Thallium	X	X	
Zinc	X	X	
Major Cations			
Hardness ($CaCO_3$)	X	X	
Calcium	X	X	
Magnesium	X	X	
Potassium	X	X	
Sodium	X	X	
Major Anions			
Total Alkalinity	X		
Acidity	X		
Fluoride	X	X	
Nitrate – Nitrite as N	X	X	
Nitrite - N	X	X	
Nitrate – N	X	X	
Sulfate	X		
Chloride	X		
Parameters			
Total Dissolved Solids		X	
Total Suspended Solids	X		
Total Organic Carbon	X		
Conductivity	X		

RadChem			
Gross Alpha Particle Activity	X	X	X
Radium 226 + Radium 228	X	X	X
Cyanide			
Free CN	X	X	
WAD CN	X	X	

eurofins

Environment Testing
TestAmerica

1 2 3 4 5 6 7 8 9 10 11 12 13 14



ANALYTICAL REPORT

Eurofins TestAmerica, Phoenix
4625 East Cotton Ctr Blvd
Suite 189
Phoenix, AZ 85040
Tel: (602)437-3340

Laboratory Job ID: 550-127548-1
Client Project/Site: 19H0053

For:
Turner Laboratories, Inc.
2445 North Coyote Drive
Suite 104
Tucson, Arizona 85745

Attn: Elizabeth Kasik

Ken Baker

Authorized for release by:
8/15/2019 2:43:03 PM

Ken Baker, Project Manager II
(602)659-7624
ken.baker@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Client: Turner Laboratories, Inc. Job ID: 550-127548-1
Project/Site: 19H0053

Qualifiers

General Chemistry

Qualifier	Qualifier Description
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 550-127548-1

Laboratory: Eurofins TestAmerica, Phoenix

Narrative

Job Narrative
550-127548-1

Comments
No additional comments.

Receipt
The samples were received on 8/8/2019 12:15 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 5.5º C.

General Chemistry
Method(s) SM 4500 CN I: Total cyanide analysis was performed for sample 19H0053-01 (550-127548-1), 19H0053-02 (550-127548-2), 19H0053-03 (550-127548-3), 19H0053-04 (550-127548-4), 19H0053-05 (550-127548-5), 19H0053-06 (550-127548-6) and 19H0053-07 (550-127548-7), and the result obtained was a non-detect. As such, the weak acid dissociable cyanide analysis was not performed, and the result for this analyte was reported as non-detect.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: Turner Laboratories, Inc.
Project/Site: 19H0053

Job ID: 550-127548-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
550-127548-1	19H0053-01	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-2	19H0053-02	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-3	19H0053-03	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-4	19H0053-04	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-5	19H0053-05	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-6	19H0053-06	Water	07/30/19 10:00	08/08/19 12:15	
550-127548-7	19H0053-07	Water	07/30/19 10:00	08/08/19 12:15	

Detection Summary

Client: Turner Laboratories, Inc. Job ID: 550-127548-1
Project/Site: 19H0053

Client Sample ID: 19H0053-01 Lab Sample ID: 550-127548-1

No Detections.

Client Sample ID: 19H0053-02 Lab Sample ID: 550-127548-2

No Detections.

Client Sample ID: 19H0053-03 Lab Sample ID: 550-127548-3

No Detections.

Client Sample ID: 19H0053-04 Lab Sample ID: 550-127548-4

No Detections.

Client Sample ID: 19H0053-05 Lab Sample ID: 550-127548-5

No Detections.

Client Sample ID: 19H0053-06 Lab Sample ID: 550-127548-6

No Detections.

Client Sample ID: 19H0053-07 Lab Sample ID: 550-127548-7

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Turner Laboratories, Inc.   Job ID: 550-127548-1
Project/Site: 19H0053

Client Sample ID: 19H0053-01   Lab Sample ID: 550-127548-1
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:23	08/13/19 12:15	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample ID: 19H0053-02   Lab Sample ID: 550-127548-2
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:23	08/13/19 12:15	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample ID: 19H0053-03   Lab Sample ID: 550-127548-3
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:23	08/13/19 12:15	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample ID: 19H0053-04   Lab Sample ID: 550-127548-4
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:23	08/13/19 12:15	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample ID: 19H0053-05   Lab Sample ID: 550-127548-5
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:24	08/13/19 12:16	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample ID: 19H0053-06   Lab Sample ID: 550-127548-6
Date Collected: 07/30/19 10:00   **Matrix: Water**
Date Received: 08/08/19 12:15

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:24	08/13/19 12:16	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Client Sample Results

Client: Turner Laboratories, Inc.
Project/Site: 19H0053

Job ID: 550-127548-1

Client Sample ID: 19H0053-07
Date Collected: 07/30/19 10:00
Date Received: 08/08/19 12:15

Lab Sample ID: 550-127548-7
Matrix: Water

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:24	08/13/19 12:16	1
Cyanide, Weak Acid Dissociable	ND	E8	0.025	0.013	mg/L		08/12/19 12:25	08/13/19 12:28	1

Method: SM 4500 CN E - Cyanide, Total (Low Level)

Lab Sample ID: MB 440-562649/1-A
Matrix: Water
Analysis Batch: 562863
Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 562649

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	ND	E8	0.0050	0.0025	mg/L		08/12/19 14:23	08/13/19 12:15	1

Lab Sample ID: LCS 440-562649/2-A
Matrix: Water
Analysis Batch: 562863
Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 562649

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyanide, Total	0.100	0.0978		mg/L		98	80 - 120

Lab Sample ID: LCSD 440-562649/3-A
Matrix: Water
Analysis Batch: 562863
Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 562649

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cyanide, Total	0.100	0.0952		mg/L		95	80 - 120	3	20

Lab Sample ID: 550-127419-C-2-B MS
Matrix: Water
Analysis Batch: 562863
Client Sample ID: Matrix Spike
Prep Type: Total/NA
Prep Batch: 562649

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyanide, Total	0.0040	E4	0.100	0.0982		mg/L		94	75 - 125

Lab Sample ID: 550-127419-C-2-C MSD
Matrix: Water
Analysis Batch: 562863
Client Sample ID: Matrix Spike Duplicate
Prep Type: Total/NA
Prep Batch: 562649

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cyanide, Total	0.0040	E4	0.100	0.106		mg/L		102	75 - 125	8	20

Client: Turner Laboratories, Inc.
Project/Site: 19H0053

Job ID: 550-127548-1

General Chemistry

Prep Batch: 562649

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-127548-1	19H0053-01	Total/NA	Water	Distill/CN	
550-127548-2	19H0053-02	Total/NA	Water	Distill/CN	
550-127548-3	19H0053-03	Total/NA	Water	Distill/CN	
550-127548-4	19H0053-04	Total/NA	Water	Distill/CN	
550-127548-5	19H0053-05	Total/NA	Water	Distill/CN	
550-127548-6	19H0053-06	Total/NA	Water	Distill/CN	
550-127548-7	19H0053-07	Total/NA	Water	Distill/CN	
MB 440-562649/1-A	Method Blank	Total/NA	Water	Distill/CN	
LCS 440-562649/2-A	Lab Control Sample	Total/NA	Water	Distill/CN	
LCSD 440-562649/3-A	Lab Control Sample Dup	Total/NA	Water	Distill/CN	
550-127419-C-2-B MS	Matrix Spike	Total/NA	Water	Distill/CN	
550-127419-C-2-C MSD	Matrix Spike Duplicate	Total/NA	Water	Distill/CN	

Analysis Batch: 562863

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-127548-1	19H0053-01	Total/NA	Water	SM 4500 CN E	562649
550-127548-2	19H0053-02	Total/NA	Water	SM 4500 CN E	562649
550-127548-3	19H0053-03	Total/NA	Water	SM 4500 CN E	562649
550-127548-4	19H0053-04	Total/NA	Water	SM 4500 CN E	562649
550-127548-5	19H0053-05	Total/NA	Water	SM 4500 CN E	562649
550-127548-6	19H0053-06	Total/NA	Water	SM 4500 CN E	562649
550-127548-7	19H0053-07	Total/NA	Water	SM 4500 CN E	562649
MB 440-562649/1-A	Method Blank	Total/NA	Water	SM 4500 CN E	562649
LCS 440-562649/2-A	Lab Control Sample	Total/NA	Water	SM 4500 CN E	562649
LCSD 440-562649/3-A	Lab Control Sample Dup	Total/NA	Water	SM 4500 CN E	562649
550-127419-C-2-B MS	Matrix Spike	Total/NA	Water	SM 4500 CN E	562649
550-127419-C-2-C MSD	Matrix Spike Duplicate	Total/NA	Water	SM 4500 CN E	562649

Prep Batch: 562867

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-127548-1	19H0053-01	Total/NA	Water	SM 4500 CN I	
550-127548-2	19H0053-02	Total/NA	Water	SM 4500 CN I	
550-127548-3	19H0053-03	Total/NA	Water	SM 4500 CN I	
550-127548-4	19H0053-04	Total/NA	Water	SM 4500 CN I	
550-127548-5	19H0053-05	Total/NA	Water	SM 4500 CN I	
550-127548-6	19H0053-06	Total/NA	Water	SM 4500 CN I	
550-127548-7	19H0053-07	Total/NA	Water	SM 4500 CN I	

Analysis Batch: 562869

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
550-127548-1	19H0053-01	Total/NA	Water	SM 4500 CN I	562867
550-127548-2	19H0053-02	Total/NA	Water	SM 4500 CN I	562867
550-127548-3	19H0053-03	Total/NA	Water	SM 4500 CN I	562867
550-127548-4	19H0053-04	Total/NA	Water	SM 4500 CN I	562867
550-127548-5	19H0053-05	Total/NA	Water	SM 4500 CN I	562867
550-127548-6	19H0053-06	Total/NA	Water	SM 4500 CN I	562867
550-127548-7	19H0053-07	Total/NA	Water	SM 4500 CN I	562867

Lab Chronicle

Client: Turner Laboratories, Inc. Job ID: 550-127548-1
Project/Site: 19H0053

Client Sample ID: 19H0053-01 Lab Sample ID: 550-127548-1
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:23	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:15	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Client Sample ID: 19H0053-02 Lab Sample ID: 550-127548-2
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:23	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:15	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Client Sample ID: 19H0053-03 Lab Sample ID: 550-127548-3
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:23	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:15	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Client Sample ID: 19H0053-04 Lab Sample ID: 550-127548-4
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:23	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:15	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Client Sample ID: 19H0053-05 Lab Sample ID: 550-127548-5
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:24	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:16	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Lab Chronicle

Client: Turner Laboratories, Inc. Job ID: 550-127548-1
Project/Site: 19H0053

Client Sample ID: 19H0053-06 Lab Sample ID: 550-127548-6
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:24	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:16	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Client Sample ID: 19H0053-07 Lab Sample ID: 550-127548-7
Date Collected: 07/30/19 10:00 **Matrix: Water**
Date Received: 08/08/19 12:15

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Distill/CN			562649	08/12/19 14:24	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN E		1	562863	08/13/19 12:16	KMY	TAL IRV
Total/NA	Prep	SM 4500 CN I			562867	08/12/19 12:25	KMY	TAL IRV
Total/NA	Analysis	SM 4500 CN I		1	562869	08/13/19 12:28	KMY	TAL IRV

Laboratory References:
TAL IRV = Eurofins TestAmerica, Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

Accreditation/Certification Summary

Client: Turner Laboratories, Inc.
Job ID: 550-127548-1
Project/Site: 19H0053

Laboratory: Eurofins TestAmerica, Phoenix

The accreditations/certifications listed below are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
Arizona	State Program	9	AZ0728	06-09-20

Laboratory: Eurofins TestAmerica, Irvine

Unless otherwise noted, all analytes for this laboratory were covered under each accreditation/certification below.

Authority	Program	EPA Region	Identification Number	Expiration Date
Arizona	State Program	9	AZ0671	10-14-19

The following analytes are included in this report, but the laboratory is not certified by the governing authority. This list may include analytes for which the agency does not offer certification.

Analysis Method	Prep Method	Matrix	Analyte
SM 4500 CN I	SM 4500 CN I	Water	Cyanide, Weak Acid Dissociable

Method Summary

Client: Turner Laboratories, Inc.
Project/Site: 19H0053

Job ID: 550-127548-1

Method	Method Description	Protocol	Laboratory
SM 4500 CN E	Cyanide, Total (Low Level)	SM	TAL IRV
SM 4500 CN I	Cyanide, Weak Acid Dissociable	SM	TAL IRV
Distill/CN	Distillation, Cyanide	None	TAL IRV
SM 4500 CN I	Cyanide, Distillation for Weak Acid Dissociable	SM	TAL IRV

Protocol References:

None = None

SM = "Standard Methods For The Examination Of Water And Wastewater"

Laboratory References:

TAL IRV = Eurofins TestAmerica, Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

127548

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19H0053

SENDING LABORATORY:	**RECEIVING LABORATORY:**
Turner Laboratories, Inc.	TestAmerica Phoenix
2445 N. Coyote Drive, Ste #104	4625 East Cotton Center Boulevard Suite 189
Tucson, AZ 85745	Phoenix, AZ 85540
Phone: 520.882.5880	Phone :(602) 437-3340
Fax: 520.882.9788	Fax:
Project Manager: Elizabeth Kasik	Please CC Kevin Brim Kbrim@turnerlabs.com

Analysis	Expires	Laboratory ID	Comments
-01			
Sample ID: 19H0053-01 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide	08/13/2019 10:00		
Cyanide WAD	08/13/2019 10:00		
Containers Supplied:			
-02			
Sample ID: 19H0053-02 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide	08/13/2019 10:00		
Cyanide WAD	08/13/2019 10:00		
Containers Supplied:			
-03			
Sample ID: 19H0053-03 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide WAD	08/13/2019 10:00		
Cyanide	08/13/2019 10:00		
Containers Supplied:			
-04			
Sample ID: 19H0053-04 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide WAD	08/13/2019 10:00		
Cyanide	08/13/2019 10:00		
Containers Supplied:			
-05			
Sample ID: 19H0053-05 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide WAD	08/13/2019 10:00		
Cyanide	08/13/2019 10:00		
Containers Supplied:			

550-127548 Chain of Custody

Released By	Date		Received By	Date	
[signature]	8/7/19	16:00	UPS	8/7/19	16:00
Released By	Date		Received By	Date	
			TAPHX	8-8-19	1213

SUBCONTRACT ORDER

Turner Laboratories, Inc.

127548

19H0053

Analysis	**Expires**	**Laboratory ID**	**Comments**
-06			
Sample ID: 19H0053-06 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide WAD	08/13/2019 10:00		
Cyanide	08/13/2019 10:00		
Containers Supplied:			
-07			
Sample ID: 19H0053-07 Non-Potable Wa Sampled:07/30/2019 10:00			
Cyanide WAD	08/13/2019 10:00		
Cyanide	08/13/2019 10:00		
Containers Supplied:			

5.5°C

UPS

GRC

Released By	8/7/19 Date	16:00	Received By UPS	8/7/19 Date	16:00
Released By	Date		Received By TAHK	8-8-19 Date	1215

Eurofins TestAmerica, Phoenix
4625 East Cotton Ctr Blvd Suite 189
Phoenix, AZ 85040
Phone. 602-437-3340 Fax 602-454-9303

Chain of Custody Record

eurofins

Client Information (Sub Contract Lab)	Sampler	Lab PM: Baker, Ken	Carrier Tracking No(s)	COC No 550-25385 1
Client Contact: Shipping/Receiving	Phone	E-Mail: ken.baker@testamericainc com	State of Origin: Arizona	Page: Page 1 of 1
Company: TestAmerica Laboratories, Inc		Accreditations Required (See note): State Program - Arizona		Job #: 550-127548-1
Address: 17461 Derian Ave, Suite 100,	Due Date Requested: 8/15/2019			
City: Irvine	TAT Requested (days):			
State, Zip: CA, 92614-5817				
Phone: 949-261-1022(Tel) 949-260-3297(Fax)	PO #			
Email	WO #			
Project Name: 19H0053	Project #: 55003219			
Site	SSOW#			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2O3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - pH 4-5, Z - other (specify)
Other:

Sample Identification - Client ID (Lab ID)	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	4500_CN_I/4500_CN_I_Prep Cyanide, Weak Acid Dissociable	4500_CN_E_LL/Distill_CN LL Cyanide	Total Number of containers	Special Instructions/Note:
			Preservation Code:							
19H0053-01 (550-127548-1)	7/30/19	10:00 Arizona		Water			X	X	1	, AZ Sample
19H0053-02 (550-127548-2)	7/30/19	10:00 Arizona		Water			X	X	1	, AZ Sample
19H0053-03 (550-127548-3)	7/30/19	10:00 Arizona		Water			X	X	1	, AZ Sample
19H0053-04 (550-127548-4)	7/30/19	10 00 Arizona		Water			X	X	1	, AZ Sample
19H0053-05 (550-127548-5)	7/30/19	10 00 Arizona		Water			X	X	1	, AZ Sample
19H0053-06 (550-127548-6)	7/30/19	10 00 Arizona		Water			X	X	1	, AZ Sample
19H0053-07 (550-127548-7)	7/30/19	10 00 Arizona		Water			X	X	1	, AZ Sample

Note Since laboratory accreditations are subject to change, TestAmerica Laboratories, Inc places the ownership of method, analyte & accreditation compliance upon out subcontract laboratories This sample shipment is forwarded under chain-of-custody If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/tests/matrix being analyzed, the samples must be shipped back to the TestAmerica laboratory or other instructions will be provided Any changes to accreditation status should be brought to TestAmerica Laboratories, Inc attention immediately If all requested accreditations are current to date, return the signed Chain of Custody attesting to said compliance to TestAmerica Laboratories, Inc

Possible Hazard Identification
Unconfirmed
Deliverable Requested I, II, III, IV, Other (specify) Primary Deliverable Rank 2

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For* ____ *Months*
Special Instructions/QC Requirements

Empty Kit Relinquished by	Date	Time.	Method of Shipment

Relinquished by	Date/Time	Company	Received by	Date/Time	Company
[signature] 08-08-19	15:40	TA Phx	FedEx		
Relinquished by	Date/Time	Company	Received by	Date/Time	Company
Relinquished by	Date/Time	Company	Received by [signature]	8/9/19 1100	TA IRV

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s)°C and Other Remarks 1 / 1.2 88 4.2/4.4

Ver 01/16/2019

Login Sample Receipt Checklist

Client: Turner Laboratories, Inc. Job Number: 550-127548-1

Login Number: 127548 **List Source: Eurofins TestAmerica, Phoenix**
List Number: 1
Creator: Gravlin, Andrea

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	False	Check done at department level as required.

Login Sample Receipt Checklist

Client: Turner Laboratories, Inc. Job Number: 550-127548-1

Login Number: 127548 **List Source: Eurofins TestAmerica, Irvine**
List Number: 2 **List Creation: 08/09/19 04:54 PM**
Creator: Ornelas, Olga

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	Not Present
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	N/A	Received project as a subcontract.
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

1 2 3 4 5 6 7 8 9 10 11 12 13 14

Radiation Safety Engineering, Inc.
3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121 (480) 897-9459
Website: www.radsafe.com FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-01	< 0.7	< 0.5	0.9 ± 0.3	0.9 ± 0.3

Date of Analysis	8/19/2019	8/9/2019	8/9/2019	8/9/2019

Robert L. Metzger, Ph.D., C.H.P. 8/22/2019
Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.
3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121
Website: www.radsafe.com
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FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-02	< 0.7	< 0.5	< 0.7	< 0.7

Date of Analysis	8/12/2019	8/9/2019	8/9/2019	8/9/2019

8/22/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.
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Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-03	4.1 ± 0.6	< 0.5	< 0.7	< 0.7

Date of Analysis	8/12/2019	8/9/2019	8/9/2019	8/9/2019

Robert L. Metzger, Ph.D., C.H.P. — 8/22/2019 Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.
3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121
Website: www.radsafe.com
(480) 897-9459
FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-04	1.3 ± 0.4	< 0.4	< 0.7	< 0.7

Date of Analysis	8/12/2019	8/9/2019	8/9/2019	8/9/2019

Robert L. Metzger, Ph.D., C.H.P. 8/22/2019
Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.

3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121
Website: www.radsafe.com
(480) 897-9459
FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-05	< 0.7	< 0.4	< 0.7	< 0.7

Date of Analysis	8/12/2019	8/9/2019	8/9/2019	8/9/2019

8/22/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

Radiation Safety Engineering, Inc.
3245 N. WASHINGTON ST. • CHANDLER, ARIZONA 85225-1121
Website: www.radsafe.com
(480) 897-9459
FAX (480) 892-5446

Radiochemical Activity in Water (pCi/L)

Turner Laboratories
2445 N. Coyote Drive, Ste. 104
Tucson, AZ 85745

Sampling Date: July 30, 2019
Sample Received: August 08, 2019
Analysis Completed: August 22, 2019

Sample ID	Gross Alpha Activity Method 600/00-02 (pCi/L)	Radium 226 Activity Method GammaRay HPGE (pCi/L)	Radium 228 Activity Method GammaRay HPGE (pCi/L)	Total Radium (pCi/L)
19H0053-07	1.7 ± 0.5	0.6 ± 0.2	< 0.7	0.6 ± 0.2

Date of Analysis	8/12/2019	8/9/2019	8/9/2019	8/9/2019

8/22/2019
Robert L. Metzger, Ph.D., C.H.P. Date
Laboratory License Number AZ0462

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19H0053

SENDING LABORATORY:	RECEIVING LABORATORY:
Turner Laboratories, Inc.	Radiation Safety Engineering, Inc.
2445 N. Coyote Drive, Ste #104	3245 N. Washington St.
Tucson, AZ 85745	Chandler, AZ 85225-1121
Phone: 520.882.5880	Phone :(480) 897-9459
Fax: 520.882.9788	Fax: (480) 892-5446
Project Manager: Elizabeth Kasik	Please CC Kevin Brim Kbrim@turnerlabs.com

Analysis	Expires	Laboratory ID	Comments
Sample ID: 19H0053-01 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		62648
Containers Supplied:			
Sample ID: 19H0053-02 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		62649
Containers Supplied:			
Sample ID: 19H0053-03 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			62650
Sample ID: 19H0053-04 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		62651
Containers Supplied:			
Sample ID: 19H0053-05 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			

Released By	Date		Received By	Date	
[signature]	8/7/19	16:00	UPS	8/7/19	16:00
Released By	Date		Received By	Date	

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19H0053

SENDING LABORATORY:	RECEIVING LABORATORY:
Turner Laboratories, Inc.	Radiation Safety Engineering, Inc.
2445 N. Coyote Drive, Ste #104	3245 N. Washington St.
Tucson, AZ 85745	Chandler, AZ 85225-1121
Phone: 520.882.5880	Phone :(480) 897-9459
Fax: 520.882.9788	Fax: (480) 892-5446
Project Manager: Elizabeth Kasik	Please CC Kevin Brim Kbrim@turnerlabs.com

Analysis	Expires	Laboratory ID	Comments
Sample ID: 19H0053-01 Non-Potable Wat Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			
Sample ID: 19H0053-02 Non-Potable Wat Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			
Sample ID: 19H0053-03 Non-Potable Wat Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			
Sample ID: 19H0053-04 Non-Potable Wat Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			
Sample ID: 19H0053-05 Non-Potable Wat Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			62652

Released By	Date		Received By	Date	
[signature]	8/7/19	16:00	UPS	8/7/19	16:00
Released By	Date		Received By	Date	

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19H0053

Analysis	Expires	Laboratory ID	Comments
Sample ID: 19H0053-07 Non-Potable Wa Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		62653
Containers Supplied:			

Released By	Date 8/7/19 16:00	Received By UPS	Date 8/7/19 16:00
Released By	Date	Received By	Date

SUBCONTRACT ORDER

Turner Laboratories, Inc.

19H0053

Analysis	Expires	Laboratory ID	Comments
Sample ID: 19H0053-07 Non-Potable Wa: Sampled:07/30/2019 10:00			
Radiochemistry, Radium 226/228	08/29/2019 10:00		
Radiochemistry, Gross Alpha	01/26/2020 10:00		
Containers Supplied:			

Released By	Date	Received By	Date
[signature]	8/7/19 16:00	UPS	8/7/19 16:00
Released By	Date	Received By	Date

April 03, 2020

Michael Taylor
Veolia Water Technologies
6981 N. Park Dr.
Pennsauken Township, NJ 08109

TEL (856) 438-1765
FAX -

Work Order No.: 20B0673

RE: Arizona Minerals

Dear Michael Taylor,

Turner Laboratories, Inc. received 6 sample(s) on 02/27/2020 for the analyses presented in the following report.

All results are intended to be considered in their entirety, and Turner Laboratories, Inc. is not responsible for use of less than the complete report. Results apply only to the samples analyzed. Samples will be disposed of 30 days after issue of our report unless special arrangements are made.

The pages that follow may contain sensitive, privileged or confidential information intended solely for the addressee named above. If you receive this message and are not the agent or employee of the addressee, this communication has been sent in error. Please do not disseminate or copy any of the attached and notify the sender immediately by telephone. Please also return the attached sheet(s) to the sender by mail.

Please call if you have any questions.

Respectfully submitted,

Turner Laboratories, Inc.
ADHS License AZ0066

Elizabeth Kasik
Laboratory Director

Client:	Veolia Water Technologies
Project:	Arizona Minerals
Work Order:	20B0673
Date Received:	02/27/2020

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Matrix	Collection Date/Time
20B0673-01	South32 Raw	Wastewater	02/13/2020 0900
20B0673-02	RO CONC	Wastewater	02/13/2020 1000
20B0673-03	60% RD Permeate	Wastewater	02/13/2020 1000
20B0673-04	Final Effluent	Wastewater	02/21/2020 0900
20B0673-05	Desaturation Sludge	Solid Materials	02/21/2020 0900
20B0673-06	Desaturated Conc	Wastewater	02/21/2020 0900

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

Case Narrative

B3	Target analyte detected in calibration blank at or above the method reporting limit.
D5	Minimum Reporting Limit (MRL) is adjusted due to sample dilution; analyte was non-detect in the sample.
E	Value is above quantitation range.
E4	Concentration estimated. Analyte was detected below laboratory Minimum Reporting Limit (MRL) but above MDL.
E8	Analyte reported to MDL per project specification. Target analyte was not detected in the sample.
H1	Sample analysis was performed past holding time.
H3	Sample was received and/or analysis requested past holding time.
H5	This test is specified to be performed in the field within 15 minutes of sampling; sample was received and analyzed past the regulatory holding time.
M1	Matrix spike recovery was high; the associated LCS/LCSD was acceptable.
M2	Matrix spike recovery was low; the associated LCS/LCSD was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated LCS/LCSD recovery was acceptable.
M4	The analysis of the spiked sample required a dilution such that the calculation does not provide useful information. The associated LCS/LCSD recovery was acceptable.
M6	Matrix spike recovery was high. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.
M7	Matrix spike recovery was low. Data reported per ADEQ policy 0154.000. Matrix interference was confirmed.
Q9	Insufficient sample received to meet method QC requirements.
R13	MS/MSD RPD exceeded method acceptance limit. Matrix spike recovery was outside acceptance criteria. Batch precision and accuracy were demonstrated.

All soil, sludge, and solid matrix determinations are reported on a wet weight basis unless otherwise noted.

ND	Not Detected at or above the PQL
PQL	Practical Quantitation Limit
DF	Dilution Factor

Client:	Veolia Water Technologies	**Client Sample ID:**	South32 Raw
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	1300				mg/L	1	03/05/2020 1145	03/07/2020 1828	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.20	D5	mg/L	2	03/03/2020 1610	03/08/2020 1251	MH
Iron	ND		0.60	D5	mg/L	2	03/03/2020 1610	03/08/2020 1251	MH
Potassium	ND		25	D5	mg/L	5	03/03/2020 1610	03/10/2020 0933	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00084		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Arsenic	0.00056		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Barium	0.0031		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Beryllium	ND		0.00025		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Cadmium	ND		0.00025		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Chromium	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Copper	0.0042		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Lead	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Manganese	0.024		0.0025		mg/L	10	03/03/2020 1610	03/07/2020 1135	MH
Nickel	0.016		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Selenium	0.0036		0.0025		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Silver	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Thallium	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
Zinc	0.11		0.040		mg/L	1	03/03/2020 1610	03/09/2020 0956	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	03/05/2020 1140	03/05/2020 1617	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	03/05/2020 1145	03/07/2020 1829	MH
Calcium	400		4.0		mg/L	1	03/05/2020 1145	03/07/2020 1828	MH
Iron	ND		0.30		mg/L	1	03/05/2020 1145	03/07/2020 1828	MH
Magnesium	71		3.0		mg/L	1	03/05/2020 1145	03/07/2020 1828	MH
Potassium	ND		5.0		mg/L	1	03/05/2020 1145	03/07/2020 1828	MH
Sodium	59		5.0		mg/L	1	03/05/2020 1145	03/07/2020 1828	MH

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Date: 04/03/2020

Client:	Veolia Water Technologies	**Client Sample ID:**	South32 Raw
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP/MS Total Metals-E200.8 (5.4)									
Antimony	0.00082		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Arsenic	ND		0.0025		mg/L	5	03/06/2020 0925	03/11/2020 1845	MH
Barium	0.0025		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Beryllium	ND		0.0050	D5	mg/L	20	03/06/2020 0925	03/15/2020 1354	MH
Cadmium	ND		0.00025		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Chromium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/16/2020 1107	MH
Copper	0.0025		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Lead	ND		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Manganese	0.045		0.0025		mg/L	10	03/06/2020 0925	03/08/2020 1735	MH
Nickel	0.013		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1735	MH
Selenium	0.0016	0.00025	0.0025	E4	mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Silver	ND		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
Thallium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/16/2020 1107	MH
Zinc	0.11		0.040		mg/L	1	03/06/2020 0925	03/09/2020 2332	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	03/09/2020 1050	03/09/2020 1739	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	25		2.0	H1	mg/L	2	03/20/2020 1130	04/02/2020 2020	EJ
Fluoride	ND		0.50	H1	mg/L	1	03/20/2020 1130	03/20/2020 2108	EJ
Sulfate	1400		500	H1	mg/L	100	03/20/2020 1130	03/26/2020 1305	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	8.0		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Carbonate (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Hydroxide (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Total (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Specific Conductance-SM2510 B									
Conductivity	3100		0.50		µmhos/cm	5	03/09/2020 1503	03/09/2020 1553	EJ
Total Dissolved Solids (Residue, Filterable)-SM2540 C									

Client:	Veolia Water Technologies	**Client Sample ID:**	South32 Raw
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-01		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Dissolved Solids (Residue, Filterable)	2100		20	H3	mg/L	1	03/04/2020 1730	03/09/2020 0935	CWB
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	02/28/2020 1240	03/03/2020 0841	CWB
pH-SM4500-H+ B									
pH (pH Units)	6.6			H5	-	1	03/17/2020 1246	03/17/2020 1321	CR
Temperature (°C)	27			H5	-	1	03/17/2020 1246	03/17/2020 1321	CR

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Lab Sample ID: 20B0673-02

Client Sample ID: RO CONC
Collection Date/Time: 02/13/2020 1000
Matrix: Wastewater

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	3900				mg/L	5	03/06/2020 1633	03/10/2020 1805	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.20	D5	mg/L	2	03/03/2020 1610	03/08/2020 1255	MH
Iron	ND		0.60	D5	mg/L	2	03/03/2020 1610	03/08/2020 1255	MH
Potassium	ND		25	D5	mg/L	5	03/03/2020 1610	03/10/2020 0937	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Arsenic	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Barium	0.0090		0.0050		mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Beryllium	ND		0.0025	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Cadmium	ND		0.0025	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Chromium	0.027		0.025		mg/L	50	03/03/2020 1610	03/07/2020 1223	MH
Copper	0.22		0.025		mg/L	50	03/03/2020 1610	03/09/2020 0901	MH
Lead	0.012		0.0050		mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Manganese	0.082		0.013		mg/L	50	03/03/2020 1610	03/07/2020 1223	MH
Nickel	0.073		0.025		mg/L	50	03/03/2020 1610	03/07/2020 1223	MH
Selenium	0.0086	0.0025	0.025	E4	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Silver	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Thallium	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
Zinc	0.51		0.40		mg/L	10	03/03/2020 1610	03/07/2020 1140	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	03/05/2020 1140	03/05/2020 1620	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.50	D5	mg/L	5	03/06/2020 1633	03/10/2020 1806	MH
Calcium	1200		20		mg/L	5	03/06/2020 1633	03/10/2020 1805	MH
Iron	ND		1.5	D5	mg/L	5	03/06/2020 1633	03/10/2020 1805	MH
Magnesium	210		15		mg/L	5	03/06/2020 1633	03/10/2020 1805	MH
Potassium	ND		25	D5	mg/L	5	03/06/2020 1633	03/10/2020 1805	MH
Sodium	160		100		mg/L	20	03/06/2020 1633	03/11/2020 1813	MH
ICP/MS Total Metals-E200.8 (5.4)									

Client:	Veolia Water Technologies	**Client Sample ID:**	RO CONC
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 1000
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-02		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Antimony	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/09/2020 2135	MH
Arsenic	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/11/2020 1757	MH
Barium	0.019		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
Beryllium	ND		0.0025	D5	mg/L	10	03/06/2020 0925	03/09/2020 2135	MH
Cadmium	ND		0.0025	D5	mg/L	10	03/06/2020 0925	03/09/2020 2135	MH
Chromium	ND		0.010	B3, D5	mg/L	20	03/06/2020 0925	03/11/2020 1757	MH
Copper	0.21		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
Lead	0.013		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
Manganese	0.12		0.0025		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
Nickel	0.052		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
Selenium	ND	0.0025	0.025	E4	mg/L	10	03/06/2020 0925	03/09/2020 2135	MH
Silver	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/09/2020 2135	MH
Thallium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/11/2020 1757	MH
Zinc	0.59		0.40		mg/L	10	03/06/2020 0925	03/08/2020 1740	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	03/09/2020 1050	03/09/2020 1741	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	70		10	H1	mg/L	10	03/20/2020 0900	03/24/2020 2221	EJ
Fluoride	ND		0.50	H1	mg/L	1	03/20/2020 0900	03/21/2020 0408	EJ
Sulfate	3600		500	H1	mg/L	100	03/20/2020 0900	03/24/2020 1931	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	2.5		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Carbonate (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Hydroxide (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Total (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Specific Conductance-SM2510 B									
Conductivity	6500		0.50		µmhos/cm	5	03/09/2020 1503	03/09/2020 1553	EJ
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	5300		20	H3	mg/L	1	03/04/2020 1730	03/09/2020 1630	CWB

Client:	Veolia Water Technologies	**Client Sample ID:**	RO CONC
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 1000
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-02		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	02/28/2020 1240	03/03/2020 0841	CWB
pH-SM4500-H+ B									
pH (pH Units)	5.6			H5	-	1	03/17/2020 1246	03/17/2020 1325	CR
Temperature (°C)	26			H5	-	1	03/17/2020 1246	03/17/2020 1325	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	60% RD Permeate
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 1000
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	15				mg/L	1	03/05/2020 1145	03/07/2020 1833	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.10		mg/L	1	03/09/2020 1430	03/10/2020 1532	MH
Iron	ND		0.30		mg/L	1	03/09/2020 1430	03/10/2020 1532	MH
Potassium	ND		5.0		mg/L	1	03/09/2020 1430	03/10/2020 1532	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Arsenic	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Barium	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Beryllium	ND		0.00025		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Cadmium	ND		0.00025		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Chromium	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Copper	0.0033		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Lead	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Manganese	0.0035		0.00025		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Nickel	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Selenium	ND		0.0025		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Silver	ND		0.00050		mg/L	1	03/09/2020 1430	03/11/2020 1210	MH
Thallium	ND		0.00050		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
Zinc	ND		0.040		mg/L	1	03/09/2020 1430	03/10/2020 1530	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	03/10/2020 1125	03/10/2020 1453	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.10		mg/L	1	03/05/2020 1145	03/07/2020 1833	MH
Calcium	5.9		4.0		mg/L	1	03/05/2020 1145	03/07/2020 1832	MH
Iron	ND		0.30		mg/L	1	03/05/2020 1145	03/07/2020 1833	MH
Magnesium	ND		3.0		mg/L	1	03/05/2020 1145	03/07/2020 1833	MH
Potassium	ND		5.0		mg/L	1	03/05/2020 1145	03/07/2020 1832	MH
Sodium	ND		5.0		mg/L	1	03/05/2020 1145	03/07/2020 1833	MH
ICP/MS Total Metals-E200.8 (5.4)									

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Date: 04/03/2020

Client:	Veolia Water Technologies	**Client Sample ID:**	60% RD Permeate
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 1000
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Antimony	ND		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Arsenic	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1506	MH
Barium	ND		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Beryllium	ND		0.0025	D5	mg/L	10	03/06/2020 0925	03/15/2020 1506	MH
Cadmium	ND		0.00025		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Chromium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/16/2020 1044	MH
Copper	0.0015		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Lead	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1506	MH
Manganese	0.0035		0.0025		mg/L	10	03/06/2020 0925	03/09/2020 2140	MH
Nickel	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1506	MH
Selenium	ND	0.00025	0.0025	E8	mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Silver	ND		0.00050		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
Thallium	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1506	MH
Zinc	ND		0.040		mg/L	1	03/06/2020 0925	03/09/2020 2353	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	03/09/2020 1050	03/09/2020 1744	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	12		1.0	H1	mg/L	1	03/21/2020 0900	03/21/2020 1747	EJ
Fluoride	0.56		0.50	H1	mg/L	1	03/21/2020 0900	03/21/2020 1747	EJ
Sulfate	21		5.0	H1	mg/L	1	03/21/2020 0900	04/02/2020 2047	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	4.0		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Carbonate (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Hydroxide (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Alkalinity, Total (As CaCO3)	ND		2.0	H3	mg/L	1	03/23/2020 0850	03/23/2020 1330	CWB
Specific Conductance-SM2510 B									
Conductivity	73		0.10		µmhos/cm	1	03/09/2020 1503	03/09/2020 1553	EJ
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	46		20	H3	mg/L	1	03/04/2020 1730	03/09/2020 0935	CWB

Client:	Veolia Water Technologies	**Client Sample ID:**	60% RD Permeate
Project:	Arizona Minerals	**Collection Date/Time:**	02/13/2020 1000
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-03		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	02/28/2020 1240	03/03/2020 0841	CWB
pH-SM4500-H+ B									
pH (pH Units)	5.8			H5	-	1	03/17/2020 1246	03/17/2020 1328	CR
Temperature (°C)	26			H5	-	1	03/17/2020 1246	03/17/2020 1328	CR

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Date: 04/03/2020

Client:	Veolia Water Technologies	**Client Sample ID:**	Final Effluent
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-04		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	790				mg/L	5	03/06/2020 1633	03/10/2020 1809	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.20	D5	mg/L	2	03/03/2020 1610	03/08/2020 1300	MH
Iron	ND		0.60	D5	mg/L	2	03/03/2020 1610	03/08/2020 1259	MH
Potassium	ND		25	D5	mg/L	5	03/03/2020 1610	03/10/2020 0944	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	0.00066		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Arsenic	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Barium	0.0069		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Beryllium	ND		0.00025		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Cadmium	ND		0.00025		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Chromium	0.0026		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Copper	0.012		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Lead	0.00059		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Manganese	ND		0.0025	D5	mg/L	10	03/03/2020 1610	03/07/2020 1213	MH
Nickel	0.018		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Selenium	0.0039		0.0025		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Silver	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Thallium	ND		0.00050		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
Zinc	ND		0.040		mg/L	1	03/03/2020 1610	03/09/2020 1048	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	03/05/2020 1140	03/05/2020 1622	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.50	D5	mg/L	5	03/06/2020 1633	03/10/2020 1810	MH
Calcium	320		20		mg/L	5	03/06/2020 1633	03/10/2020 1809	MH
Iron	ND		1.5	D5	mg/L	5	03/06/2020 1633	03/10/2020 1809	MH
Magnesium	ND		15	D5	mg/L	5	03/06/2020 1633	03/10/2020 1809	MH
Potassium	ND		25	D5	mg/L	5	03/06/2020 1633	03/10/2020 1809	MH
Sodium	64		50		mg/L	10	03/06/2020 1633	03/11/2020 1817	MH
ICP/MS Total Metals-E200.8 (5.4)									

Client:	Veolia Water Technologies	**Client Sample ID:**	Final Effluent
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-04		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Antimony	0.00074		0.00050		mg/L	1	03/06/2020 0925	03/10/2020 0015	MH
Arsenic	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Barium	0.0069		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1807	MH
Beryllium	ND		0.0025	D5	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Cadmium	ND		0.00025		mg/L	1	03/06/2020 0925	03/10/2020 0015	MH
Chromium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/16/2020 1129	MH
Copper	0.0092		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1807	MH
Lead	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Manganese	0.0035		0.0025		mg/L	10	03/06/2020 0925	03/08/2020 1807	MH
Nickel	0.013		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1807	MH
Selenium	0.0026	0.0025	0.025	E4	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Silver	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Thallium	ND		0.0050	D5	mg/L	10	03/06/2020 0925	03/15/2020 1527	MH
Zinc	ND		0.040		mg/L	1	03/06/2020 0925	03/10/2020 0015	MH
CVAA Total Mercury-E245.1									
Mercury	ND		0.0010		mg/L	1	03/09/2020 1050	03/09/2020 1746	MH
Anions by Ion Chromatography-E300.0 (2.1)									
Chloride	38		2.0	H1	mg/L	2	03/20/2020 0900	03/24/2020 1816	EJ
Fluoride	ND		0.50	H1	mg/L	1	03/20/2020 0900	03/21/2020 0022	EJ
Sulfate	870		500	H1	mg/L	100	03/20/2020 0900	03/24/2020 1835	EJ
Alkalinity-SM2320B									
Alkalinity, Bicarbonate (As CaCO3)	180		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Total (As CaCO3)	180		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Specific Conductance-SM2510 B									
Conductivity	2300		0.50		µmhos/cm	5	03/09/2020 1503	03/09/2020 1553	EJ
Total Dissolved Solids (Residue, Filterable)-SM2540 C									
Total Dissolved Solids (Residue, Filterable)	1600		20		mg/L	1	02/28/2020 0845	03/04/2020 0830	CWB

Client:	Veolia Water Technologies	**Client Sample ID:**	Final Effluent
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-04		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	02/28/2020 1240	03/03/2020 0841	CWB
pH-SM4500-H+ B									
pH (pH Units)	6.5			H5	-	1	03/11/2020 1545	03/11/2020 1604	CR
Temperature (°C)	23			H5	-	1	03/11/2020 1545	03/11/2020 1604	CR

Client:	Veolia Water Technologies	**Client Sample ID:**	Desaturation Sludge
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Solid Materials
Lab Sample ID:	20B0673-05		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
ICP Metals, SPLP Leached by SW 1312-SW6010 C									
Selenium	0.078		0.040		mg/L	1	03/10/2020 1125	03/11/2020 0941	MH

Client:	Veolia Water Technologies	**Client Sample ID:**	Desaturated Conc
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Hardness-Calculation									
Hardness, Calcium/Magnesium (As CaCO3)	2300				mg/L	5	03/06/2020 1633	03/10/2020 1817	MH
ICP Dissolved Metals-E 200.7 (4.4)									
Boron	ND		0.20	D5	mg/L	2	03/03/2020 1610	03/08/2020 1304	MH
Iron	ND		0.60	D5	mg/L	2	03/03/2020 1610	03/08/2020 1303	MH
Potassium	ND		25	D5	mg/L	5	03/03/2020 1610	03/10/2020 0948	MH
ICP/MS Dissolved Metals-E 200.8 (5.4)									
Antimony	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Arsenic	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Barium	0.017		0.0050		mg/L	10	03/03/2020 1610	03/05/2020 1431	MH
Beryllium	ND		0.0025	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Cadmium	ND		0.0025	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Chromium	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Copper	0.0051		0.0050		mg/L	10	03/03/2020 1610	03/05/2020 1431	MH
Lead	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Manganese	ND		0.0025		mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Nickel	0.031		0.0050		mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Selenium	0.0087	0.0025	0.025	E4	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Silver	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Thallium	ND		0.0050	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
Zinc	ND		0.40	D5	mg/L	10	03/03/2020 1610	03/07/2020 1218	MH
CVAA Dissolved Mercury-E 245.1									
Mercury	ND		0.0010		mg/L	1	03/05/2020 1140	03/05/2020 1625	MH
ICP Total Metals-E200.7 (4.4)									
Boron	ND		0.50	D5	mg/L	5	03/06/2020 1633	03/10/2020 1818	MH
Calcium	920		20		mg/L	5	03/06/2020 1633	03/10/2020 1817	MH
Iron	ND		1.5	D5	mg/L	5	03/06/2020 1633	03/10/2020 1817	MH
Magnesium	ND		15	D5	mg/L	5	03/06/2020 1633	03/10/2020 1817	MH
Potassium	ND		25	D5	mg/L	5	03/06/2020 1633	03/10/2020 1817	MH
Sodium	150		100		mg/L	20	03/06/2020 1633	03/11/2020 1821	MH
ICP/MS Total Metals-E200.8 (5.4)									

Client:	Veolia Water Technologies	**Client Sample ID:**	Desaturated Conc
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Antimony	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Arsenic	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Barium	0.015		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1812	MH
Beryllium	ND		0.0050	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Cadmium	ND		0.0050	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Chromium	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/16/2020 1018	MH
Copper	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Lead	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Manganese	ND		0.0050	D5	mg/L	20	03/06/2020 0925	03/16/2020 1018	MH
Nickel	0.035		0.0050		mg/L	10	03/06/2020 0925	03/08/2020 1812	MH
Selenium	ND	0.0050	0.050	E8	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Silver	ND		0.010	D5	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Thallium	ND	0.00047	0.010	E4	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH
Zinc	ND	0.046	0.80	E4	mg/L	20	03/06/2020 0925	03/15/2020 1426	MH

CVAA Total Mercury-E245.1

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Mercury	ND		0.0010		mg/L	1	03/09/2020 1050	03/09/2020 1749	MH

Anions by Ion Chromatography-E300.0 (2.1)

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Chloride	85		10	H1	mg/L	10	03/20/2020 0900	03/24/2020 1912	EJ
Fluoride	0.56		0.50	H1	mg/L	1	03/20/2020 0900	03/21/2020 0253	EJ
Sulfate	2000		500	H1	mg/L	100	03/20/2020 0900	03/24/2020 1950	EJ

Alkalinity-SM2320B

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Alkalinity, Bicarbonate (As CaCO3)	450		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Carbonate (As CaCO3)	ND		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Hydroxide (As CaCO3)	ND		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB
Alkalinity, Total (As CaCO3)	450		2.0		mg/L	1	03/06/2020 0820	03/06/2020 0822	CWB

Specific Conductance-SM2510 B

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Conductivity	6200		0.50		µmhos/cm	5	03/09/2020 1503	03/09/2020 1553	EJ

Total Dissolved Solids (Residue, Filterable)-SM2540 C

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Dissolved Solids (Residue, Filterable)	3700		20		mg/L	1	02/28/2020 0845	03/03/2020 0900	CWB

Turner Laboratories, Inc.

Date: 04/03/2020

Client:	Veolia Water Technologies	**Client Sample ID:**	Desaturated Conc
Project:	Arizona Minerals	**Collection Date/Time:**	02/21/2020 0900
Work Order:	20B0673	**Matrix:**	Wastewater
Lab Sample ID:	20B0673-06		

Analyses	Result	MDL	PQL	Qual	Units	DF	Prep Date	Analysis Date	Analyst
Total Suspended Solids (Residue, Non-Filterable)-SM2540 D									
Total Suspended Solids	ND		10	Q9	mg/L	1	02/28/2020 1240	03/03/2020 0841	CWB
pH-SM4500-H+ B									
pH (pH Units)	11			H5	-	1	03/16/2020 1120	03/16/2020 1127	JG
Temperature (°C)	21			H5	-	1	03/16/2020 1120	03/16/2020 1127	JG

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003015 - E 200.7 (4.4)										
Blank (2003015-BLK1)				Prepared & Analyzed: 03/08/2020						
Boron	ND	0.10	mg/L							
Iron	ND	0.30	mg/L							
Potassium	ND	5.0	mg/L							
LCS (2003015-BS1)				Prepared & Analyzed: 03/08/2020						
Boron	1.1	0.10	mg/L	1.000		109	85-115			
Iron	1.1	0.30	mg/L	1.000		106	85-115			
Potassium	10	5.0	mg/L	10.00		104	85-115			
LCS Dup (2003015-BSD1)				Prepared & Analyzed: 03/08/2020						
Boron	1.1	0.10	mg/L	1.000		106	85-115	3	20	
Iron	1.0	0.30	mg/L	1.000		103	85-115	2	20	
Potassium	9.8	5.0	mg/L	10.00		98	85-115	6	20	
Matrix Spike (2003015-MS1)	**Source: 20B0645-02**			Prepared & Analyzed: 03/08/2020						
Boron	1.3	0.10	mg/L	1.000	0.13	119	70-130			
Iron	1.1	0.30	mg/L	1.000	0.061	103	70-130			
Potassium	16	5.0	mg/L	10.00	9.4	64	70-130			M7
Batch 2003016 - E 200.8 (5.4)										
Blank (2003016-BLK1)				Prepared & Analyzed: 03/04/2020						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003016 - E 200.8 (5.4)										
LCS (2003016-BS1)				Prepared & Analyzed: 03/04/2020						
Antimony	0.051	0.00050	mg/L	0.05000		102	85-115			
Arsenic	0.051	0.00050	mg/L	0.05000		101	85-115			
Barium	0.052	0.00050	mg/L	0.05000		103	85-115			
Beryllium	0.054	0.00025	mg/L	0.05000		107	85-115			
Cadmium	0.049	0.00025	mg/L	0.05000		98	85-115			
Chromium	0.053	0.00050	mg/L	0.05000		106	85-115			
Copper	0.053	0.00050	mg/L	0.05000		106	85-115			
Lead	0.049	0.00050	mg/L	0.05000		98	85-115			
Manganese	0.049	0.00025	mg/L	0.05000		98	85-115			
Nickel	0.051	0.00050	mg/L	0.05000		102	85-115			
Selenium	0.045	0.0025	mg/L	0.05000		90	85-115			
Silver	0.052	0.00050	mg/L	0.05000		103	85-115			
Thallium	0.048	0.00050	mg/L	0.05000		97	85-115			
Zinc	0.10	0.040	mg/L	0.1000		104	85-115			
LCS Dup (2003016-BSD1)				Prepared & Analyzed: 03/04/2020						
Antimony	0.051	0.00050	mg/L	0.05000		101	85-115	1	20	
Arsenic	0.050	0.00050	mg/L	0.05000		100	85-115	0.9	20	
Barium	0.051	0.00050	mg/L	0.05000		102	85-115	2	20	
Beryllium	0.054	0.00025	mg/L	0.05000		107	85-115	0.09	20	
Cadmium	0.048	0.00025	mg/L	0.05000		97	85-115	1	20	
Chromium	0.053	0.00050	mg/L	0.05000		105	85-115	0.6	20	
Copper	0.052	0.00050	mg/L	0.05000		104	85-115	2	20	
Lead	0.049	0.00050	mg/L	0.05000		97	85-115	1	20	
Manganese	0.049	0.00025	mg/L	0.05000		97	85-115	1	20	
Nickel	0.050	0.00050	mg/L	0.05000		101	85-115	1	20	
Selenium	0.043	0.0025	mg/L	0.05000		87	85-115	3	20	
Silver	0.051	0.00050	mg/L	0.05000		102	85-115	0.8	20	
Thallium	0.048	0.00050	mg/L	0.05000		95	85-115	1	20	
Zinc	0.097	0.040	mg/L	0.1000		97	85-115	7	20	
Matrix Spike (2003016-MS1)	**Source: 20B0656-01**			Prepared & Analyzed: 03/04/2020						
Antimony	0.056	0.00050	mg/L	0.05000	0.00016	111	70-130			
Arsenic	0.061	0.00050	mg/L	0.05000	0.0072	108	70-130			
Barium	0.099	0.00050	mg/L	0.05000	0.051	96	70-130			
Beryllium	0.052	0.0013	mg/L	0.05000	0.00020	104	70-130			
Cadmium	0.048	0.00025	mg/L	0.05000	ND	96	70-130			
Chromium	0.059	0.0025	mg/L	0.05000	0.0015	115	70-130			
Copper	0.048	0.00050	mg/L	0.05000	0.0012	93	70-130			
Lead	0.054	0.0025	mg/L	0.05000	ND	107	70-130			
Manganese	0.062	0.0013	mg/L	0.05000	0.0043	115	70-130			
Nickel	0.059	0.0025	mg/L	0.05000	0.0022	114	70-130			
Selenium	0.047	0.0025	mg/L	0.05000	0.0048	84	70-130			
Silver	0.046	0.00050	mg/L	0.05000	0.000092	92	70-130			
Thallium	0.052	0.0025	mg/L	0.05000	ND	105	70-130			
Zinc	0.29	0.040	mg/L	0.1000	0.19	104	70-130			

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003016 - E 200.8 (5.4)										
Matrix Spike (2003016-MS2)		**Source: 20B0645-02**		Prepared: 03/04/2020 Analyzed: 03/05/2020						
Antimony	0.055	0.00050	mg/L	0.05000	0.00076	109	70-130			
Arsenic	0.13	0.00050	mg/L	0.05000	0.070	120	70-130			
Barium	0.082	0.00050	mg/L	0.05000	0.030	103	70-130			
Beryllium	0.042	0.00025	mg/L	0.05000	0.00026	83	70-130			
Cadmium	0.049	0.00025	mg/L	0.05000	ND	97	70-130			
Chromium	0.064	0.0050	mg/L	0.05000	0.0053	118	70-130			
Copper	0.17	0.00050	mg/L	0.05000	0.13	87	70-130			
Lead	0.051	0.00050	mg/L	0.05000	0.000076	102	70-130			
Manganese	14	0.025	mg/L	0.05000	13	NR	70-130			M3
Nickel	0.066	0.0050	mg/L	0.05000	0.012	107	70-130			
Selenium	0.061	0.0025	mg/L	0.05000	0.0031	116	70-130			
Silver	0.045	0.0050	mg/L	0.05000	ND	90	70-130			
Thallium	0.050	0.00050	mg/L	0.05000	0.00013	100	70-130			
Zinc	0.11	0.040	mg/L	0.1000	0.013	100	70-130			
Batch 2003060 - E 245.1										
Blank (2003060-BLK1)				Prepared & Analyzed: 03/05/2020						
Mercury	ND	0.0010	mg/L							
LCS (2003060-BS1)				Prepared & Analyzed: 03/05/2020						
Mercury	0.0049	0.0010	mg/L	0.005000		98	85-115			
LCS Dup (2003060-BSD1)				Prepared & Analyzed: 03/05/2020						
Mercury	0.0048	0.0010	mg/L	0.005000		97	85-115	0.8	20	
Matrix Spike (2003060-MS1)		**Source: 20B0530-01**		Prepared & Analyzed: 03/05/2020						
Mercury	0.0049	0.0010	mg/L	0.005000	0.000026	97	70-130			
Matrix Spike Dup (2003060-MSD1)		**Source: 20B0530-01**		Prepared & Analyzed: 03/05/2020						
Mercury	0.0049	0.0010	mg/L	0.005000	0.000026	98	70-130	1	20	
Batch 2003067 - E200.7 (4.4)										
Blank (2003067-BLK1)				Prepared: 03/05/2020 Analyzed: 03/07/2020						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (2003067-BS1)				Prepared: 03/05/2020 Analyzed: 03/07/2020						
Boron	1.0	0.10	mg/L	1.000		103	85-115			
Calcium	9.5	4.0	mg/L	10.00		95	85-115			
Iron	0.95	0.30	mg/L	1.000		95	85-115			
Magnesium	9.6	3.0	mg/L	10.00		96	85-115			
Potassium	9.8	5.0	mg/L	10.00		98	85-115			
Sodium	9.8	5.0	mg/L	10.00		98	85-115			

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003067 - E200.7 (4.4)										
LCS Dup (2003067-BSD1)				Prepared: 03/05/2020 Analyzed: 03/07/2020						
Boron	1.0	0.10	mg/L	1.000		103	85-115	0.7	20	
Calcium	9.3	4.0	mg/L	10.00		93	85-115	1	20	
Iron	0.95	0.30	mg/L	1.000		95	85-115	0.6	20	
Magnesium	9.5	3.0	mg/L	10.00		95	85-115	0.4	20	
Potassium	9.7	5.0	mg/L	10.00		97	85-115	0.3	20	
Sodium	10	5.0	mg/L	10.00		102	85-115	4	20	
Matrix Spike (2003067-MS1)	**Source: 20B0481-01**			Prepared: 03/05/2020 Analyzed: 03/07/2020						
Boron	1.1	0.10	mg/L	1.000	0.13	100	70-130			
Calcium	98	4.0	mg/L	10.00	89	86	70-130			
Iron	1.2	0.30	mg/L	1.000	0.28	95	70-130			
Magnesium	19	3.0	mg/L	10.00	9.8	94	70-130			
Potassium	14	5.0	mg/L	10.00	3.7	99	70-130			
Sodium	83	5.0	mg/L	10.00	74	83	70-130			
Matrix Spike (2003067-MS2)	**Source: 20B0645-02**			Prepared: 03/05/2020 Analyzed: 03/07/2020						
Boron	1.1	0.10	mg/L	1.000	0.11	101	70-130			
Calcium	370	4.0	mg/L	10.00	370	NR	70-130			M3
Iron	29	0.30	mg/L	1.000	29	20	70-130			M3
Magnesium	200	3.0	mg/L	10.00	190	51	70-130			M3
Potassium	21	5.0	mg/L	10.00	11	102	70-130			
Sodium	300	5.0	mg/L	10.00	300	24	70-130			M3
Batch 2003080 - E200.7 (4.4)										
Blank (2003080-BLK1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Boron	ND	0.10	mg/L							
Calcium	ND	4.0	mg/L							
Iron	ND	0.30	mg/L							
Magnesium	ND	3.0	mg/L							
Potassium	ND	5.0	mg/L							
Sodium	ND	5.0	mg/L							
LCS (2003080-BS1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Boron	1.1	0.10	mg/L	1.000		105	85-115			
Calcium	11	4.0	mg/L	10.00		108	85-115			
Iron	1.0	0.30	mg/L	1.000		103	85-115			
Magnesium	10	3.0	mg/L	10.00		101	85-115			
Potassium	10	5.0	mg/L	10.00		100	85-115			
Sodium	10	5.0	mg/L	10.00		100	85-115			
LCS Dup (2003080-BSD1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Boron	1.1	0.10	mg/L	1.000		106	85-115	0.8	20	
Calcium	10	4.0	mg/L	10.00		104	85-115	4	20	
Iron	1.0	0.30	mg/L	1.000		102	85-115	1	20	
Magnesium	10	3.0	mg/L	10.00		101	85-115	0.4	20	
Potassium	9.9	5.0	mg/L	10.00		99	85-115	1	20	
Sodium	9.9	5.0	mg/L	10.00		99	85-115	0.9	20	

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003080 - E200.7 (4.4)										
Matrix Spike (2003080-MS1)	**Source: 20B0681-01**			Prepared: 03/06/2020 Analyzed: 03/08/2020						
Boron	1.1	0.10	mg/L	1.000	0.094	105	70-130			
Calcium	230	4.0	mg/L	10.00	220	73	70-130			
Iron	1.0	0.30	mg/L	1.000	0.021	99	70-130			
Magnesium	40	3.0	mg/L	10.00	30	102	70-130			
Potassium	13	5.0	mg/L	10.00	3.5	94	70-130			
Sodium	38	5.0	mg/L	10.00	31	71	70-130			
Matrix Spike (2003080-MS2)	**Source: 20C0079-01**			Prepared: 03/06/2020 Analyzed: 03/08/2020						
Boron	1.2	0.10	mg/L	1.000	0.12	103	70-130			
Calcium	84	4.0	mg/L	10.00	76	87	70-130			
Iron	1.1	0.30	mg/L	1.000	0.056	100	70-130			
Magnesium	21	3.0	mg/L	10.00	11	101	70-130			
Potassium	16	5.0	mg/L	10.00	6.5	96	70-130			
Sodium	87	5.0	mg/L	10.00	79	78	70-130			
Batch 2003081 - E200.8 (5.4)										
Blank (2003081-BLK1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (2003081-BS1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Antimony	0.048	0.00050	mg/L	0.05000		95	85-115			
Arsenic	0.048	0.00050	mg/L	0.05000		96	85-115			
Barium	0.048	0.00050	mg/L	0.05000		97	85-115			
Beryllium	0.050	0.00025	mg/L	0.05000		99	85-115			
Cadmium	0.049	0.00025	mg/L	0.05000		97	85-115			
Chromium	0.049	0.00050	mg/L	0.05000		97	85-115			
Copper	0.049	0.00050	mg/L	0.05000		99	85-115			
Lead	0.050	0.00050	mg/L	0.05000		99	85-115			
Manganese	0.047	0.00025	mg/L	0.05000		95	85-115			
Nickel	0.047	0.00050	mg/L	0.05000		95	85-115			
Selenium	0.048	0.0025	mg/L	0.05000		96	85-115			
Silver	0.048	0.00050	mg/L	0.05000		96	85-115			
Thallium	0.045	0.00050	mg/L	0.05000		91	85-115			
Zinc	0.098	0.040	mg/L	0.1000		98	85-115			

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003081 - E200.8 (5.4)										
LCS Dup (2003081-BSD1)				Prepared: 03/06/2020 Analyzed: 03/08/2020						
Antimony	0.050	0.00050	mg/L	0.05000		100	85-115	5	20	
Arsenic	0.051	0.00050	mg/L	0.05000		101	85-115	5	20	
Barium	0.050	0.00050	mg/L	0.05000		101	85-115	4	20	
Beryllium	0.051	0.00025	mg/L	0.05000		102	85-115	3	20	
Cadmium	0.051	0.00025	mg/L	0.05000		102	85-115	5	20	
Chromium	0.050	0.00050	mg/L	0.05000		101	85-115	3	20	
Copper	0.052	0.00050	mg/L	0.05000		104	85-115	5	20	
Lead	0.052	0.00050	mg/L	0.05000		103	85-115	4	20	
Manganese	0.051	0.00025	mg/L	0.05000		101	85-115	7	20	
Nickel	0.051	0.00050	mg/L	0.05000		102	85-115	8	20	
Selenium	0.050	0.0025	mg/L	0.05000		100	85-115	5	20	
Silver	0.051	0.00050	mg/L	0.05000		101	85-115	6	20	
Thallium	0.047	0.00050	mg/L	0.05000		95	85-115	5	20	
Zinc	0.11	0.040	mg/L	0.1000		106	85-115	8	20	
Matrix Spike (2003081-MS1)		**Source: 20B0645-02**		Prepared: 03/06/2020 Analyzed: 03/08/2020						
Antimony	0.024	0.00050	mg/L	0.05000	0.0027	43	70-130			M7
Arsenic	0.39	0.050	mg/L	0.05000	0.29	211	70-130			M3
Barium	0.32	0.050	mg/L	0.05000	0.20	235	70-130			M3
Beryllium	0.051	0.0025	mg/L	0.05000	0.00045	102	70-130			
Cadmium	0.047	0.00025	mg/L	0.05000	0.00072	93	70-130			
Chromium	0.091	0.050	mg/L	0.05000	0.097	NR	70-130			M7
Copper	0.17	0.050	mg/L	0.05000	0.090	151	70-130			M6
Lead	0.23	0.050	mg/L	0.05000	0.15	175	70-130			M3
Manganese	13	0.025	mg/L	0.05000	14	NR	70-130			M3
Nickel	0.10	0.0050	mg/L	0.05000	0.047	108	70-130			
Selenium	0.042	0.0025	mg/L	0.05000	0.0018	80	70-130			
Silver	0.043	0.00050	mg/L	0.05000	0.0011	84	70-130			
Thallium	0.055	0.0050	mg/L	0.05000	0.0063	97	70-130			
Zinc	0.53	0.040	mg/L	0.1000	0.41	120	70-130			
Matrix Spike (2003081-MS2)		**Source: 20C0065-09**		Prepared: 03/06/2020 Analyzed: 03/08/2020						
Antimony	0.049	0.00050	mg/L	0.05000	0.00025	98	70-130			
Arsenic	0.22	0.00050	mg/L	0.05000	0.17	103	70-130			M4
Barium	0.47	0.00050	mg/L	0.05000	0.41	113	70-130			
Beryllium	0.049	0.0025	mg/L	0.05000	ND	99	70-130			
Cadmium	0.046	0.00025	mg/L	0.05000	ND	93	70-130			
Chromium	0.070	0.0050	mg/L	0.05000	0.013	114	70-130			
Copper	0.066	0.00050	mg/L	0.05000	0.024	83	70-130			
Lead	0.050	0.00050	mg/L	0.05000	0.00018	99	70-130			
Manganese	0.062	0.0025	mg/L	0.05000	0.0052	115	70-130			
Nickel	0.067	0.0050	mg/L	0.05000	0.013	109	70-130			
Selenium	0.12	0.0025	mg/L	0.05000	0.058	118	70-130			
Silver	0.044	0.00050	mg/L	0.05000	0.00010	87	70-130			
Thallium	0.050	0.0050	mg/L	0.05000	0.0075	85	70-130			
Zinc	0.10	0.040	mg/L	0.1000	0.012	89	70-130			
Batch 2003097 - E245.1										

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003097 - E245.1										
Blank (2003097-BLK1)				Prepared & Analyzed: 03/09/2020						
Mercury	ND	0.0010	mg/L							
LCS (2003097-BS1)				Prepared & Analyzed: 03/09/2020						
Mercury	0.0051	0.0010	mg/L	0.005000		102	85-115			
LCS Dup (2003097-BSD1)				Prepared & Analyzed: 03/09/2020						
Mercury	0.0052	0.0010	mg/L	0.005000		104	85-115	2	20	
Matrix Spike (2003097-MS1)		**Source: 20C0031-01**		Prepared & Analyzed: 03/09/2020						
Mercury	0.0047	0.0010	mg/L	0.005000	0.000065	92	70-130			
Matrix Spike (2003097-MS2)		**Source: 20C0233-01**		Prepared & Analyzed: 03/09/2020						
Mercury	0.0049	0.0010	mg/L	0.005000	0.000083	97	70-130			
Matrix Spike Dup (2003097-MSD1)		**Source: 20C0031-01**		Prepared & Analyzed: 03/09/2020						
Mercury	0.0047	0.0010	mg/L	0.005000	0.000065	92	70-130	0.3	20	
Matrix Spike Dup (2003097-MSD2)		**Source: 20C0233-01**		Prepared & Analyzed: 03/09/2020						
Mercury	0.0048	0.0010	mg/L	0.005000	0.000083	95	70-130	2	20	
Batch 2003100 - E 200.7 (4.4)										
Blank (2003100-BLK1)				Prepared & Analyzed: 03/10/2020						
Boron	ND	0.10	mg/L							
Iron	ND	0.30	mg/L							
Potassium	ND	5.0	mg/L							
LCS (2003100-BS1)				Prepared & Analyzed: 03/10/2020						
Boron	1.0	0.10	mg/L	1.000		100	85-115			
Iron	1.0	0.30	mg/L	1.000		104	85-115			
Potassium	11	5.0	mg/L	10.00		107	85-115			
LCS Dup (2003100-BSD1)				Prepared & Analyzed: 03/10/2020						
Boron	0.96	0.10	mg/L	1.000		96	85-115	4	20	
Iron	0.99	0.30	mg/L	1.000		99	85-115	4	20	
Potassium	10	5.0	mg/L	10.00		103	85-115	4	20	
Matrix Spike (2003100-MS1)		**Source: 20B0681-01**		Prepared & Analyzed: 03/10/2020						
Boron	1.1	0.10	mg/L	1.000	0.090	101	70-130			
Iron	0.97	0.30	mg/L	1.000	0.0057	97	70-130			
Potassium	13	5.0	mg/L	10.00	3.6	98	70-130			
Batch 2003102 - E 200.8 (5.4)										

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003102 - E 200.8 (5.4)										
Blank (2003102-BLK1)				Prepared & Analyzed: 03/10/2020						
Antimony	ND	0.00050	mg/L							
Arsenic	ND	0.00050	mg/L							
Barium	ND	0.00050	mg/L							
Beryllium	ND	0.00025	mg/L							
Cadmium	ND	0.00025	mg/L							
Chromium	ND	0.00050	mg/L							
Copper	ND	0.00050	mg/L							
Lead	ND	0.00050	mg/L							
Manganese	ND	0.00025	mg/L							
Nickel	ND	0.00050	mg/L							
Selenium	ND	0.0025	mg/L							
Silver	ND	0.00050	mg/L							
Thallium	ND	0.00050	mg/L							
Zinc	ND	0.040	mg/L							
LCS (2003102-BS1)				Prepared & Analyzed: 03/10/2020						
Antimony	0.049	0.00050	mg/L	0.05000		99	85-115			
Arsenic	0.050	0.00050	mg/L	0.05000		101	85-115			
Barium	0.049	0.00050	mg/L	0.05000		99	85-115			
Beryllium	0.054	0.00025	mg/L	0.05000		108	85-115			
Cadmium	0.051	0.00025	mg/L	0.05000		101	85-115			
Chromium	0.052	0.00050	mg/L	0.05000		103	85-115			
Copper	0.052	0.00050	mg/L	0.05000		104	85-115			
Lead	0.052	0.00050	mg/L	0.05000		103	85-115			
Manganese	0.050	0.00025	mg/L	0.05000		100	85-115			
Nickel	0.050	0.00050	mg/L	0.05000		99	85-115			
Selenium	0.051	0.0025	mg/L	0.05000		101	85-115			
Silver	0.047	0.00050	mg/L	0.05000		94	85-115			
Thallium	0.052	0.00050	mg/L	0.05000		105	85-115			
Zinc	0.093	0.040	mg/L	0.1000		93	85-115			
LCS Dup (2003102-BSD1)				Prepared & Analyzed: 03/10/2020						
Antimony	0.050	0.00050	mg/L	0.05000		99	85-115	0.2	20	
Arsenic	0.050	0.00050	mg/L	0.05000		100	85-115	0.3	20	
Barium	0.049	0.00050	mg/L	0.05000		99	85-115	0.1	20	
Beryllium	0.054	0.00025	mg/L	0.05000		108	85-115	0.1	20	
Cadmium	0.050	0.00025	mg/L	0.05000		101	85-115	0.5	20	
Chromium	0.052	0.00050	mg/L	0.05000		105	85-115	1	20	
Copper	0.052	0.00050	mg/L	0.05000		103	85-115	0.5	20	
Lead	0.052	0.00050	mg/L	0.05000		105	85-115	1	20	
Manganese	0.051	0.00025	mg/L	0.05000		102	85-115	2	20	
Nickel	0.051	0.00050	mg/L	0.05000		101	85-115	2	20	
Selenium	0.050	0.0025	mg/L	0.05000		100	85-115	1	20	
Silver	0.048	0.00050	mg/L	0.05000		96	85-115	2	20	
Thallium	0.053	0.00050	mg/L	0.05000		106	85-115	1	20	
Zinc	0.10	0.040	mg/L	0.1000		103	85-115	10	20	

Turner Laboratories, Inc.

Date: 04/03/2020

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003102 - E 200.8 (5.4)										
Matrix Spike (2003102-MS1)		**Source: 20C0222-01**		Prepared & Analyzed: 03/10/2020						
Antimony	0.049	0.00050	mg/L	0.05000	0.000083	98	70-130			
Arsenic	0.056	0.00050	mg/L	0.05000	0.0047	102	70-130			
Barium	0.058	0.00050	mg/L	0.05000	0.012	93	70-130			
Beryllium	0.044	0.0013	mg/L	0.05000	0.000080	88	70-130			
Cadmium	0.048	0.00025	mg/L	0.05000	ND	97	70-130			
Chromium	0.062	0.00050	mg/L	0.05000	0.0015	120	70-130			
Copper	0.050	0.00050	mg/L	0.05000	0.0059	89	70-130			
Lead	0.049	0.00050	mg/L	0.05000	ND	99	70-130			
Manganese	0.086	0.0013	mg/L	0.05000	0.041	89	70-130			
Nickel	0.060	0.00050	mg/L	0.05000	0.0030	114	70-130			
Selenium	0.063	0.0025	mg/L	0.05000	0.011	105	70-130			
Silver	0.042	0.00050	mg/L	0.05000	0.000037	85	70-130			
Thallium	0.050	0.00050	mg/L	0.05000	ND	100	70-130			
Zinc	0.094	0.040	mg/L	0.1000	0.0029	92	70-130			
Batch 2003115 - E 245.1										
Blank (2003115-BLK1)				Prepared & Analyzed: 03/10/2020						
Mercury	ND	0.0010	mg/L							
LCS (2003115-BS1)				Prepared & Analyzed: 03/10/2020						
Mercury	0.0053	0.0010	mg/L	0.005000		106	85-115			
LCS Dup (2003115-BSD1)				Prepared & Analyzed: 03/10/2020						
Mercury	0.0054	0.0010	mg/L	0.005000		108	85-115	2	20	
Matrix Spike (2003115-MS1)		**Source: 20C0173-01**		Prepared & Analyzed: 03/10/2020						
Mercury	0.0053	0.0010	mg/L	0.005000	0.000078	104	70-130			
Matrix Spike Dup (2003115-MSD1)		**Source: 20C0173-01**		Prepared & Analyzed: 03/10/2020						
Mercury	0.0048	0.0010	mg/L	0.005000	0.000078	95	70-130	9	20	
Batch 2003130 - SW6010 C										
Blank (2003130-BLK1)				Prepared: 03/10/2020 Analyzed: 03/11/2020						
Selenium	ND	0.040	mg/L							
LCS (2003130-BS1)				Prepared: 03/10/2020 Analyzed: 03/11/2020						
Selenium	2.0	0.040	mg/L	2.000		99	80-120			
LCS Dup (2003130-BSD1)				Prepared: 03/10/2020 Analyzed: 03/11/2020						
Selenium	2.0	0.040	mg/L	2.000		99	80-120	0.6	20	
Matrix Spike (2003130-MS1)		**Source: 20B0673-05**		Prepared: 03/10/2020 Analyzed: 03/11/2020						
Selenium	2.1	0.040	mg/L	2.000	0.078	101	75-125			
Matrix Spike Dup (2003130-MSD1)		**Source: 20B0673-05**		Prepared: 03/10/2020 Analyzed: 03/11/2020						
Selenium	2.1	0.20	mg/L	2.000	0.078	103	75-125	1	20	

Turner Laboratories, Inc.

Date: 04/03/2020

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2002326 - SM2540 C										
Duplicate (2002326-DUP1)		**Source: 20B0576-17**		Prepared: 02/28/2020 Analyzed: 03/04/2020						
Total Dissolved Solids (Residue, Filterable)	23000	20	mg/L		24000			4	5	
Duplicate (2002326-DUP2)		**Source: 20B0576-18**		Prepared: 02/28/2020 Analyzed: 03/04/2020						
Total Dissolved Solids (Residue, Filterable)	23000	20	mg/L		22000			1	5	
Duplicate (2002326-DUP3)		**Source: 20B0418-01RE1**		Prepared: 02/28/2020 Analyzed: 03/03/2020						
Total Dissolved Solids (Residue, Filterable)	3600	20	mg/L		3600			0.7	5	
Batch 2002343 - SM2540 D										
Duplicate (2002343-DUP1)		**Source: 20B0645-02**		Prepared: 02/28/2020 Analyzed: 03/03/2020						
Total Suspended Solids	2400	10	mg/L		2400			1	5	
Duplicate (2002343-DUP2)		**Source: 20B0673-04**		Prepared: 02/28/2020 Analyzed: 03/03/2020						
Total Suspended Solids	1.0	10	mg/L		ND			200	5	Q9
Batch 2003039 - SM2540 C										
Duplicate (2003039-DUP1)		**Source: 20C0072-01**		Prepared: 03/04/2020 Analyzed: 03/09/2020						
Total Dissolved Solids (Residue, Filterable)	990	20	mg/L		980			1	5	
Duplicate (2003039-DUP2)		**Source: 20C0010-01**		Prepared: 03/04/2020 Analyzed: 03/09/2020						
Total Dissolved Solids (Residue, Filterable)	22000	20	mg/L		22000			0.3	5	
Batch 2003068 - SM2320B										
Blank (2003068-BLK1)				Prepared & Analyzed: 03/06/2020						
Alkalinity, Bicarbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Carbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Hydroxide (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Total (As CaCO3)	ND	2.0	mg/L							
LCS (2003068-BS1)				Prepared & Analyzed: 03/06/2020						
Alkalinity, Total (As CaCO3)	250	2.0	mg/L	250.0		98	90-110			
LCS Dup (2003068-BSD1)				Prepared & Analyzed: 03/06/2020						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		95	90-110	3	10	
Matrix Spike (2003068-MS1)		**Source: 20B0645-02**		Prepared & Analyzed: 03/06/2020						
Alkalinity, Total (As CaCO3)	420	2.0	mg/L	250.0	200	90	70-130			
Matrix Spike Dup (2003068-MSD1)		**Source: 20B0645-02**		Prepared & Analyzed: 03/06/2020						
Alkalinity, Total (As CaCO3)	420	2.0	mg/L	250.0	200	88	70-130	1	10	
Batch 2003105 - SM2510 B										
LCS (2003105-BS1)				Prepared & Analyzed: 03/09/2020						
Conductivity	150	0.10	µmhos/cm	141.2		103	0-200			

Turner Laboratories, Inc.

Date: 04/03/2020

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003105 - SM2510 B										
LCS Dup (2003105-BSD1)				Prepared & Analyzed: 03/09/2020						
Conductivity	150	0.10	µmhos/cm	141.2		103	0-200	0	200	
Duplicate (2003105-DUP1)		**Source: 20B0673-04**		Prepared & Analyzed: 03/09/2020						
Conductivity	2300	0.50	µmhos/cm		2300			0	10	
Batch 2003152 - SM4500-H+ B										
Duplicate (2003152-DUP1)		**Source: 20B0645-02**		Prepared & Analyzed: 03/11/2020						
pH (pH Units)	7.3		-		7.3			0.5	200	H5
Temperature (°C)	28		-		28			0.4	200	H5
Batch 2003211 - SM4500-H+ B										
Duplicate (2003211-DUP1)		**Source: 20C0213-01**		Prepared & Analyzed: 03/16/2020						
pH (pH Units)	1.9		-		1.9			0	200	
Temperature (°C)	23		-		23			0.4	200	
Duplicate (2003211-DUP2)		**Source: 20C0213-08**		Prepared & Analyzed: 03/16/2020						
pH (pH Units)	1.8		-		1.8			3	200	
Temperature (°C)	23		-		23			0.9	200	
Batch 2003230 - SM4500-H+ B										
Duplicate (2003230-DUP1)		**Source: 20C0361-02**		Prepared & Analyzed: 03/17/2020						
pH (pH Units)	1.6		-		1.5			2	200	H5
Temperature (°C)	24		-		23			0.9	200	H5
Duplicate (2003230-DUP2)		**Source: 20B0698-01**		Prepared & Analyzed: 03/17/2020						
pH (pH Units)	1.8		-		1.7			2	200	H5
Temperature (°C)	25		-		25			0.8	200	H5
Batch 2003298 - SM2320B										
Blank (2003298-BLK1)				Prepared & Analyzed: 03/23/2020						
Alkalinity, Bicarbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Carbonate (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Hydroxide (As CaCO3)	ND	2.0	mg/L							
Alkalinity, Total (As CaCO3)	ND	2.0	mg/L							
LCS (2003298-BS1)				Prepared & Analyzed: 03/23/2020						
Alkalinity, Total (As CaCO3)	230	2.0	mg/L	250.0		94	90-110			
LCS Dup (2003298-BSD1)				Prepared & Analyzed: 03/23/2020						
Alkalinity, Total (As CaCO3)	240	2.0	mg/L	250.0		95	90-110	2	10	
Matrix Spike (2003298-MS1)		**Source: 20C0438-01**		Prepared & Analyzed: 03/23/2020						
Alkalinity, Total (As CaCO3)	280	2.0	mg/L	250.0	50	90	70-130			
Matrix Spike Dup (2003298-MSD1)		**Source: 20C0438-01**		Prepared & Analyzed: 03/23/2020						
Alkalinity, Total (As CaCO3)	270	2.0	mg/L	250.0	50	90	70-130	0.7	10	

Turner Laboratories, Inc.

Date: 04/03/2020

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003278 - E300.0 (2.1)										
Blank (2003278-BLK1)				Prepared & Analyzed: 03/20/2020						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (2003278-BS1)				Prepared & Analyzed: 03/20/2020						
Chloride	12	1.0	mg/L	12.50		97	90-110			
Fluoride	2.0	0.50	mg/L	2.000		102	90-110			
Sulfate	12	5.0	mg/L	12.50		99	90-110			
LCS Dup (2003278-BSD1)				Prepared & Analyzed: 03/20/2020						
Chloride	12	1.0	mg/L	12.50		97	90-110	0.6	10	
Fluoride	2.1	0.50	mg/L	2.000		104	90-110	2	10	
Sulfate	12	5.0	mg/L	12.50		100	90-110	0.2	10	
Matrix Spike (2003278-MS1)	**Source: 20C0314-01**			Prepared: 03/20/2020 Analyzed: 03/25/2020						
Sulfate	290	50	mg/L	125.0	210	64	80-120			M2
Matrix Spike (2003278-MS2)	**Source: 20C0362-05**			Prepared: 03/20/2020 Analyzed: 03/25/2020						
Chloride	12	1.0	mg/L	12.50	ND	98	80-120			
Fluoride	2.0	0.50	mg/L	2.000	ND	99	80-120			
Sulfate	13	5.0	mg/L	12.50	ND	100	80-120			
Matrix Spike Dup (2003278-MSD1)	**Source: 20C0314-01**			Prepared: 03/20/2020 Analyzed: 03/25/2020						
Sulfate	290	50	mg/L	125.0	210	66	80-120	0.8	10	M2
Matrix Spike Dup (2003278-MSD2)	**Source: 20C0362-05**			Prepared: 03/20/2020 Analyzed: 03/26/2020						
Chloride	12	1.0	mg/L	12.50	ND	99	80-120	0.4	10	
Fluoride	2.0	0.50	mg/L	2.000	ND	101	80-120	3	10	
Sulfate	13	5.0	mg/L	12.50	ND	100	80-120	0.3	10	
Batch 2003279 - E300.0 (2.1)										
Blank (2003279-BLK1)				Prepared & Analyzed: 03/20/2020						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (2003279-BS1)				Prepared & Analyzed: 03/20/2020						
Chloride	12	1.0	mg/L	12.50		95	90-110			
Fluoride	2.1	0.50	mg/L	2.000		104	90-110			
Sulfate	12	5.0	mg/L	12.50		99	90-110			
LCS Dup (2003279-BSD1)				Prepared & Analyzed: 03/20/2020						
Chloride	12	1.0	mg/L	12.50		95	90-110	0.06	10	
Fluoride	2.1	0.50	mg/L	2.000		104	90-110	0.2	10	
Sulfate	12	5.0	mg/L	12.50		99	90-110	0.2	10	
Matrix Spike (2003279-MS1)	**Source: 20C0514-02**			Prepared: 03/20/2020 Analyzed: 03/27/2020						
Chloride	12	1.0	mg/L	12.50	ND	100	80-120			
Fluoride	2.0	0.50	mg/L	2.000	ND	98	80-120			
Sulfate	13	5.0	mg/L	12.50	ND	102	80-120			

Client: Veolia Water Technologies
Project: Arizona Minerals
Work Order: 20B0673
Date Received: 02/27/2020

QC Summary

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 2003279 - E300.0 (2.1)										
Matrix Spike (2003279-MS2)	**Source: 20C0362-06**			Prepared: 03/20/2020 Analyzed: 03/27/2020						
Chloride	12	1.0	mg/L	12.50	ND	98	80-120			
Fluoride	2.0	0.50	mg/L	2.000	ND	101	80-120			
Sulfate	12	5.0	mg/L	12.50	1.5	88	80-120			
Matrix Spike Dup (2003279-MSD1)	**Source: 20C0514-02**			Prepared: 03/20/2020 Analyzed: 03/27/2020						
Chloride	12	1.0	mg/L	12.50	ND	99	80-120	0.9	10	
Fluoride	2.0	0.50	mg/L	2.000	ND	99	80-120	1	10	
Sulfate	13	5.0	mg/L	12.50	ND	102	80-120	0.1	10	
Matrix Spike Dup (2003279-MSD2)	**Source: 20C0362-06**			Prepared: 03/20/2020 Analyzed: 03/28/2020						
Chloride	13	1.0	mg/L	12.50	ND	100	80-120	2	10	
Fluoride	2.0	0.50	mg/L	2.000	ND	102	80-120	0.6	10	
Sulfate	13	5.0	mg/L	12.50	1.5	90	80-120	2	10	
Batch 2003280 - E300.0 (2.1)										
Blank (2003280-BLK1)				Prepared & Analyzed: 03/21/2020						
Chloride	ND	1.0	mg/L							
Fluoride	ND	0.50	mg/L							
Sulfate	ND	5.0	mg/L							
LCS (2003280-BS1)				Prepared & Analyzed: 03/21/2020						
Chloride	12	1.0	mg/L	12.50		98	90-110			
Fluoride	2.0	0.50	mg/L	2.000		102	90-110			
Sulfate	13	5.0	mg/L	12.50		100	90-110			
LCS Dup (2003280-BSD1)				Prepared & Analyzed: 03/21/2020						
Chloride	12	1.0	mg/L	12.50		96	90-110	1	10	
Fluoride	2.0	0.50	mg/L	2.000		101	90-110	0.8	10	
Sulfate	12	5.0	mg/L	12.50		100	90-110	0.9	10	
Matrix Spike (2003280-MS1)	**Source: 20C0524-01**			Prepared: 03/21/2020 Analyzed: 03/27/2020						
Chloride	250	1.0	mg/L	12.50		NR	80-120			
Fluoride	2.3	0.50	mg/L	2.000	0.92	69	80-120			M2
Sulfate	140	5.0	mg/L	12.50	16	1000	80-120			M1
Matrix Spike Dup (2003280-MSD1)	**Source: 20C0524-01**			Prepared: 03/21/2020 Analyzed: 03/27/2020						
Chloride	250	1.0	mg/L	12.50		NR	80-120	0.08	10	
Fluoride	1.9	0.50	mg/L	2.000	0.92	48	80-120	20	10	M2, R13
Sulfate	140	5.0	mg/L	12.50	16	1000	80-120	0.05	10	E, M1

2445 N. Coyote Drive, Suite 104
Tucson, Arizona 85745
(520) 882-5880
Fax: (520) 882-9788
www.turnerlabs.com

TURNER LABORATORIES INC.

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

TURNER WORK ORDER # 20B0673 DATE 2/26/20 PAGE 1 OF 1

PROJECT NAME South 32 #

CONTACT NAME Michael Taylor

COMPANY NAME Veolia Water Technologies

ADDRESS 6981 N. Park Dr.

ZIP 08109 PHONE 856 438 1765 EMAIL michael.Taylor@Veolia.com

SAMPLER'S SIGNATURE [signature]

CIRCLE ANALYSIS REQUESTED AND/OR CHECK THE APPROPRIATE BOX

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX*	NUMBER OF CONTAINERS	Base Neutrals 625/8270 ☐ Acids ☐	Volatile Organics ☐ 624 ☐ 524.2 ☐ 8260	TTHMS ☐ HAAS ☐	☒ Chloride ☒ Sulfate ☐ Resistivity	NO_2 ☐ NO_3 ☐ TKN ☐	☐ TPH 1664 ☐ Oil & Grease	TCLP Analysis VOA ☐ Semi-VOA ☐ Pest. ☐	Metals TCLP ☐ Dissolved ☒	Metals Total ☒ RCRA8 ☐	Cyanide Total ☐ Amen. ☐ WAD ☐	SDWA-INORGANICS PRIMARY ☐ SECONDARY ☐	Coliform MPN ☐ PIA ☐ Fecal ☐	pH ☐ Cr_6 ☐ Cl_2 ☐ Turb ☐	COD ☐ TSS ☒ BOD ☐		Please see attached analyte list	
S32 Raw	2/13/20	9:00AM		WW					X				X	X					X			
RO Conc	2/13/20	10:00AM		WW					X				X	X					X			
60% RO Permeate	2/13/20	10:00AM		WW					X				X	X					X			
Final Effluent	2/21/20	9:00AM		WW					X				X	X					X			
Desaturation Sludge	2/21/20	9:00AM		WW									TCLP Metals									
Desaturated Conc.	2/21/20	9:00AM		WW					X				X	X					X			

1. RELINQUISHED BY:
Signature [signature]
Printed Name Michael Taylor
Firm Veolia Water Tech
Date/Time 2/26/20 10:00AM

2. RECEIVED BY:
Signature
Printed Name FedEx
Firm
Date/Time

TURNAROUND REQUIREMENTS:
X Standard (approx. 10 days)*
___ Next Day ___ 2 Day ___ 5 Day*
___ Email Preliminary Results
* Working Days

REPORT REQUIREMENTS:
___ I. Routine Report
___ II. Report (includes DUP, MS, MSD, as required, may be charged as samples)
___ III. Date Validation Report (Includes All Raw Data) Add 10% to invoice

INVOICE INFORMATION:
Account ___ Y ___ N
P.O. #
Bill to:

SAMPLE RECEIPT:
Total Containers 15
Temperature 4.6
☒ Wet Ice
☐ Ambient
☐ Blue Ice

3. RELINQUISHED BY:
Signature FedEx 2/27 -10:00
Printed Name
Firm
Date/Time

4. RECEIVED BY:
Signature [signature]
Printed Name Cammi Winters
Firm TURNER LABORATORIES, INC.
Date/Time 2/27/20 10:00 CW

* LEGEND
SAMPLE MATRIX
DW = DRINKING WATER
GW = GROUNDWATER
SD = SOLID
SG = SLUDGE
SL = SOIL
ST = STORMWATER
WW = WASTEWATER

Compliance Analysis: ☐ Yes ☐ No	Custody Seals ☐	Preservation Confirmation ☒
ADEQ Forms: ☐ Yes ☐ No	Container Intact ☒	Appropriate Head Space ☒
Mail ADEQ Forms: ☐ Yes ☐ No	COC / Labels Agree ☒	Received Within Hold Time ☒

SPECIAL INSTRUCTIONS/COMMENTS:

Sample Analysis Program

Analyte	Total	Dissolved	Other
Metals			
Antimony	X	X	
Arsenic	X	X	
Barium	X	X	
Beryllium	X	X	
Boron	X	X	
Cadmium	X	X	
Chromium, total	X	X	
Copper	X	X	
Iron	X	X	
Lead	X	X	
Manganese	X	X	
Mercury	X	X	
Nickel	X	X	
Selenium	X	X	
Silver	X	X	
Thallium	X	X	
Zinc	X	X	
Major Cations			
Hardness ($CaCO_3$)	X		
Calcium	X		
Magnesium	X		
Potassium	X		
Sodium	X		
Major Anions			
Total Alkalinity	X		
Acidity	X		
Fluoride	X		
Sulfate	X		
Chloride	X		
Parameters			
Total Dissolved Solids		X	
Total Suspended Solids	X		
Conductivity	X		

Michael Taylor
Process Lab Manager, Philadelphia Office

VEOLIA WATER TECHNOLOGIES
off.: +1
856-438-1765
6981 N. Park Drive, Suite 600 /Pennsauken, NJ 08109 USA

www.veoliawatertech.com

Attachment A
Sample Analysis Program

Analyte	Total	Dissolved	Other
Metals			
Antimony	X	X	
Arsenic	X	X	
Barium	X	X	
Beryllium	X	X	
Boron	X	X	
Cadmium	X	X	
Chromium, total	X	X	
Copper	X	X	
Iron	X	X	
Lead	X	X	
Manganese	X	X	
Mercury	X	X	
Nickel	X	X	
Selenium	X	X	
Silver	X	X	
Thallium	X	X	
Zinc	X	X	
Major Cations			
Hardness ($CaCO_3$)	X		
Calcium	X		
Magnesium	X		
Potassium	X		
Sodium	X		
Major Anions			
Total Alkalinity	X		
Acidity	X		
Fluoride	X		
Sulfate	X		
Chloride	X		
Parameters			
Total Dissolved Solids		X	
Total Suspended Solids	X		
Conductivity	X		

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

January 28, 2020

Report to:	Bill to:
Sarah Richman	Accounts Payable
Arizona Minerals Inc.	Arizona Minerals Inc.
2210 East Fort Lowell Rd	2210 E Fort Lowell Road
Tucson, AZ 85719	Tucson, AZ 85719

cc: Sheena Leon

Project ID:
ACZ Project ID: L57032

Sarah Richman:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on January 22, 2020. This project has been assigned to ACZ's project number, L57032. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L57032. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

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

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

All samples and sub-samples associated with this project will be disposed of after January 17, 2022. If the samples are determined to be hazardous, additional charges apply for disposal (typically $11/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical raw data reports for ten years.

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

S. Habermehl

Scott Habermehl has reviewed and approved this report.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Arizona Minerals Inc.
Project ID:
Sample ID: WTP AUDIT 1

ACZ Sample ID: ***L57032-01***
Date Sampled: *01/16/20 12:45*
Date Received: *01/22/20*
Sample Matrix: *Groundwater*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A								01/23/20 10:15	slm

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Selenium, +4	SM 3114 B, AA-Hydride	1		U	*	mg/L	0.001	0.005	01/24/20 12:51	slm
Selenium, +4 and +6	SM 3114 B, AA-Hydride	1	0.0018	B	*	mg/L	0.001	0.005	01/24/20 11:59	slm
Selenium, +6 (calc)	SM 3114 B, AA-Hydride		0.002	B		mg/L	0.001	0.005	01/27/20 0:00	calc
Selenium, dissolved	SM 3114 B, AA-Hydride	1	0.0020	B		mg/L	0.001	0.005	01/27/20 13:42	slm
Selenium, organic (calc)	SM 3114 B, AA-Hydride			U		mg/L	0.001	0.005	01/27/20 0:00	calc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um filter)	SOPWC050	1							01/23/20 8:21	mlh

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Arizona Minerals Inc.
Project ID:
Sample ID: WTP AUDIT 2

ACZ Sample ID: ***L57032-02***
Date Sampled: *01/16/20 12:45*
Date Received: *01/22/20*
Sample Matrix: *Groundwater*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A								01/23/20 10:15	slm

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Selenium, +4	SM 3114 B, AA-Hydride	1		U	*	mg/L	0.001	0.005	01/24/20 12:53	slm
Selenium, +4 and +6	SM 3114 B, AA-Hydride	1	0.0018	B	*	mg/L	0.001	0.005	01/24/20 12:05	slm
Selenium, +6 (calc)	SM 3114 B, AA-Hydride		0.002	B		mg/L	0.001	0.005	01/27/20 0:00	calc
Selenium, dissolved	SM 3114 B, AA-Hydride	1	0.0021	B		mg/L	0.001	0.005	01/27/20 13:44	slm
Selenium, organic (calc)	SM 3114 B, AA-Hydride			U		mg/L	0.001	0.005	01/27/20 0:00	calc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um filter)	SOPWC050	1							01/23/20 8:24	mlh

Arizona license number: AZ0102

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Arizona Minerals Inc.
Project ID:
Sample ID: WTP AUDIT 5

ACZ Sample ID: ***L57032-03***
Date Sampled: *01/16/20 12:45*
Date Received: *01/22/20*
Sample Matrix: *Groundwater*

Inorganic Prep

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um) & Acidification	M200.7/200.8/3005A								01/23/20 10:15	slm

Metals Analysis

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Selenium, +4	SM 3114 B, AA-Hydride	1		U	*	mg/L	0.001	0.005	01/24/20 12:59	slm
Selenium, +4 and +6	SM 3114 B, AA-Hydride	1	0.0017	B	*	mg/L	0.001	0.005	01/24/20 12:07	slm
Selenium, +6 (calc)	SM 3114 B, AA-Hydride		0.002	B		mg/L	0.001	0.005	01/27/20 0:00	calc
Selenium, dissolved	SM 3114 B, AA-Hydride	1	0.0023	B		mg/L	0.001	0.005	01/27/20 13:46	slm
Selenium, organic (calc)	SM 3114 B, AA-Hydride			U		mg/L	0.001	0.005	01/27/20 0:00	calc

Wet Chemistry

Parameter	EPA Method	Dilution	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Lab Filtration (0.45um filter)	SOPWC050	1							01/23/20 8:27	mlh

Arizona license number: AZ0102

ACZ Laboratories, Inc.
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Inorganic Reference

Report Header Explanations

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

QC Sample Types

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

QC Sample Type Explanations

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

ACZ Qualifiers (Qual)

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

Method References

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

Comments

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

For a complete list of ACZ□s Extended Qualifiers, please click:
https://acz.com/wp-content/uploads/2019/04/Ext-Qual-List.pdf

REP001.03.15.02

Arizona Minerals Inc. ACZ Project ID: ***L57032***

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

Selenium, +4 SM 3114 B, AA-Hydride

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG490571													
WG490571ICV	ICV	01/24/20 12:43	SE200123-1	.025025		.026	mg/L	104	90	110			
WG490571ICB	ICB	01/24/20 12:45				U	mg/L		-0.003	0.003			
WG490571LRB	LRB	01/24/20 12:47				U	mg/L		-0.003	0.003			
WG490571LFB	LFB	01/24/20 12:49	SE200123-3	.02012		.0205	mg/L	102	85	115			
L57032-02LFM	LFM	01/24/20 12:55	SE200123-3	.02012	U	.0211	mg/L	105	85	115			
L57032-02LFMD	LFMD	01/24/20 12:57	SE200123-3	.02012	U	.0214	mg/L	106	85	115	1	20	

Selenium, +4 and +6 SM 3114 B, AA-Hydride

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG490469													
WG490469ICV	ICV	01/24/20 11:51	SE200103-2	.025025		.0265	mg/L	106	90	110			
WG490469ICB	ICB	01/24/20 11:53				U	mg/L		-0.003	0.003			
WG490469LRB	LRB	01/24/20 11:55				U	mg/L		-0.003	0.003			
WG490469LFB	LFB	01/24/20 11:57	SE200103-4	.02224		.0236	mg/L	106	85	115			
L57032-01LFM	LFM	01/24/20 12:01	SE200103-4	.02224	.0018	.0188	mg/L	76	85	115			MA
L57032-01LFMD	LFMD	01/24/20 12:03	SE200103-4	.02224	.0018	.0219	mg/L	90	85	115	15	20	

Selenium, dissolved SM 3114 B, AA-Hydride

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec%	Lower	Upper	RPD	Limit	Qual
WG490636													
WG490636ICV	ICV	01/27/20 13:09	SE200103-2	.025025		.0271	mg/L	108	90	110			
WG490636ICB	ICB	01/27/20 13:11				U	mg/L		-0.003	0.003			
WG490636LRB	LRB	01/27/20 13:13				U	mg/L		-0.003	0.003			
WG490636LFB	LFB	01/27/20 13:15	SE200103-4	.02224		.0235	mg/L	106	85	115			
L56977-01LFM	LFM	01/27/20 13:19	SE20XPREP	.4448	.0205	.475	mg/L	102	85	115			
L56977-01LFMD	LFMD	01/27/20 13:21	SE20XPREP	.4448	.0205	.494	mg/L	106	85	115	4	20	
L57032-03LFM	LFM	01/27/20 13:48	SE200103-4	.02224	.0023	.0246	mg/L	100	85	115			
L57032-03LFMD	LFMD	01/27/20 13:50	SE200103-4	.02224	.0023	.0252	mg/L	103	85	115	2	20	

Arizona Minerals Inc. ACZ Project ID: ***L57032***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L57032-01	WG490469	Selenium, +4 and +6	SM 3114 B, AA-Hydride	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
L57032-02	WG490469	Selenium, +4 and +6	SM 3114 B, AA-Hydride	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
L57032-03	WG490469	Selenium, +4 and +6	SM 3114 B, AA-Hydride	MA	Recovery for either the spike or spike duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.

Metals Analysis

The following parameters are not offered for certification or are not covered by AZ certificate #AZ0102.		
	Selenium, +4	SM 3114 B, AA-Hydride
	Selenium, +4 and +6	SM 3114 B, AA-Hydride
The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.		
	Selenium, +4	SM 3114 B, AA-Hydride
	Selenium, +4 and +6	SM 3114 B, AA-Hydride

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Arizona Minerals Inc.

ACZ Project ID: L57032
Date Received: 01/22/2020 10:33
Received By:
Date Printed: 1/22/2020

Receipt Verification

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

Samples/Containers

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

NA indicates Not Applicable

Chain of Custody Related Remarks

Client Contact Remarks

Shipping Containers

Cooler Id	Temp(°C)	Temp Criteria(°C)	Rad(µR/Hr)	Custody Seal Intact?
6283	5.3	<=6.0	15	Yes

Was ice present in the shipment container(s)?

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

Client must contact an ACZ Project Manager if analysis should not proceed for samples received outside of their thermal preservation acceptance criteria.

ACZ Laboratories, Inc.
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Sample Receipt

Arizona Minerals Inc.

ACZ Project ID:	L57032
Date Received:	01/22/2020 10:33
Received By:	
Date Printed:	1/22/2020

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

ACZ Laboratories, Inc. L57032

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Sarah Richman	Address: 2210 E. Ft. Lowell Rd.
Company: South32	Tucson, Az 85719
E-mail: sarah.richman@south32.net	Telephone: 520-485-1300

Copy of Report to:

Name: Sheena Leon	E-mail: sheena.leon@south32.net
Company: South32	Telephone: 520-403-9998

Invoice to:

Name:	Address: 2210 E. Ft Lowell Rd
Company: South 32	Tucson, Az 85719
E-mail: hermosaaccounts@south32.net	Telephone: 520-485-1300

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ☐ NO ☐

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified

Are samples for SDWA Compliance Monitoring? Yes ☐ No ✓

If yes, please include state forms. Results will be reported to PQL for Colorado.

Sampler's Name: Lydia M. **Sampler's Site Information** State Az Zip code 85624 Time Zone Az

***Sampler's Signature:** [signature]

*I attest to the authenticity and validity of this sample. I understand that intentionally mislabeling the time/date/location or tampering with the sample in anyway, is considered fraud and punishable by State Law.

PROJECT INFORMATION ANALYSES REQUESTED *(attach list or use quote number)*

Quote #:

PO#:

Reporting state for compliance testing:

Check box if samples include NRC licensed material? ☐

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Se Speciation							
WTP Audit 1	1/16/20 12:45	GW	2	✓							
WTP Audit 2	1/16/20 12:45	GW	2	✓							
WTP Audit 5	1/16/20 12:45	GW	2	✓							

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
Lydia Mortensen	1/16/20 2:00	[signature] 1/22/20	10:30

L57032 Chain of Custod

FRMAD050.06.14.14 White - Return with sample. Yellow - Retain for your records.

L57032-2001280852

APPENDIX G: STUDY REPORTS

BQE Water

Removal of Selenium from Membrane Retentate Using Electro-Reduction - WTP Modification at Hermosa

Bench Scale Testing and Treatability Assessment

April 2, 2020

Prepared for:
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CEO & President

Confidentiality

This document has been prepared exclusively for South 32 by BQE Water Inc. The document is strictly confidential and is intended only for the use of the recipient's authorized personnel.

BQE Water

Table of Contents

1. Executive Summary

Arizona Minerals Inc. (AMI), must modify the existing Water Treatment Plant at Hermosa to reduce sulfate and selenium concentrations to below respective treatment targets of 800 mg/L and 1.6 µg/L. The proposed additional treatment stages include: first, membrane treatment using Reverse Osmosis (RO) for rejection of selenium and sulfate salts that generates a clean permeate stream while concentrating the salts into a supersaturated retentate stream; second, desaturation of the retentate stream to remove sulfate as gypsum, and third re-blending of permeate and desaturated retentate. None of these stages remove selenium. Thus, an additional treatment stage is required. Understanding the unique project requirements, and based on AMI's knowledge of BQE Water's expertise and experience, AMI engaged BQE Water to perform a technical review of the proposed treatment process and to perform bench scale testing to assess the efficiency of electro-reduction as the additional treatment stage to remove selenium from membrane retentate.

Based on the outcome of the review, BQE Water decided to perform treatability testing using the Electro-Reduction Circuit (ERC) to remove selenium from synthetic solutions mimicking the composition of both retentate streams that would be produced by Reverse Osmosis (RO) and Nanofiltration (NF).

Results of Treatability Tests:

- ERC successfully removed selenium to below the target of 1.6 µg/L from both RO and NF retentates and initial selenium concentrations as high as 45 µg/L.
- Solid residue generated by ERC treatment passes TCLP and is suitable for non-hazardous landfill disposal.
- ERC helps remove copper, arsenic, and lead from retentate and achieve incremental improvement in metals removal in WTP over and above the removal achieved by MULTIFLO.
- A portion of nitrate contained in retentate is converted to ammonia. If RO is selected, then the need for operating the MBBR system to re-oxidize ammonia back to nitrate needs to be assessed.
- Treated water may contain slightly higher concentration of manganese than the feed.

2. Project Background

Arizona Minerals Inc. (AMI) has to modify the existing water treatment plant (WTP) at Hermosa to reduce sulfate and selenium concentrations to below respective treatment targets of 800 mg/L and 1.6 µg/L. The treatment process proposed for sulfate removal by Veolia involves the use of Reverse Osmosis (RO) and gypsum desaturation from RO retentate. No solution was proposed for selenium removal as primarily the low discharge limit of selenium is very difficult to meet by many treatment processes.

Recently, BQE Water completed successful pilot scale demonstration of simultaneous removal of sulfate and selenium from industrial waste water with key characteristics similar to the feed of WTP at Hermosa. The pilot treatment flowsheet included Nanofiltration (NF) combined with retentate desaturation for sulfate removal and selenium removal by the Electro-reduction circuit (ERC). Thus, BQE Water considered ERC to be a good technical fit for selenium control at Hermosa and AMI requested that BQE Water perform treatability testing using a synthetically prepared solution of membrane retentate.

This document summarizes BQE Water's review of selenium and sulfate removal integration into the existing WTP and the results of bench scale treatability testing of selenium removal in ERC carried out using synthetically prepared desaturated membrane retentate solution.

3. Objectives

The main objectives of this work is to demonstrate that ERC can meet the expected effluent water quality for selenium at an acceptable cost assuming that membrane and desaturation treatment processes operate as per design expectations. Specifically the objectives include:

- Validate treatability of membrane retentate in ERC for selenium removal.
- Assess the deportment of other species during the ERC treatment.
- Establish the composition and stability of the solids generated by ERC treatment

4. Integration of Selenium Removal into WTP Flowsheet

This section summarizes BQE Water's analysis of the possible options for integrating selenium removal by electro-reduction into the WTP flowsheet including:

- Review of existing WTP feed and treated water quality.
- Review of proposed engineering design basis for Reverse Osmosis (RO).
- Selenium electro-reduction integration into:
  - Base case flowsheet using RO; and
  - Alternate flowsheet using NF and different membrane pre-treatment and retentate desaturation conditions.

4.1 Review of Existing WTP Feed and Discharge Water Quality

The existing WTP operation consists of pH adjustment using lime (with optional ferric addition) followed by solid-liquid separation in a MULTIFLO clarifier and an ultrafiltration (UF) stage. The original treatment objective was to remove suspended solids and dissolved metals upstream of the biological ammonia removal plant (MBBR). Since ammonia removal is not required, the MBBR plant is not operating.

BQE Water's review of the plant operation data supplied by AMI revealed the following key differences between the plant feed and treated water quality that are salient to the application of membrane treatment downstream of UF and integration of selenium removal into the treatment of membrane retentate:

- There is a significant increase in calcium concentration between feed and effluent caused by lime addition (~120 mg/L).
- There is a major drop in alkalinity (~ 180 mg/L) across the existing treatment presumably caused by lime addition and precipitation of $CaCO_3$.
- There is a noticeable drop in magnesium concentration (~ 120 mg/L) across the existing treatment caused by lime addition and precipitation of $Mg(OH)_2$.

In addition, the following characteristics of the existing treatment are salient to the analysis of different selenium removal options integrated into WTP:

- There is a very small load of dissolved metals reporting to WTP (single digit ppm) mainly because the feed water pH is circumneutral which limits the solubility of most metals.
- The different sulfate concentrations in the feed and treated water is relatively small due to the fact that the feed water is gypsum saturated and the portion of total sulfate associated with heavy metals dissolved in plant feed and partial magnesium removal is relatively small.

As the flowsheet of WTP is expanded to achieve sulfate and selenium removal, the purpose of the existing treatment system changes too. Specifically, in addition to protecting the microbial population in the MBBR from heavy metals poisoning, the system must also act as an effective pre-treatment to protect the membrane system that will be installed downstream of UF. Moreover, if possible, the existing system should be operated such that it aids the selenium removal system applied to the membrane retentate.

The suitability of the current mode of WTP operation including the resultant changes in water quality and treatment characteristics are discussed in Sections 4.2 and 4.3.

4.2 Key Aspects of Successful Integration of Selenium Removal into WTP

The key aspects of successful integration of selenium removal into the WTP at Hermosa include the following:

- Choice of membrane type.
- Control of scaling potential in the membrane system.
- Conditions selected in gypsum desaturation step.

All of these aspects are discussed in detail in sections below.

Choice of Membrane Type

The project objective is to remove selenium and sulfate. Both are present as divalent anions. While RO will remove these target species, it will also remove all mono-valent species which does not produce any benefit. In fact, the removal of monovalent nitrate ions by RO may result in the need to start operating the MBBR process which is currently not needed. This is because selenium removal by ERC converts a portion of nitrate to ammonia, which must then be re-oxidized back to nitrate. Moreover, RO is always subject to a higher risk of fouling, a lower water recovery, and a higher operating pressure as compared to NF. NF membranes achieve a very similar level of removal, as that of RO, for divalent ions such as selenate and sulfate. However, the pores in NF membranes are much larger than those in RO, which is the main reason for all the other benefits, i.e. lower operating pressure, risk of scaling, and higher water recovery. Based on this, BQE Water decided to carry out treatability tests for both RO and NF retentate solutions.

Membrane Pre-treatment and Control of Scaling Potential

Table 4-1 demonstrates the impact of existing pre-treatment using lime addition, and of membrane selection, on the scaling potential and overall performance of the membrane system operating upstream of selenium reduction by ERC. The risk of scaling is captured by the value of saturation indices for calcite and gypsum. The higher the value of each index, the greater the risk of scaling. The electric conductivity of membrane retentate is difficult to calculate, however, there is a clear difference between retentate generated from raw feed and of that generated from feed pre-treated with lime. This has an impact on the selenium reduction process. The higher the electrical conductivity, the easier and less expensive the electro-reduction process.

Table 4-1. Saturation Indices and Conductivity of Retentate Produced by RO and NF Operating on Raw Feed and Feed Pre-treated with Lime.

Retentate Scaling Potential & Conductivity	Raw Feed	Feed Pre-treated with Lime
RO (60% water recovery)		
Calcite - Stiff & Davis Stability Index (S&DSI)	1.6	1.1
Gypsum Saturation Index (SI)	4.9	6.5

Retentate – Electric Conductivity	High	Low
NF (70% water recovery)		
Calcite S&DSI	1.3	NC
Gypsum Saturation Index (SI)	4.9	NC
Retentate – Electric Conductivity	High	NC

NC = Not Considered

As can be seen from Table 4-1, pre-treatment with lime slightly reduces the risk of scaling associated with calcite but increases the risk of scaling associated with gypsum quite significantly. It also reduces the electrical conductivity of retentate which negatively impacts selenium reduction downstream. Furthermore, Table 4-1 shows that the risk of scaling for NF operating on raw feed, while achieving 70% water recovery, is comparable to that observed for RO operating on pre-treated feed with a 60% water recovery. The operation of NF on feed pre-treated by lime is not considered as lime pre-treatment for RO was shown to be technical inferior for the Se removal.

Based on all of the above, NF is favored over RO as the membrane of choice for sulfate and selenium removal at WTP. To summarize, NF still requires pre-treatment but the pre-treatment is simplified, consisting of suspended solids removal and the removal of certain dissolved constituents without the need for increasing pH.

Process Conditions in Retentate Gypsum Desaturation Stage

One of the key process parameter of the retentate desaturation process is the pH setpoint. The use of pH setpoint with pH > 11 would maximize sulphate removal, however, it could also negatively impact the operating cost and efficiency of selenium electro-reduction downstream of the retentate de-saturation stage. Based on BQE Water's expertise in selenium removal and analysis of the water chemistry at Hermosa indicates that the desaturation process operating at pH < 9.5 would still achieve the overall sulfate treatment target while ensuring that selenium electro-reduction operates at high efficiency.

4.3 Options for Integration of Electro-Reduction for Selenium Removal into WTP at Hermosa

Electro-reduction utilizes iron released from anodes in electrolytic cells to precipitate selenium from the retentate. The main process consumables are power and iron. Power consumption is proportional to solution conductivity. Iron consumption depends on a number of factors including selenium concentration and selenium treatment target.

Figures 4-1a and 4-1b depict the two scenarios considered by BQE Water for integration of ERC into WTP at Hermosa including:

1. Flowsheet involving RO operating at 60% water recovery; and
2. Flowsheet involving NF operating at 70% water recovery.

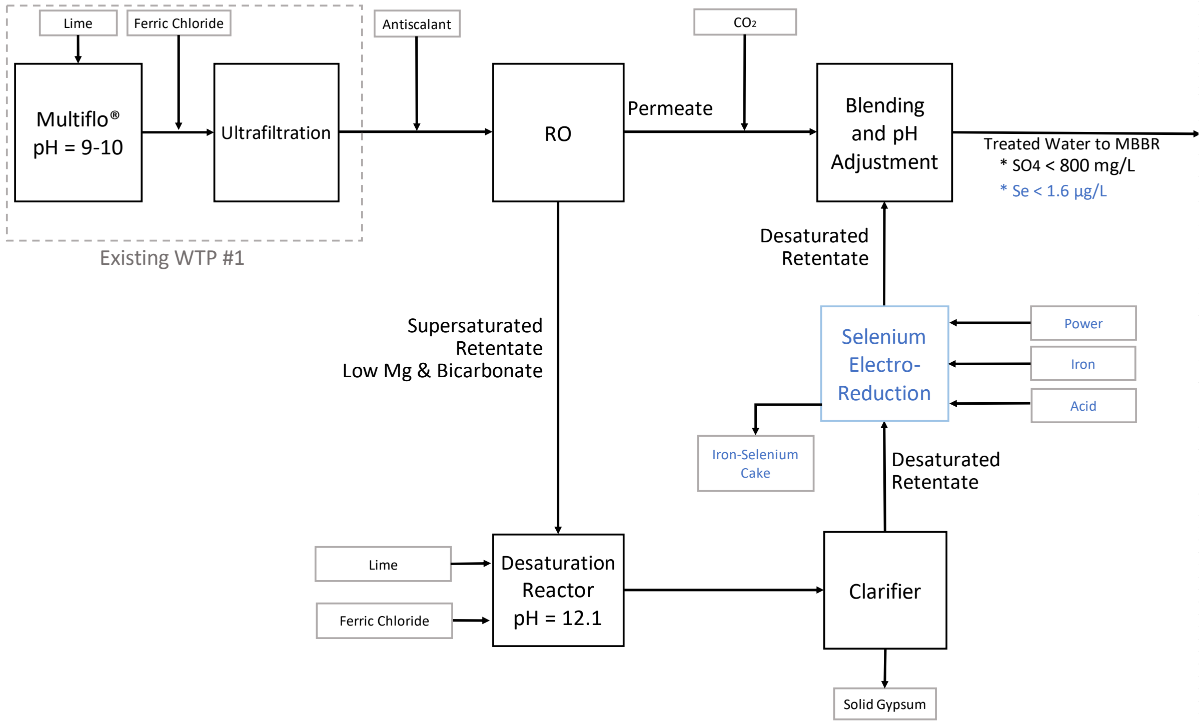

Figure 4-1a. Flowsheet using RO and ERC.

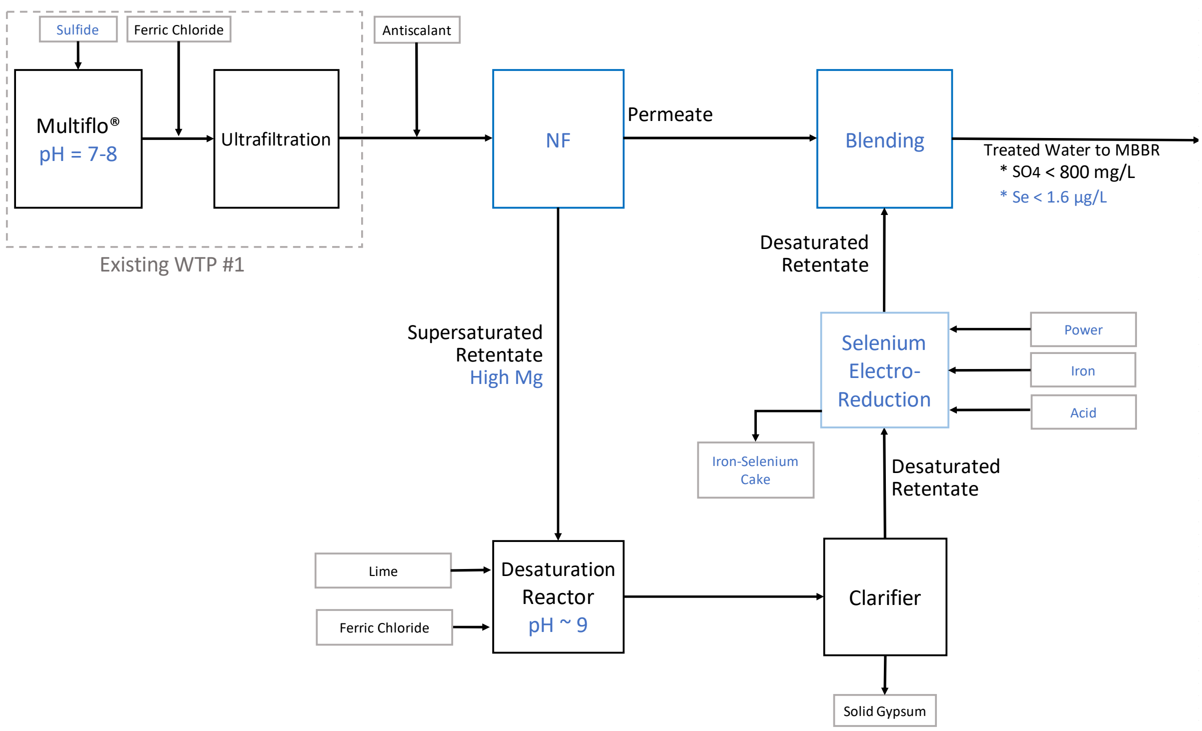

Figure 4-1b. Flowsheet using NF and ERC.

In both flowsheet scenarios, ERC is applied to remove selenium from the de-saturated membrane retentate. However, there are several key difference between the two flowsheets that are highlighted in blue in Figures 4-1b including:

- Difference in pH and reagents used in as part of membrane pre-treatment in the existing MULTIFLO system.
- Difference in the choice of membrane type, e.g. RO vs NF.
- pH used during desaturation of membrane retentate.
- Re-acidification requirement for the final effluent and the associated injection of CO_2.

5. Methodology

5.1 Preparation of Synthetic Retentate Solutions

Two different retentate solutions were prepared for ERC testing including

- Retentate expected to be produced by RO operating at 60% water recovery, and desaturated with respect to gypsum at pH 12.1; and
- Retentate expected to be produced by NF operating at 70% water recovery, and desaturated with respect to gypsum at neutral pH

Synthetic solutions were prepared and stored in two 30-gallon drums. Vancouver tap water was used as the water source and reagent grade chemicals were added into each drum to reach target spiking concentrations of the key constituents. Excess gypsum was added into each drum to ensure that both solutions were fully saturated with respect to gypsum. The drum contents were mixed overnight, allowed to settle and the solution was filtered prior to assays and use in the ERC tests. Target compositions for both retentate solutions were identified by modelling the performance of RO and NF on the average plant feed and BQE's experience with the de-saturation process. Neither of the retentate solutions were spiked with selenium in the drums. Instead, selenium was added to aliquots of retentate (typically ~ 2 gallons) withdrawn from the drums just prior to each ERC test to allow testing over a range of selenium concentrations.

Table 5-1 presents the composition of the two retentate solutions used during the treatability testing.

Table 5-1. Composition of Synthetic Retentate Solutions Used during Treatability Testing.

	RO RETENTATE pH = 12.1		NF RETENTATE pH 8.1	
	[mg/L]	**[meq/L]**	**[mg/L]**	**[meq/L]**
ANIONS				
Sulfate	1315	27	3980	83
Chloride	383	11	36	1
Nitrate-N	36	1	5	0
Hydroxide	214	13	0	0
Bicarbonate as $CaCO_3$	0	0	200	4
Total Anions		**52**		**88**
CATIONS				
Calcium	825	41	470	23
Magnesium	0	0	655	54
Sodium	179	8	470	23
Total Cations		**49**		**83**
Charge Balance		**3**		**5**

Solutions were stored at room temperature during the test campaign and the composition was re-checked after 4 days to assess solution stability. While the pH dropped from 12.1 to 11.9 and 8.1 to 7.9 in the RO and NF retentate drums, respectively, no meaningful change in the concentration of any of the main constituents was observed. This indicates that the solutions were stable and remained unchanged during the test campaign.

5.2 ERC Test Matrix

The basic experimental set-up for ERC used in this test campaign is identical to the one described in previous bench scale testing reports prepared for AMI in 2019 and 2020.

The test matrix applied to this campaign is shown in Table 5-2.

Table 5-2. ERC Test Matrix.

Test #	ERC Electrolyte	Se in Solution Prior to ERC Treatment [µg/L]	Purpose
1	RO Retentate - pH 12.1	20	
2	RO Retentate - pH 12.1	20	Duplicate/repeatability
3	RO Retentate - pH 12.1	20	Triplicate/repeatability
4	NF Retentate – pH 8.1	20	
5	NF Retentate – pH 8.1	20	Duplicate/repeatability
6	NF Retentate – pH 8.1	20	Triplicate/repeatability
7	NF Retentate – pH 8.1	45	
8	NF Retentate – pH 8.1	45	Duplicate/repeatability

As can be seen from this table, a total of eight tests were completed during the campaign including three tests with RO retentate and five tests with NF retentate. Six tests were carried out using the initial selenium concentration of 20 µg/L. Although this concentration corresponds to the upper limit of selenium concentration based on the water quality data available to date, two additional tests were completed using a higher initial selenium concentration of 45 µg/L. This was to provide extra conservatism into the assessment including the cost estimates. In this context, it is important to note that the higher the concentration of selenium in the ERC electrolyte, the higher the capital and operating costs.

5.3 Reagents

All chemical reagents used in the spiking of the synthetic water were technical grade. Table 5-3 is a list of reagents used in the makeup of the synthetic solutions as well as throughout testing within this campaign. When dosing, purity of each chemical is also taken into account and additional dosing is adjusted as required.

Table 5-3. Reagents Used During Solution Preparation and Testing.

Reagent	Vendor	Purity (w/w)	Addition method
Calcium chloride dihydrate	BDH	99%-105%	Dry
Calcium nitrate 4-hydrate	Alfa Aesar	99%-103%	Dry
Calcium oxide	Acros Organics	97%	5 % lime slurry
Calcium sulfate dihydrate	Sigma-aldrich	99%-101%	Dry
Magnesium sulfate anhydrous	Anachemia	≥ 99%	Dry
Selenium Stock 20 mg/L	Alfa Aesar	100%	Dilute from 2 g/L selenium stock (from sodium selenate)
Sodium bicarbonate	Wards science	≥ 99%	Dry
Sodium sulfate	Saskatchewan Minerals	99%	Dry
Sulfuric acid 5 %	Anachemia	97%	Stock solution dilute from 98%
Sulfuric acid 98 %	Anachemia	98%	Concentrated

5.4 Analytical Methods

Table 5-4 lists analytical methods that were used by CARO Analytical Services and ALS Analytical Services for sample analysis throughout this test campaign. Metals were analysed by Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS), anions by Ion Chromatography (IC), and ammonia by automated colorimetry. All assay results used for data analysis and results interpretation by BQE Water were completed by CARO and ALS. Both labs are accredited by the Canadian Association for Laboratories Accreditation (CALA) to ISO 17025:2005 for specific tests listed in the scope of accreditation approved by CALA.

Table 5-4. List of Assays Used During Test Program.

Analyte	Technique	Assay Provider	Reference Method	Preservative
Alkalinity	Titration with H_2SO_4	CARO	SM 2320 B (2011)	None
Ammonia, Total	Automated Colorimetry (Phenate)	CARO	SM 4500-NH3 G (2011)	H_2SO_4
Anions	IC	CARO	SM 4110 B (2011)	None
Dissolved Metals	0.45 µm Filtration / ICP-MS	CARO	EPA 200.8 / EPA 6020 B	HNO_3
Total Metals	HNO_3+HCl Hot Block Digestion / ICP-MS	CARO	EPA 200.2 / EPA 6020 B	HNO_3
TCLP	20:1 Leach for 18h / HNO_3+HCl Hot Block Digestion / ICP-MS	CARO	EPA 1311/ EPA 200.2 / EPA 6020 B	None
Metals in solid	Dry, Sieve (180 um) Soil / Four Acid (HNO_3 + $HClO_4$ + HF + HCl) Digestion With ICP-MS Finish	ALS	-	None

Based on CARO's report, the detection limit reported for selenium is 0.00050 mg/L measured by ICP-MS.

5.5 Quality Assurance/Quality Control

BQE Water lab maintains rigorous QA/QC for sampling to avoid contamination and ensure confidence in the assay results. ERC tests were performed by trained laboratory staff. All glassware was cleaned, acid washed with 10% v/v HCl, and rinsed thoroughly with DI water. Standard sample handling, filtration, and preservation procedures were followed to ensure sample integrity. Each instrument was operated by trained staff members. All instruments were calibrated according to manufacturer guidelines and in accordance with SOPs. Analytical balances, pipettes, micro-pumps, and other measuring devices are calibrated professionally with certification and logging.

All samples were collected in sealed sample bottles provided by CARO Analytical Services. Standard sample handling, filtration and preservation procedures were followed to ensure sample integrity. The synthetic feed samples were sampled once when freshly made and once again after 4 days of storage at room temperature to capture any changes within the synthetic feed.

The following is the QC reported by analytical labs for different samples. Groups of samples were prepared in batches and analyzed in conjunction with QC samples that ensure the data was of the highest quality:

- Method Blank (Blk): A blank sample that undergoes sample processing identical to that carried out for the test samples. Method blank results are used to assess contamination from the laboratory environment and reagents.
- Duplicate (Dup): An additional or second portion of a randomly selected sample in the analytical run carried through the entire analytical process. Duplicates provide a measure of the analytical method's precision (reproducibility).
- Blank Spike (BS): A sample of known concentration which undergoes processing identical to that carried out for test samples, also referred to as a laboratory control sample (LCS). Blank spikes provide a measure of the analytical method's accuracy.

- Matrix Spike (MS): A second aliquot of sample is fortified with a known concentration of target analytes and carried through the entire analytical process. Matrix spikes evaluate potential matrix effects that may affect the analyte recovery.
- Reference Material (SRM): A homogenous material of similar matrix to the samples, certified for the parameter(s) listed. Reference Materials ensure that the analytical process is adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10-20 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Due to the low treatment target of 1.6 µg/L selenium, it is imperative that the selenium analysis be accurate and validated. The nature of this solution being in such low concentration of selenium means that the values being reported are close to or below the detection limit of the analytical technique. Thus, duplicate ERC tests were run to verify the sample data and to ensure the selenium treatment target is met. During sampling, no dilution of samples was made for any dissolved metals analysis (for selenium analysis).

6. Results and Discussion

Test results demonstrating efficiency of ERC for selenium removal from RO and NF retentate solutions, stability of the treatment residue, and deportment of constituents other than selenium during the ERC treatment is presented and discussed in Sections 6.1 through 6.3.

6.1 Selenium Removal by ERC

RO Retentate

Figure 6-1 depicts residual selenium as a function of iron consumed in ERC for the three tests completed using synthetic RO retentate. As apparent from the results, selenium removal was consistent in all three tests indicating good repeatability. In all tests selenium was removed to below 1.6 µg/L.

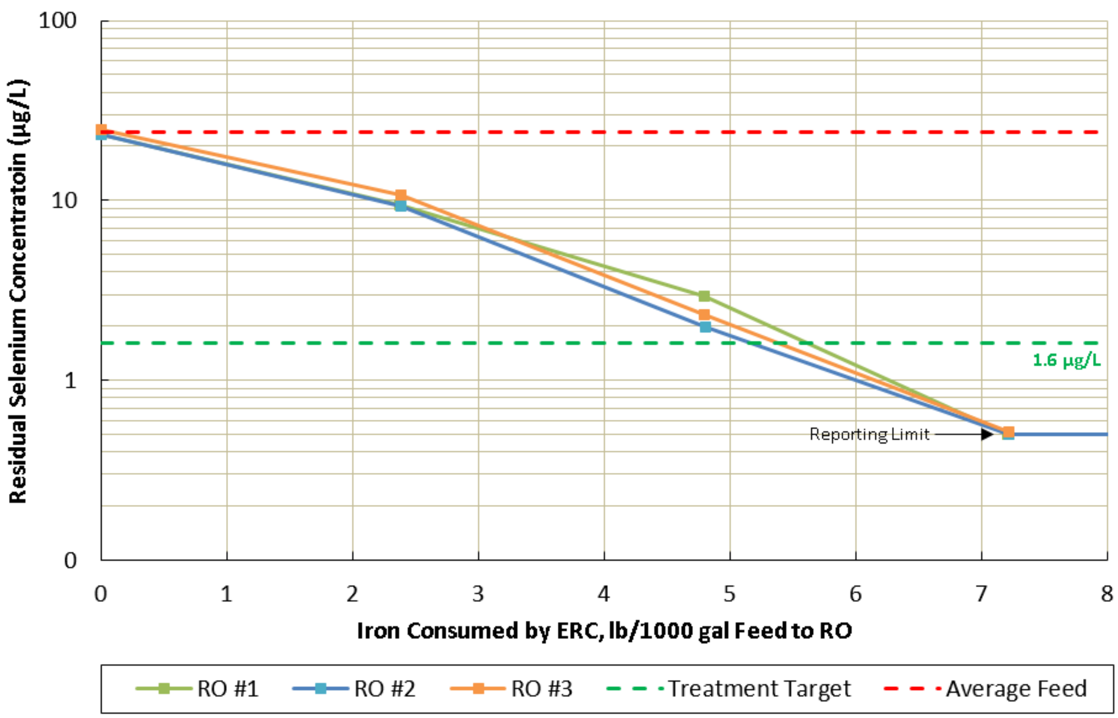

Figure 6-1. Selenium Removal from Synthetic RO Retentate.

Approximately, 5.8 lb iron was consumed in ERC per 1,000 gallons of feed to RO. The corresponding power consumed is approximately 70 kWh/1000 gallons. These values are the main process KPIs that determine the capital and operating cost of the ERC system.

NF Retentate

Figure 6-2 depicts residual selenium as a function of iron consumed in ERC for the three tests completed using NF retentate. As apparent from the results, all three tests successfully removed selenium to below 1.6 µg/L. The frequency of sampling was increased for the third test to better demonstrate the selenium removal kinetics. Approximately 2.7 lb iron was consumed in ERC to remove selenium to below 1.6 µg/L per 1000 gallons of feed to NF.

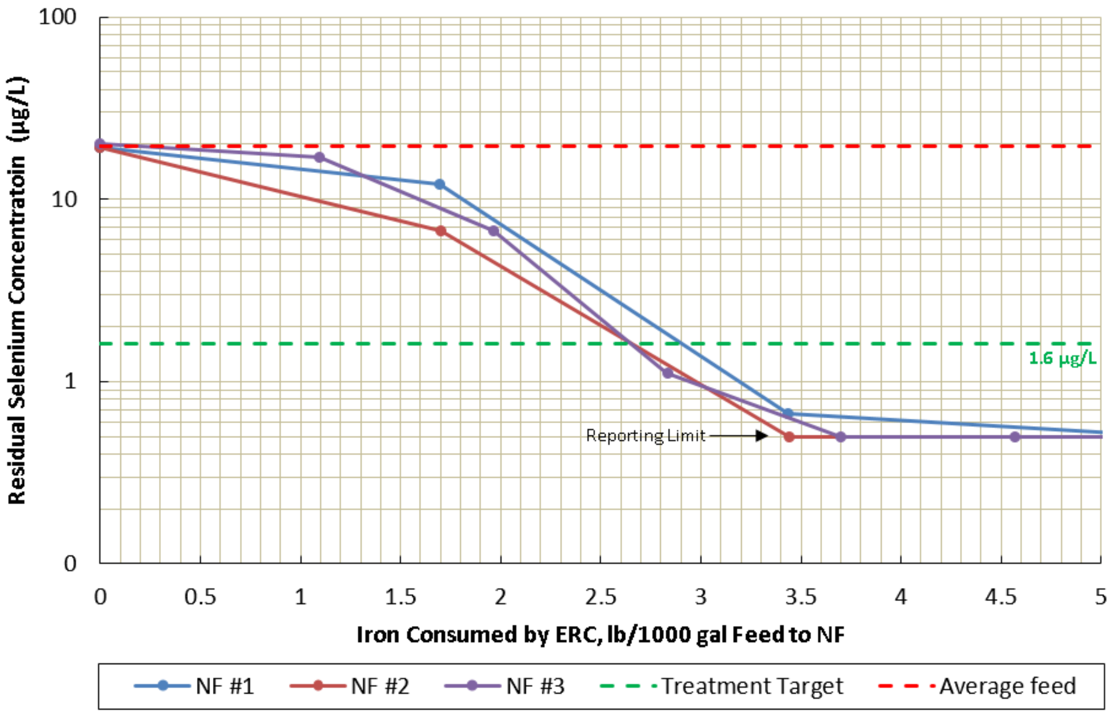

Figure 6-2. Selenium Removal from NF Retentate.

Sensitivity to Feed Selenium Concentration

In order to evaluate the sensitivity of selenium removal in ERC to feed selenium concentration, two additional tests were completed with the NF retentate solution spiked to a higher selenium concentration of approximately 45 µg/L. Figure 6-3 shows the results of these two tests along with one test with lower feed selenium concentration for comparison. As apparent from the results, approximately 3.1 lb iron was consumed in ERC to treat 1000 gallons of NF feed water. Thus if the selenium concentration in NF feed water doubles, the iron consumption in the ERC will increase by approximately 0.4 lb for every 1,000 gallons of feed water treated.

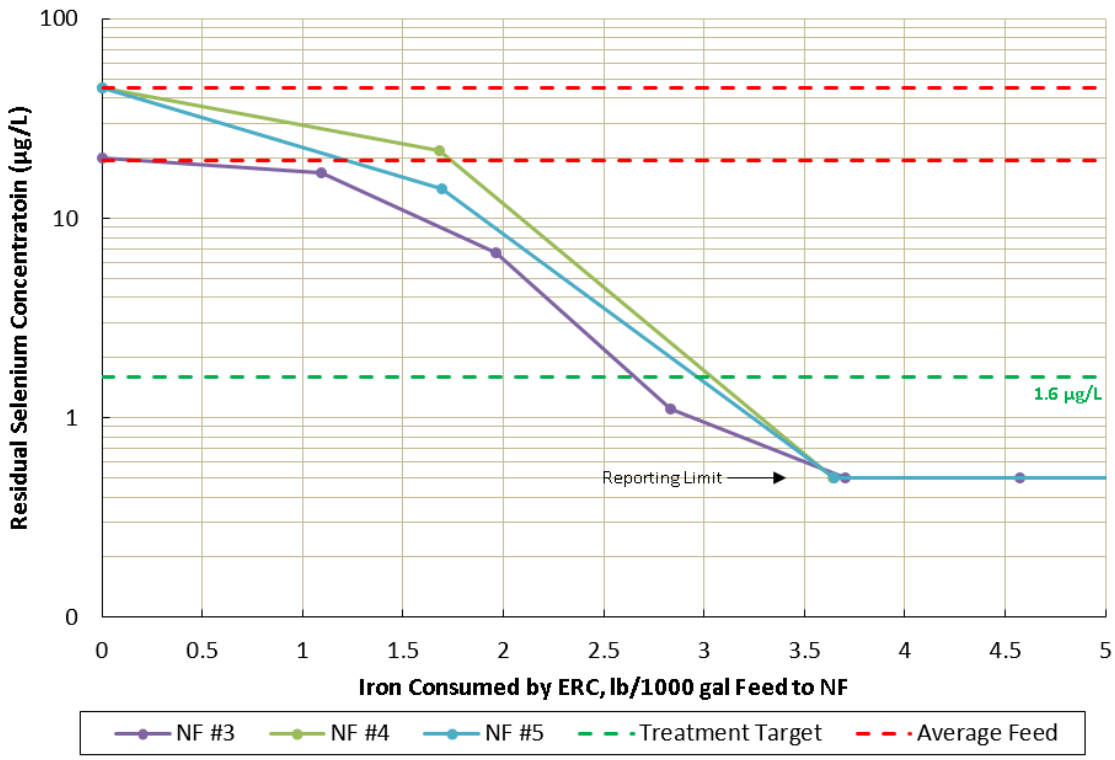

Figure 6-3. Sensitivity of Selenium Removal from NF Retentate to Initial Selenium Concentration.

Summary of Consumption of Main ERC Process Consumables

Table 6-1 compares the consumption of the main ERC process consumables determined by testing.

Table 6-1. Summary of Consumption of ERC Process Consumables.

Type of Retentate	Power Consumption	Iron Consumption	Acid Consumption
	kWh/1000 gallons of feed	lb/1000 gallons of feed	lb/1000 gallons of feed
RO Retentate (pH 12.1; 60% water recovery)	70	5.8	3.1
NF Retentate (pH 8.1; 70% water recovery)	18	2.7	0.7

The results shown in Table 6-1 clearly indicate that the consumption of all ERC process consumables is higher for the RO retentate compared to NF retentate. The impact of this on the capital and operating cost estimates is discussed in Section 7.

6.2 Deportment of Constituents Other than Selenium across ERC Process

In order to ensure that ERC treatment does not create any adverse effects or unintended consequences for the operation and discharge of water from WTP at Hermosa, the deportment of all non-selenium constituents across the ERC was tracked during the test campaign. The vast majority of constituents present in the synthetic retentate pass through the ERC process as inerts. However, there are several constituents whose concentrations changed and these changes are salient to the overall treatment process at WTP. These are summarized in Table 6-2. The constituents listed in this table are grouped into four categories including nitrogen species, calcium and magnesium sulfates, heavy metals and metalloids, and alloying metals released from the iron anode including manganese and iron.

Table 6-2. Deportment of N-species and Alkalinity Pre/Post ERC.

Constituent	Units	RO Retentate		NF Retentate	
		Avg. Pre ERC	Avg Post ERC	Avg. Pre ERC	Avg Post ERC
N species					
Nitrate (as N)	mg/L	34.80	14.75	5.51	1.49
Ammonia, Total (as N)	mg/L	<0.020	20.3	<0.020	4.68
Calcium/Magnesium Sulfates					
Sulfate	mg/L	1260	1860	3980	3696
Calcium, dissolved	mg/L	825	807	469	471
Magnesium, dissolved	mg/L	0.090	4.44	655	498
Heavy metals/metalloids					
Arsenic, dissolved	mg/L	0.00124	<0.00050	0.00183	0.00063
Copper, dissolved	mg/L	0.00254	0.00188	0.01840	0.00504
Lead, dissolved	mg/L	0.00048	<0.00020	0.00028	<0.00020
Alloying Metals					
Manganese, dissolved	mg/L	0.00071	0.259	0.0088	3.3
Iron, dissolved	mg/L	<0.010	0.68	<0.010	16.3

Table 6-2 shows that a portion of nitrate present in the retentate is reduced to ammonia in the ERC. This is consistent with all previous projects where ERC was use for selenium removal. The main implication of this is that if RO is used as the membrane of choice then the final effluent would probably need to be processed through the MBBR to re-oxidize ammonia back to nitrate. In the case of NF, this would not be necessary since the majority of nitrate present in the plant feed would pass through the NF membrane (monovalent ion), thus bypass the ERC.

Data presented in Table 6-2 indicate that there is small amount of sulfate removed from the NF retentate in the ERC and this is linked to the partial removal of magnesium. In contrast, sulfate concentration increased in the RO retentate due to the increased consumption of sulfuric acid during processing of this type of retentate. This defeats the purpose of increasing sulfate removal from RO retentate by running the RO retentate desaturation process at high pH. Finally, the calcium data shown in Table 6-2 indicate that little to no gypsum precipitates in the ERC from either of the two retentates as there is no discernable difference between calcium concentration before and after ERC treatment.

Table 6-2 shows that the concentration of several heavy metals and metalloids including arsenic, copper, and lead are removed to ultralow levels by the ERC. This can help reduce the final concentrations of these constituents in the final effluent discharged into the environment or reporting to the MBBR system located downstream of the ERC.

Table 6-2 also shows that there is a slight increase in dissolved manganese concentration across the ERC which is most likely caused by the release of this metal from the sacrificial iron anode. Although manganese does not have a specific discharge limit, it needs to be monitored. Given the fact that the ERC effluent is re-blended with the clean permeate prior to discharge, the final effluent concentration of manganese will be significantly lower than the concentrations shown in Table 6-2. Finally, Table 6-2 shows that dissolved iron concentrations increases across the ERC. While this increase was observed during the test program, it would not be expected to occur in the full scale plant. This is because the design of the ERC circuit includes a polishing stage that achieved iron removal to very low levels. The test campaign was focused on selenium removal in the ERC reactor and no polishing treatment was applied to the samples withdrawn from ERC prior to assays during the test campaign.

6.3 Treatment Residue Stability

Figure 6-4 shows the solids residue generated by the ERC. The slurry was filtered using a Buchner funnel with a 25 micron filter. The solids were washed with DI water and filtered again to eliminate the interference from the pore water. The solids samples were then sent for elemental analysis which involved acid digestion and stability assessment using the standard Toxicity Characteristic Leaching Procedure (TCLP). This procedure is used to classify solids as either hazardous or non-hazardous for disposal in landfills.

Figure 6-4. Filtered Solids Residue from NF 70% Test Case (Left) and RO 60% Test Case (Right).

Table 6-3 shows the elemental composition of the solids. The solids were primarily composed of iron, magnesium, sulfur and calcium. The higher magnesium content of the NF 70% solids is due to the higher magnesium concentration in the solution treated in ERC. Conversely, the higher calcium content of the RO 60% retentate solution is evident in the higher calcium content of the corresponding solids. In both cases, selenium content of the solids is very low.

Table 6-3. Elemental Composition of the Washed ERC Solids.

Metals	Unit	RO 60% ERC solids	NF 70% ERC solids
Ag	mg/L	0.62	0.38
Al	mg/L	400	500
As	mg/L	51	32.2
Ba	mg/L	<10	<10
Be	mg/L	<0.05	<0.05
Ca	mg/L	10700	5300
Cd	mg/L	<0.02	<0.02
Co	mg/L	44.7	36.3
Cr	mg/L	657	490
Cu	mg/L	1065	701
Fe	mg/L	>500000	>500000
K	mg/L	100	100
La	mg/L	<0.5	<0.5
Mg	mg/L	600	17000
Mn	mg/L	3950	3830
Mo	mg/L	99.4	57.7
Na	mg/L	800	400
Ni	mg/L	588	505
P	mg/L	100	60
Pb	mg/L	1.8	5.8
Re	mg/L	0.014	0.008
S	mg/L	19400	23100
Sb	mg/L	27.6	20.6
Se	mg/L	10	9
Sn	mg/L	54.5	29.3
Sr	mg/L	40.4	50.4
Zn	mg/L	13	19

From the TCLP analysis shown in table 6-4, it can be seen that solids produced during treatment of RO and NF retentate are non-hazardous and suitable for disposal in non-hazardous landfills. This is in-line with BQE Water's experience from all previous lab, pilot, and demo-scale testing of the ERC process on a variety of wastewater chemistries.

Table 6.4. TCLP Results for Solid Residue Samples Generated by ERC Treatment.

Metals	Unit	Reporting limit	EPA TCLP limit	RO 60% ERC solids	NF 70% ERC solids
Arsenic	mg/L	0.01	2.5	<0.010	<0.010
Barium	mg/L	1	100.0	<1.0	<1.0
Boron	mg/L	0.5	500.0	<0.50	<0.50
Chromium	mg/L	0.05	0.5	<0.050	<0.050
Copper	mg/L	0.1	100	<0.10	<0.10
Lead	mg/L	0.01	5.0	<0.010	<0.010
Mercury	mg/L	0.002	0.1	<0.002	<0.002
Selenium	mg/L	0.02	1.0	<0.020	<0.020
Silver	mg/L	0.002	5.0	<0.002	<0.002
Uranium	mg/L	0.02	10.0	<0.020	<0.020
Zinc	mg/L	0.5	500.0	<0.50	<0.50

Toxicity Characteristic Leaching Procedure - Characteristics introduction and regulatory definitions - Washington, DC: U.S. Environmental Protection Agency (EPA).

7. Full Scale ERC Treatment

7.1 Design Basis for Full Scale System

As discussed in Section 4, there are two scenarios considered for integrating selenium removal into the WTP flowsheet as part of this treatability assessment report including:

- ERC applied to retentate produced by RO operating at 60% water recovery and other unit processes as per the block diagram shown in Figure 4-1a
- ERC applied to retentate produced by NF operating at 70% water recovery and other unit processes as per the block diagram shown in Figure 4-1b

Table 7-1 summarizes the key ERC design parameters that represent the basis of the engineering design of the full scale system informed by the results of testing and BQE Water's technical assessment.

Table 7-1. Design Basis for Full Scale System.

ERC Integration Scenario		RO Figure 4-2a	NF Figure 4-2b
WTP Feed Flow	US Gallon/Day	173,000	173,000
Plant Availability	Operating Days/Year	350	350
pH in MULTIFLO system	pH	9 - 10	"as is"
Water Recovery in Membrane	Percent	60%	70%
Retentate Flow Rate to ERC	US Gallon/Day	69,000	52,000
Se in Retentate – opex basis	µg/L	20	20
Se in Retentate – capex basis	µg/L	45	45
Se Treatment Target in ERC	µg/L	1.6	1.6
# of Electrolytic Cells in Operation - Opex basis	#	3	2
# of Electrolytic Cells Installed - Capex basis	#	4	3
ERC Power Consumption	kWh/1000 gal of feed	70	18
ERC Iron Consumption	lb/1000 gal of feed	5.8	2.7
ERC Acid Consumption	lb/1000 gal of feed	3.1	0.7

In both scenarios, ERC is sized to have the capacity to treat the full flow of retentate (no slip/by-pass stream) and remove selenium from concentrations as high as 45 µg/L to the discharge limit of 1.6 µg/L.

These are both very conservative design assumptions since a) data from the existing WTP indicates that selenium concentration in retentate entering ERC would currently be less than 25 µg/L, and b) the ERC may not need to treat the full flow of retentate because the ERC can achieve the end-of-pipe selenium discharge limit of 1.6 µg/L in the discharge from ERC, i.e. upstream of blending the ERC discharge with the permeate containing virtually zero selenium.

7.2 Operation of Full Scale ERC

Table 7-2 presents the estimates of the ERC process consumables required on an annual basis in the WTP treating 173,000 GPD of impacted water at Hermosa.

Table 7-2. Estimate of ERC Process Consumables Required for WTP operation.

ERC Integration Option	WTP Capacity	Hydraulic Flow Entering ERC	ERC Process Consumables		
	US GPD	US GPD	Iron {dmt/a)	Acid{dmt/a)	Power (MWh/a)
RO	173,000	69,000	170	90	4,400
NF	173,000	52,000	80	20	1,100

Although the exact O&M labour and supervisory requirements for the ERC cannot be determined because operations, supervisory, and maintenance personnel will be shared with the other parts of WTP, insight into the requirements, and the overall operability of the ERC system can be gained based on several design parameters listed in Table 7-3.

Table 7-3. ERC Design Parameters Affecting Plant Operability.

	Electrocell Power "On" Time	Total Hours of ERC Operation	Frequency of Anode Replacement
ERC Integration Option	Hours per day	Hours per day	#/month
RO	21	23	4
NF	15	18	2

As can be seen from this table, the ERC system will have to operate around the clock. There is less operating time per day associated with the NF option which provides operational buffer in the event of process upsets which could be caused by treatment stages upstream of ERC.

In addition to the consumables requirements shown in Table 7-2 and the operating labour/supervisory requirements discussed above, there are other costs outside of the battery limits of the ERC system that need to be considered prior to arriving at a holistic "all-in" operating costs including:

- Cost of lime and other reagents used in the MULTIFLO system pre-treatment upstream of RO or NF and in the retentate desaturation stage.
- Cost difference between pumping power for RO and NF where NF requires significantly lower pressure to treat the same flow as RO.
- Cost of membrane cleaning and cleaning frequency for NF and RO.
- Cost of handling and disposal of iron-selenium solids produced by ERC.
- Cost of CO_2 consumed by the RO based flowsheet to bring the pH down to acceptable level for discharge.
- Maintenance costs.

8. Conclusions

The conclusions that can be drawn from the technical analysis of simultaneous removal of sulfate and selenium from WTP feed water and the results of the bench scale treatability testing can be summarized below:

Results of Treatability Tests

- ERC successfully removed selenium to below the target of 1.6 µg/L from both RO and NF retentates with initial selenium concentrations as high as 45 µg/L.
- Solid residue generated by ERC treatment passes TCLP and is suitable for non-hazardous landfill disposal.
- ERC helps remove copper, arsenic, and lead from retentate and achieve incremental improvement in metals removal in WTP over and above the removal achieved by MULTIFLO.
- Significant portion of nitrate contained in retentate is converted to ammonia. If RO is selected then the need for operating the MBBR system to re-oxidize ammonia back to nitrate needs to be assessed.
- Treated water may contain slightly higher concentration of manganese than the feed.

Full Scale System Deployment

There are significant advantages to using NF instead of RO as the membrane of choice for WTP upgrade at Hermosa including savings in

- Power consumption in ERC and membrane treatment
- Iron consumption in ERC
- Sulphuric Acid in ERC

South32 RO and Sulfate Desaturation
Summary of Lab Work

Project No. 5600218075

Submitted by:

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December 2019

WATER TECHNOLOGIES

The goal of this testing was to process effluent from the VRP WTP through a lab-scale RO unit to produce a permeate sample and concentrated brine sample. The brine was treated with lime along with sludge recirculation to precipitate (desaturate) calcium sulfate. The desaturated brine was combined with the permeate, neutralized with carbon dioxide, and sent for off-site analysis. South32 collected a sample from the WTP effluent while treating January Adit (JA) water. The sample was received in the Philadelphia lab on October 4, 2019 as six 5-gallon carboys. Five of the carboys were mixed together in a 55-gallon drum and used as the starting material.

The raw water was characterized in house as shown below:

Raw water	
pH	7.86
TDS	2550
SO4	1760
Ca Hardness as CaCO3	1550
Total Hardness as CaCO3	1560

A sample was collected to be sent for a full characterization at a third party lab. The remaining water was then treated with 5 mg/L of sodium hypochlorite while mixing for 10 minutes to deter biological growth, then 7 mg/L sodium bisulfite for 5 minutes to remove residual chlorine. Residual chlorine was measured in house at <0.01 mg/L after bisulfite treatment.

8 mg/L of Hydrex 4175, an antiscalant, was added to the water, and then processed through an RO skid with a DOW XLE-2540 membrane. Process conditions shown below:

	Start	End
Permeate cond.	23	64
feed pressure	53	65
conc. Pressure	48	60
feed flow (lpm)	6.5	6.5
permeate flow (lpm)	0.75	0.75

The RO was shut down at 60% permeate recovery by volume. RO concentrate characteristics shown below:

RO Conc	
SO4	4415
Ca Hardness	4150

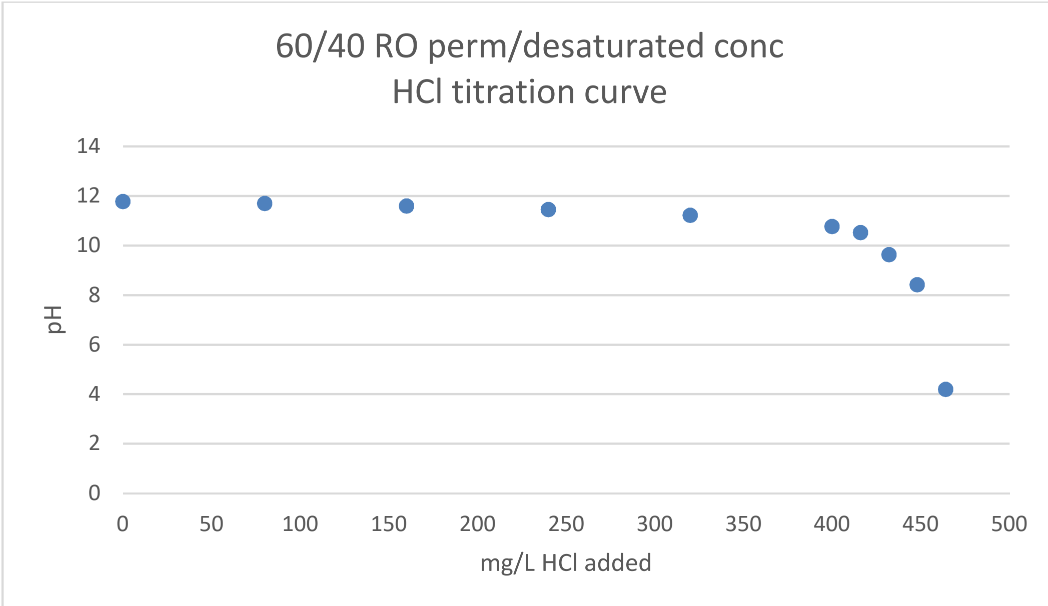
A series of 1L jar tests was then performed on the RO concentrate. In the first test, 30 g/L of plaster of Paris (calcium sulfate $CaSO_4.1/2\ H_2O$) was added as seed material. For the first group of tests, 700 mg/L of calcium (in the form of lime) was added with a 30 minute reaction time under continuous mixing. Then 10 mg/L of ferric chloride was added as a coagulant with 2 minutes mixing, followed by 1 mg/L Hydrex 6161 anionic flocculant. After 3 minutes of flocculation time, the jars were allowed to settle. The supernatant was decanted off for residual sulfate measurement, and the 'sludge' layer was left behind. In each subsequent test, fresh RO concentrate was added to the sludge so that it would continually be recycled to improve reaction efficiency.

TSS of the sludge and volume of sludge were measured during the 1.5 g/L lime tests to try to approximate the amount of sludge generation from the desaturation process. The calculated amount of sludge generated was 1920 mg of sludge generated per liter of water treated. There were some inherent difficulties in this measurement, as the sludge settles quickly and adheres to container walls.

After several runs at 700 mg/L Ca (1295 mg/L lime), the lime dose was increased to 1500 mg/L and then 2000 mg/L see the effect on sulfate reduction. A table of results is shown below:

Desaturation Testing											
Test #	1	2	3	4	5	6	7	8	9	10	11
water volume (L)	2	1	1	1	1	1	1	1	1	1	1
Plaster of paris (g)	30	0	0	0	0	0	0	0	0	0	0
lime added (g)	2.59	1.295	1.295	1.295	1.295	1.295	1.295	1.5	1.5	2	2
pH after lime	11.77	11.95	11.97	11.96	11.99	11.97	11.95	12.04	12.05	12.13	12.12
sludge recycle	0	2:1	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1
rxn time (min)	30	30	30	30	30	30	30	30	30	30	30
ferric chloride (mg/L as FeCl3)	10	10	10	10	10	10	10	10	10	10	10
Hydrex 6161 (mg/L)	1	1	1	1	1	1	1	1	1	1	1
Effluent SO4 (mg/L)	4360	3440	2355	2320	2370	2275	2325	2225	2175	2050	2010

After collecting this data, a final series of three tests were conducted using 1.5 g/L lime to produce a desaturation sample. A 1 gallon blended sample was produced by blending in RO permeate in a 60% permeate 40% desaturated RO concentrate ratio. The final sulfate concentration of this blend was 841 mg/L, and 11.78 pH. The sample was titrated with 0.1N HCl as shown in the table and curve below.



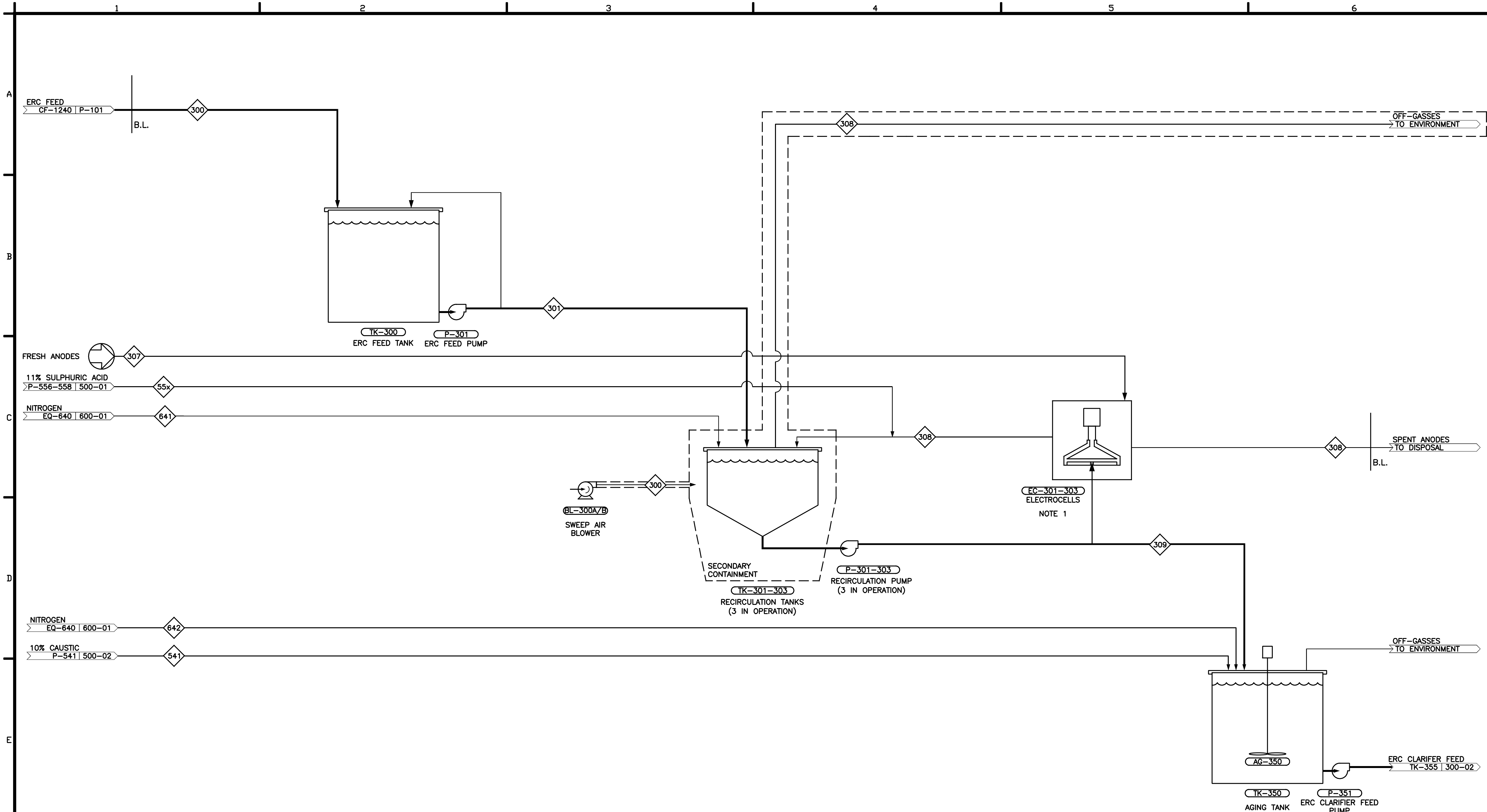
HCl neutralization	
mg/L HCl added	pH
0	11.78
80	11.7
160	11.6
240	11.46
320	11.22
400	10.77
416	10.52
432	9.64
448	8.42
464	4.2

The blended sample was then treated with CO2 fed through a mass flow meter and air stone to increase the surface area of the bubbles. The approximate flow rate of CO2 was 80 mL/min. Only two data points were taken during this process. After 1200 mL of CO2 had been fed, the pH had dropped to 8.5. After 1730 mL of CO2 had been fed, the pH was 7.5. Some solids were precipitated during the process. 114 mg/L of TSS was measured in the water after CO2 treatment.

A final sample of CO2 treated water was collected to be sent for third party full characterization.

Analyte	UNITS	Raw water	60/40 RO permeate to desaturated RO concentrate	DL	RL
B by ICP, Dissolved	mg/L	ND	ND	0.0032	0.10
Fe by ICP, Dissolved	mg/L	ND	ND	0.0031	0.30
K by ICP, Dissolved	mg/L	ND	ND	0.14	5.0
Mercury, Dissolved	mg/L	ND	ND	0.0000041	0.0010
Ag by ICP/MS	mg/L	ND	ND	0.00021	0.0050
As by ICP/MS	mg/L	ND	ND	0.0010	0.0050
Ba by ICP/MS	mg/L	ND	0.0057	0.00029	0.0050
Be by ICP/MS	mg/L	ND	ND	0.00013	0.0025
Cd by ICP/MS	mg/L	ND	ND	0.00050	0.0025
Cr by ICP/MS	mg/L	0.0069	0.0013	0.00023	0.0050
Cu by ICP/MS	mg/L	ND	0.0081	0.0015	0.0050
Mn by ICP/MS	mg/L	0.0041	0.00079	0.00038	0.0025
Ni by ICP/MS	mg/L	0.025	0.011	0.00015	0.0050
Pb by ICP/MS	mg/L	ND	0.014	0.00057	0.0050
Sb by ICP/MS	mg/L	ND	ND	0.00039	0.0050
Se by ICP/MS	mg/L	ND	0.00073	0.0025	0.025
Tl by ICP/MS	mg/L	ND	ND	0.00023	0.0050
Zn by ICP/MS	mg/L	ND	ND	0.023	0.40
Mercury, Total	mg/L	ND	ND	0.000041	0.0010
Hardness, Ca & Mg	mg/L	1800	1300		
Ag by ICP/MS, Dissolved	mg/L	ND	ND	0.00011	0.0025
As by ICP/MS, Dissolved	mg/L	ND	ND	0.0010	0.0050
Ba by ICP/MS Dissolved	mg/L	0.0025	0.0054	0.00015	0.0025
Be by ICP/MS, Dissolved	mg/L	ND	ND	0.00013	0.0025
Cd by ICP/MS Dissolved	mg/L	ND	ND	0.00025	0.0013
Cr by ICP/MS, Dissolved	mg/L	ND	ND	0.00023	0.0050
Cu by ICP/MS, Dissolved	mg/L	ND	0.0067	0.0015	0.0050
Mn by ICP/MS, Dissolved	mg/L	0.021	0.0053	0.00077	0.0050
Ni by ICP/MS, Dissolved	mg/L	0.035	0.028	0.00015	0.0050
Pb by ICP/MS, Dissolved	mg/L	ND	ND	0.00057	0.0050
Sb by ICP/MS, Dissolved	mg/L	ND	ND	0.00020	0.0025
Se by ICP/MS, Dissolved	mg/L	ND	ND	0.0025	0.025
Tl by ICP/MS, Dissolved	mg/L	ND	ND	0.00023	0.0050
Zn by ICP/MS, Dissolved	mg/L	ND	ND	0.023	0.40
B by ICP, Total	mg/L	ND	ND	0.0032	0.10
Ca by ICP, Total	mg/L	690	530	1.3	40
Fe by ICP, Total	mg/L	ND	ND	0.0031	0.30
K by ICP, Total	mg/L	ND	7.0	1.4	50
Mg by ICP, Total	mg/L	17	ND	0.10	3.0
Na by ICP, Total	mg/L	64	62	5.8	50
Fluoride by Ion Chromatography	mg/L	ND	ND	0.17	0.50
Bicarbonate Alkalinity	mg/L	28	370		2.0
Carbonate Alkalinity	mg/L	ND	ND		2.0
Hydroxide Alkalinity	mg/L	ND	ND		2.0
Total Alkalinity	mg/L	28	370		2.0
Conductivity	µmhos/cm	3800	2600		1.0
Total Dissolved Solids	mg/L	2400	1700	20	20
Total Suspended Solids	mg/L	ND	170		10
pH	-	8.1	7.3		
Chloride by Ion Chromatography	mg/L	31	42	7.4	10
Sulfate by Ion Chromatography	mg/L	1700	910	150	500

APPENDIX H: PROPOSED UPGRADE PROCESS FLOW DIAGRAMS



NOTES:

1. THERE WILL BE 3 ERC SYSTEMS INSTALLED. 2 ERC SYSTEMS OPERATING. EACH SYSTEM IS COMPOSED OF 1 RECIRCULATION TANK (TK-301/302/303), 1 RECIRCULATION PUMP (P-301/302/303) AND 1 ELECTROCELL(EC-301/302/303).

BQE Water

REV.	REVISION ISSUED FOR:	DATE	DRAWN	DESIGNED	REVIEWED	APPROVED
P	ISSUED FOR INFO	2020 APR 16	K. HICKS			
A	ISSUED FOR INFO	2020 APR 02	C. XIAO	C. XIAO	B. BAKER	B. BAKER

CLIENT NAME: ARIZONA MINERALS INC

PROJECT TITLE: HERMOSA WTP UPGRADES & MODIFICATIONS

DRAWING TITLE: ELECTROREDUCTION CIRCUIT

CLIENT DWG. NO:

BQE WATER DWG. No. 18022-WTP-PFD-300-01

SCALE:	DIM:	SIZE:	REV:
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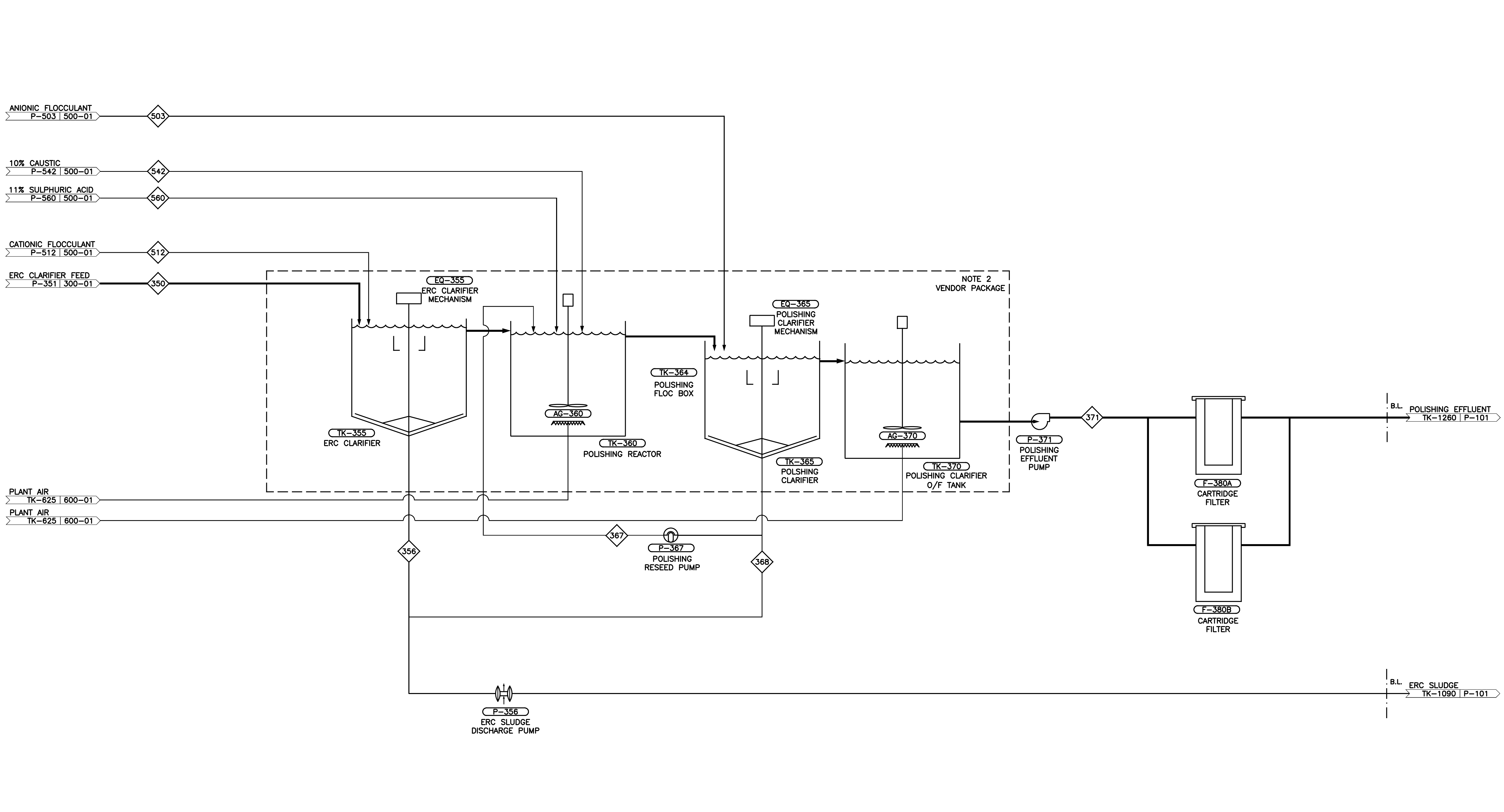

NOTES:

1. POLISHING SYSTEM PACKAGE COMPLETE WITH (2) CLARIFIER BASINS, (2) MIXER BASINS, AND (2) FLOC BOXES.

BQE Water

REV.	REVISION ISSUED FOR:	DATE	DRAWN	DESIGNED	REVIEWED	APPROVED
P	ISSUED FOR INFO	2020 APR 16	K. HICKS			
A	ISSUED FOR INFO	2020 APR 02	C. XIAO	C. XIAO	B. BAKER	B. BAKER

CLIENT NAME: ARIZONA MINERALS INC

PROJECT TITLE: HERMOSA WTP UPGRADES & MODIFICATIONS

DRAWING TITLE: ELECTROREDUCTION CIRCUIT

CLIENT DWG. NO:

BQE WATER DWG. No. 18022-WTP-PFD-300-02

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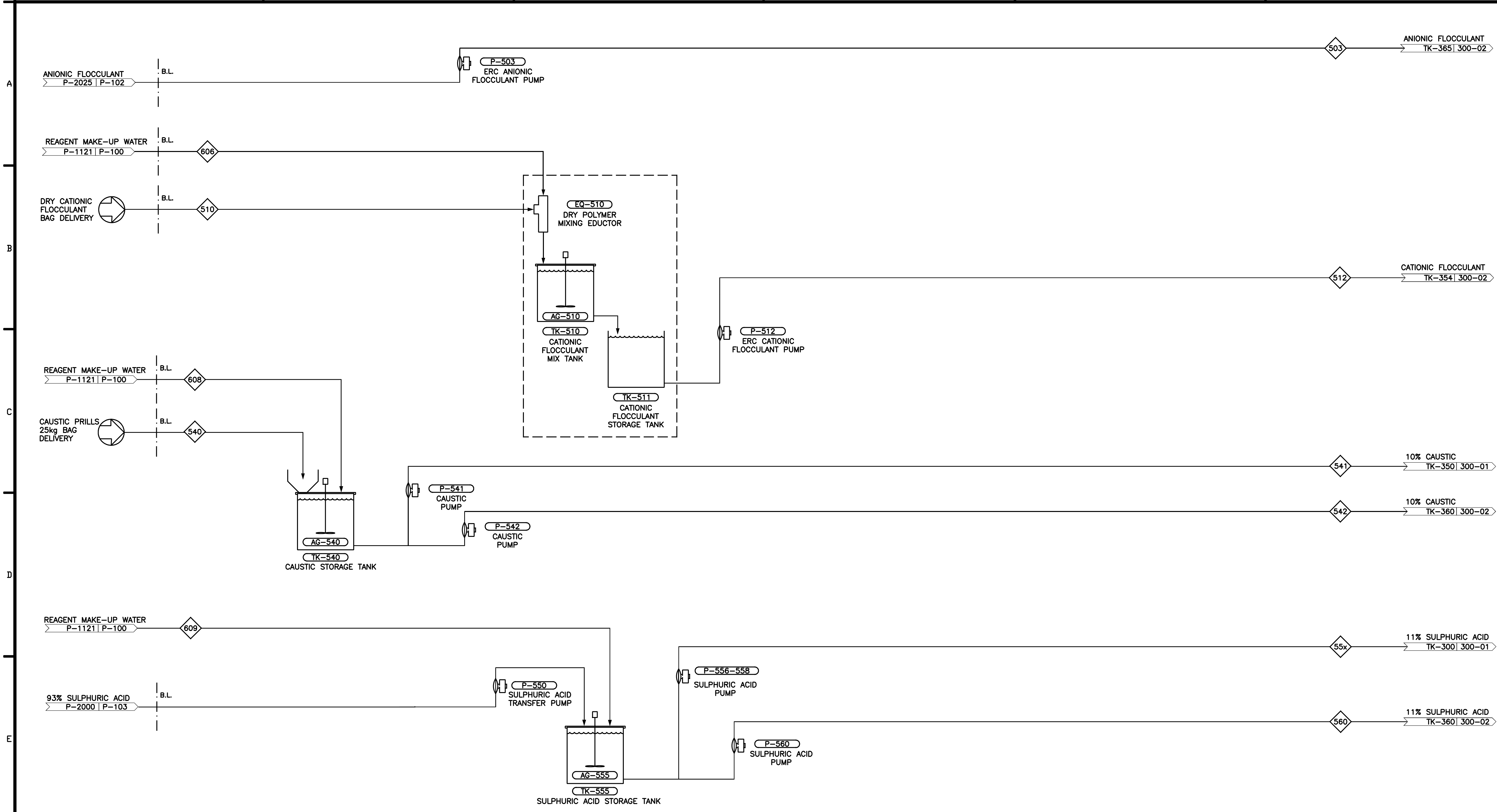

BQE Water

REV.	REVISION ISSUED FOR:	DATE	DRAWN	DESIGNED	REVIEWED	APPROVED
P	ISSUED FOR INFO	2020 APR 16	K. HICKS			
A	ISSUED FOR INFO	2020 APR 02	C. XIAO	C. XIAO	B. BAKER	B. BAKER

CLIENT NAME: ARIZONA MINERALS INC

PROJECT TITLE: HERMOSA WTP UPGRADES & MODIFICATIONS

DRAWING TITLE: REAGENT CIRCUIT

CLIENT DWG. NO	BQE WATER DWG. No.
	18022–WTP–PFD–500–01

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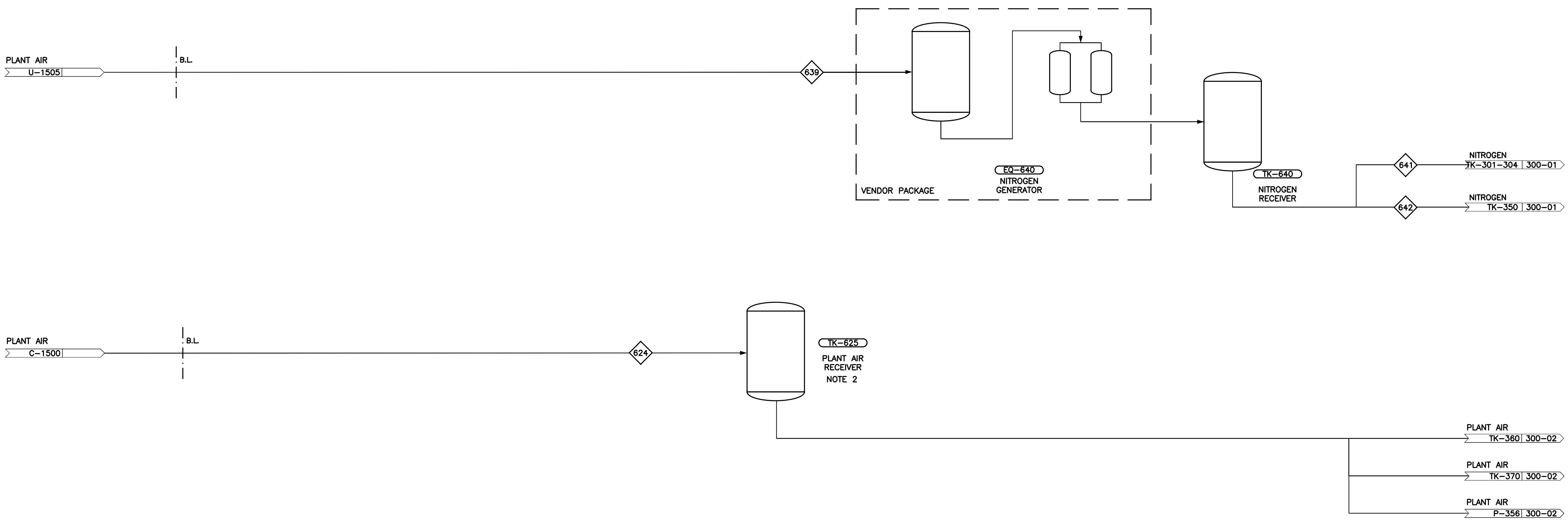

NOTES:

1. PLANT AIR TO BE DISTRIBUTED PLANT WIDE, WITH TAKE-OFFS LOCATED IN CONVENIENT LOCATIONS CLOSE TO DUTY POINTS.
2. INCLUDED AS A CONTINGENCY IN CASE THE EXISTING AIR RECEIVER HAS INSUFFICIENT CAPACITY.

BQE Water

REV.	REVISION ISSUED FOR:	DATE	DRAWN	DESIGNED	REVIEWED	APPROVED
P	ISSUED FOR INFO	2020 APR 16	K. HICKS			
A	ISSUED FOR INFO	2020 APR 02	C. XIAO	C. XIAO	B. BAKER	B. BAKER

CLIENT NAME: ARIZONA MINERALS INC

PROJECT TITLE: HERMOSA WTP UPGRADES & MODIFICATIONS

DRAWING TITLE: UTILITY CIRCUIT

CLIENT DWG. NO:

BQE WATER DWG. No. 18022-WTP-PFD-600-01

SCALE:	DD#	SIZE:	REV:
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SCALE:	NONE	DATE
DESIGNED BY	-	MAR 20
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PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS PFD UPGRADES PROCESS FLOW SHEET 1

PROJECT NO. M3-PN190449
DWG NO. P100-00
REV NO. P
DATE -

SOUTH32

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SCALE: NONE	DATE
DESIGNED BY -	MAR 20
DRAWN BY -	MAR 20
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PROJECT MGR	
CLIENT APPR.	

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HERMOSA PROJECT

PROJECT NO. M3-PN190449

WTP UPGRADES & MODIFICATIONS PFD UPGRADES PROCESS FLOW SHEET 2

DWG NO. P101-00

REV NO. P | DATE -

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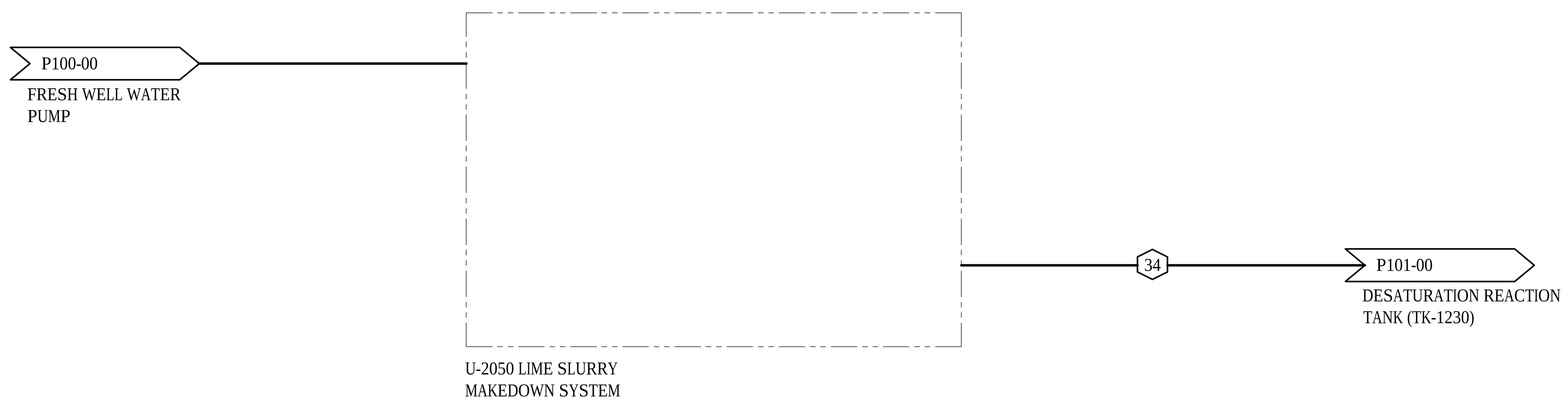
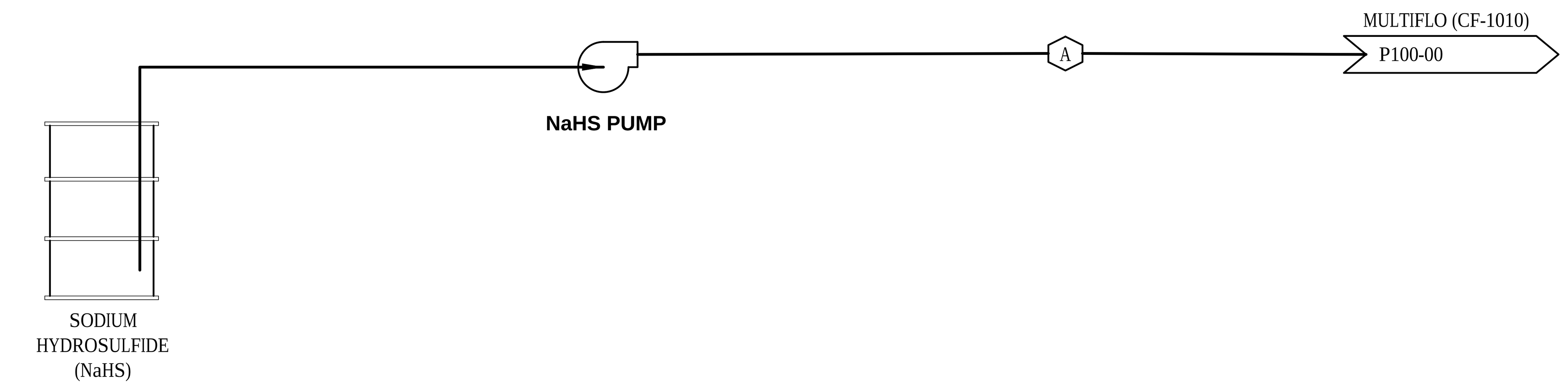
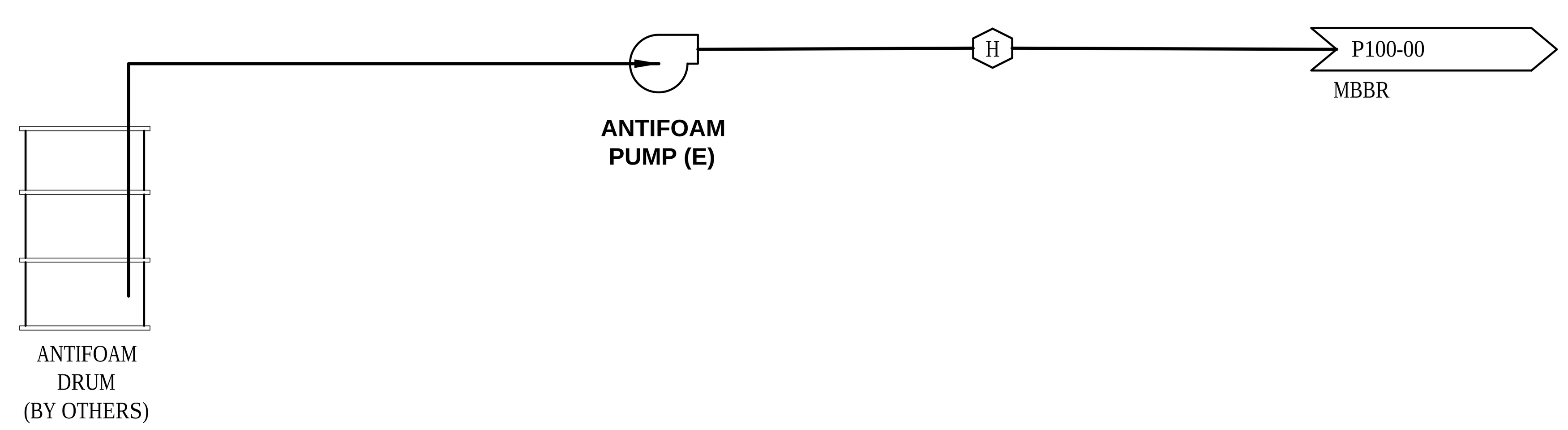


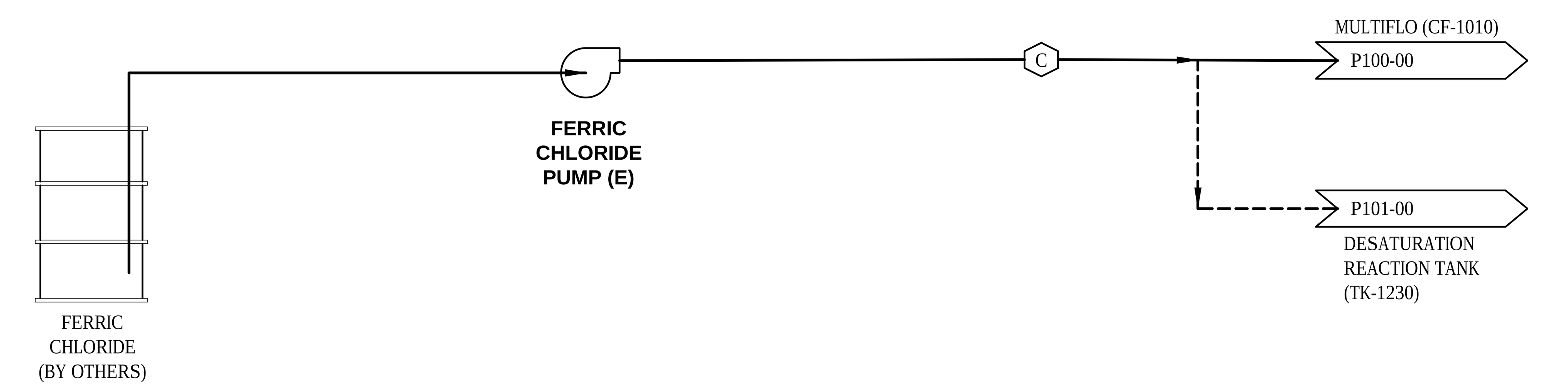
LIME SLURRY



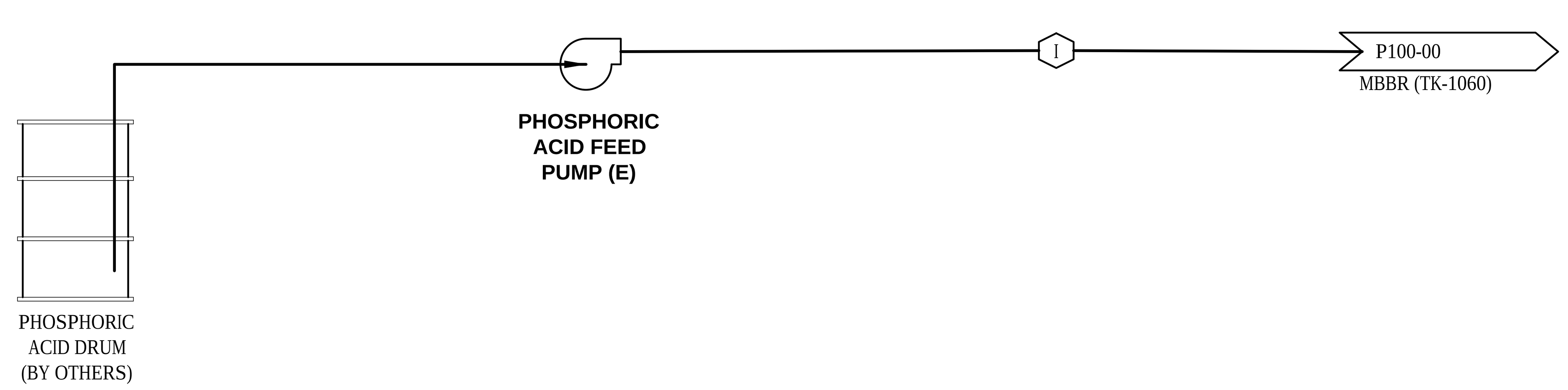
SODIUM HYDROSULFIDE (NaHS)



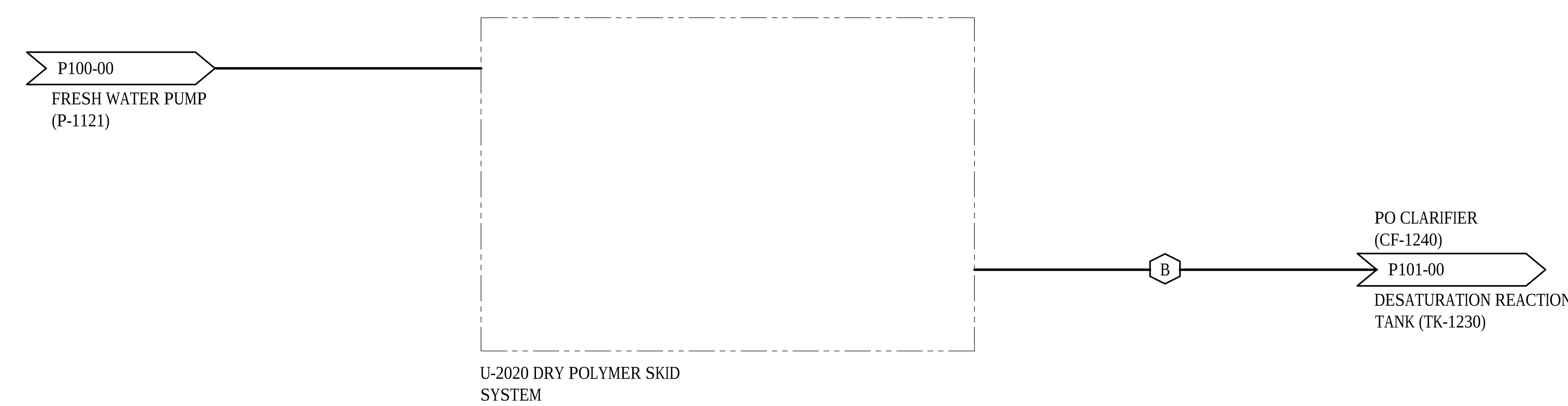
ANTIFOAM



FERRIC CHLORIDE



PHOSPHORIC ACID



ANIONIC FLOCCULANT SYSTEM
(AKA DRY POLYMER SYSTEM)

SYMBOLS

MAIN PROCESS FLOW
INTERMITTENT FLOW
(E) EXISTING EQUIPMENT

SOUTH32

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REFERENCES		REFERENCES		REVISIONS						REVISIONS					
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DESIGNED BY -	MAR 20	
DRAWN BY -	MAR 20	
CHECKED BY		
PROJECT MGR		
CLIENT APPR.		

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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS PFD UPGRADES REAGENT FLOW SHEET 1

PROJECT NO. M3-PN190449
DWG NO. **P102-00**
REV NO. P
DATE -

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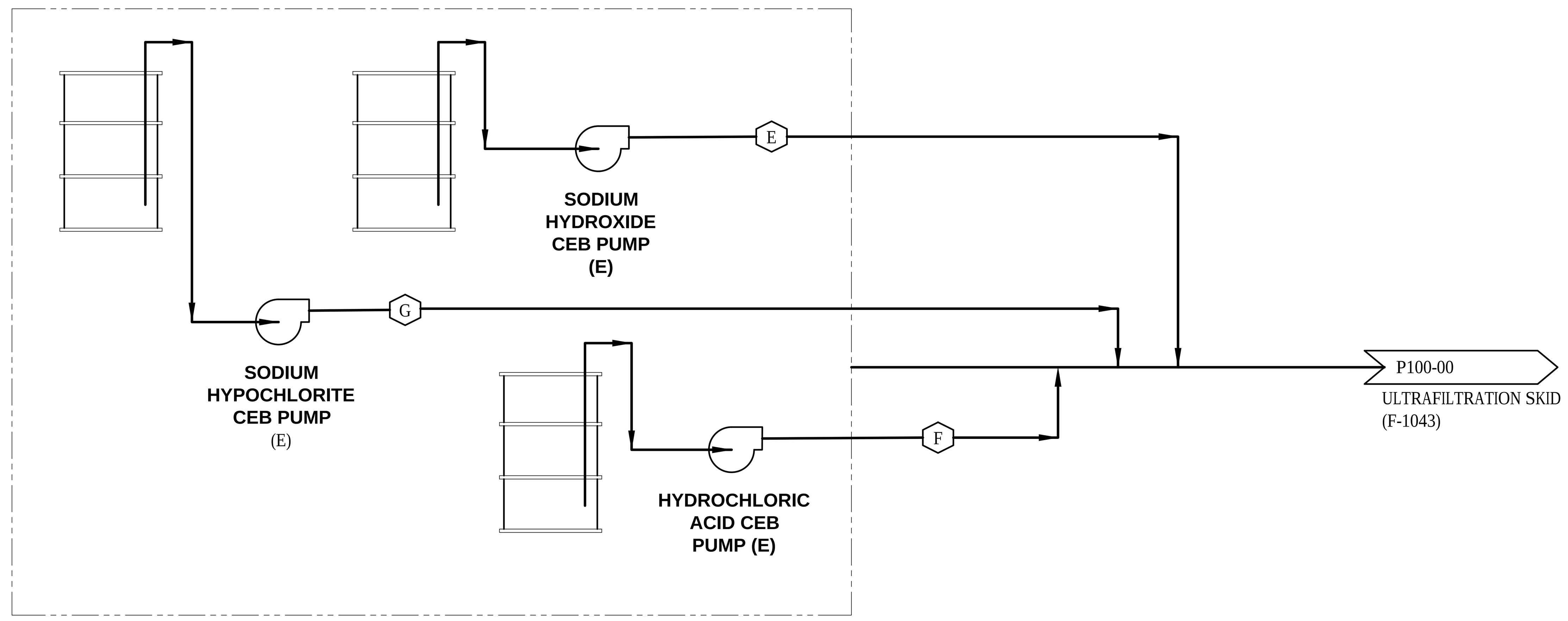
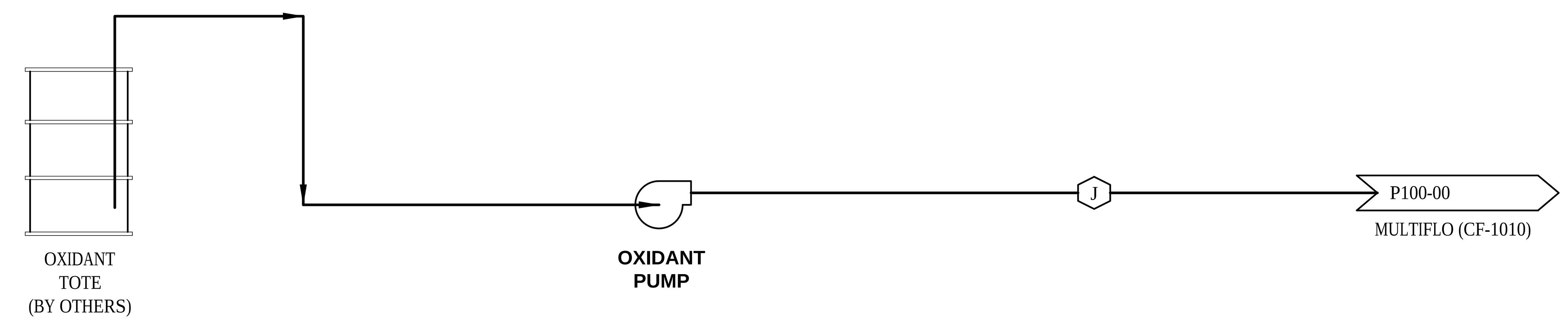
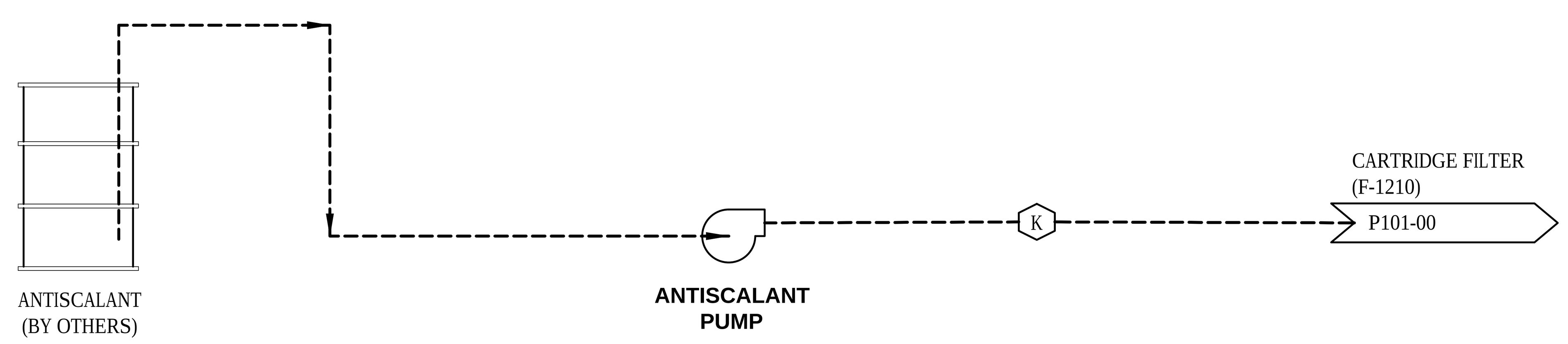


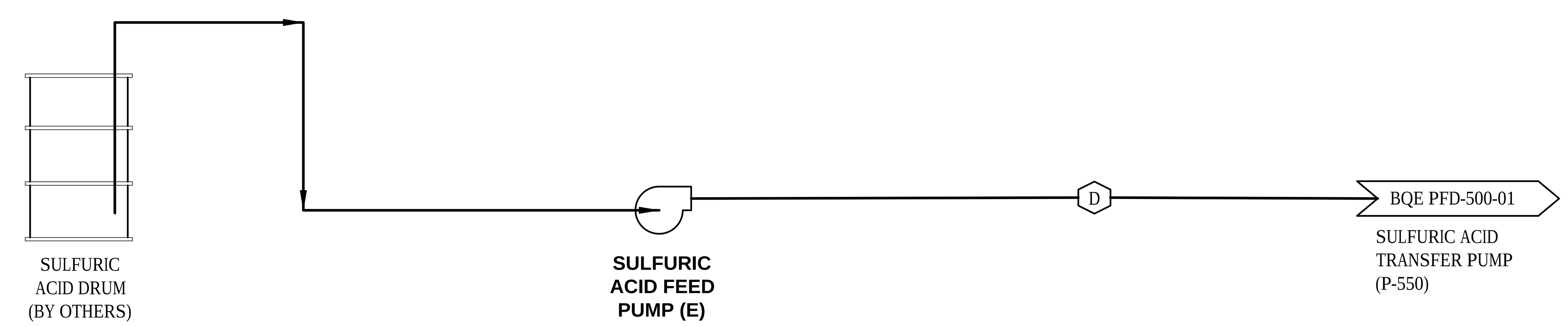
CHEMICAL ENHANCED BACKWASH (CEB) SKID



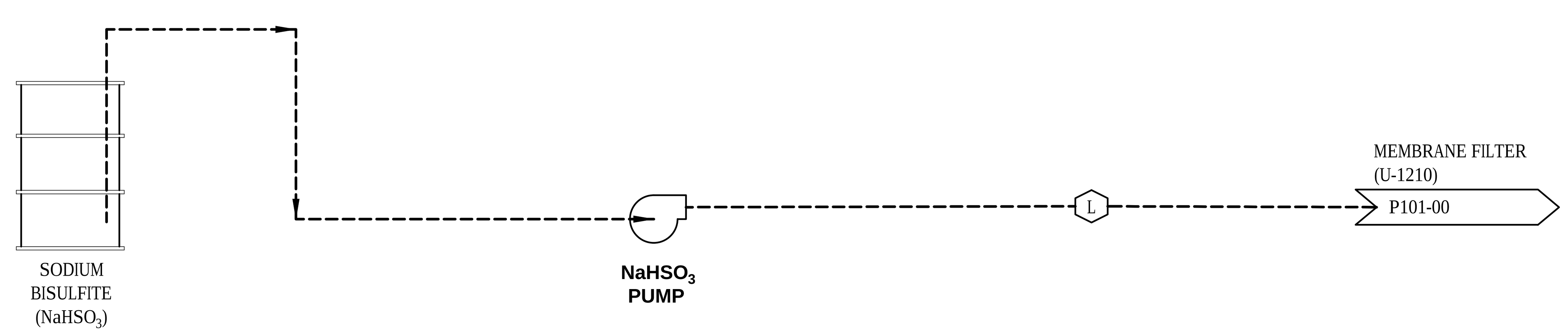
OXIDANT



ANTISCALANT



SULFURIC ACID



SODIUM BISULFITE ($NaHSO_3$)

SYMBOLS

MAIN PROCESS FLOW
INTERMITTENT FLOW
(E) EXISTING EQUIPMENT

SOUTH32

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REFERENCES		REFERENCES		REVISIONS						REVISIONS					
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HERMOSA PROJECT

WTP UPGRADES & MODIFICATIONS
PFD
UPGRADES REAGENT FLOW SHEET 2

PROJECT NO. M3-PN190449
DWG NO. P103-00
REV NO. P
DATE -

APPENDIX I: PROPOSED UPGRADE MECHANICAL AND EQUIPMENT LISTS

BQE Water

Mechanical Equipment List

Project: **Hermosa WTP**
Client: **South 32**
Location: **Arizona**

DOCUMENT #:	DATE OF ISSUE:	REVISION ISSUED FOR:	CREATOR:	REVIEWER:	APPROVER:	REV
18033-WTP-MEL-01	April 2, 2020	ISSUED FOR REVIEW	V. Sundar	B. Baker	B. Baker	A
	April 20, 2020	ISSUED FOR INFORMATION	B. Baker	B. Baker	B. Baker	B
	April 27, 2020	ISSUED FOR PERMITTING				P

Tag No.	Qty.	Name	Capacity and Size (design)	Process Conditions	Material of Construction	Comments	REV
Area 300 - ERC							
Vessels							
TK-300	1	ERC Feed Tank	ID = 8 ft, H = 9 ft, Liquid V = 2940 gallon, Tank V = 3000 gallon	Iron Slurry; pH 9.0	Epoxy Coated CS / HDPE		B
TK-301/302/303	3	Recirculation Tank	ID = 8 ft, H = 8 ft, Liquid V = 1320 gallon, Tank V = 2000 gallon, 30 Degree Cone Bottom	Iron Slurry; pH 9.0	Epoxy Coated CS		B
TK-350	1	Aging Tank	ID = 8 ft, H = 9 ft, Liquid V = 2940 gallon, Tank V = 3000 gallon	Iron Slurry; pH 4.3	Epoxy Coated CS		B
TK-355	1	ERC Clarifier	Part of EQ-355	Iron Slurry; pH 9.0	SS		A
TK-360	1	Polishing Reactor	Part of EQ-355	SO4 Brine Solution; pH 4.2	SS		A
TK-365	1	Polishing Clarifier	Part of EQ-355	Iron Slurry; pH 4.3	SS		A
TK-370	1	Polishing Clarifier O/F Tank	Part of EQ-355	Iron Slurry; pH 9.0	SS		A
Agitators							
AG-350	1	Aging Tank Agitator	Di = 36 in @ 120 RPM, MHP = 5 HP	Iron Slurry; pH 9.0	SS316		B
EQ-355	1	ERC Clarifier Rake Mechanism	Part of EQ-355	Iron Slurry; pH 9.0	SS		A
AG-360	1	Polishing Reactor Agitator	Part of EQ-355	Iron Slurry; pH 4.3	SS316		A
EQ-365	1	Polishing Clarifier Rake Mechanism	Part of EQ-355	Iron Slurry; pH 4.3	SS		A
AG-370	1	Polishing Clarifier O/F Tank Agitator	Part of EQ-355	SO4 Brine Solution; pH 4.2	SS316		A
Pumps & Blowers							
BL-300A/B	2	Sweep Air Blower	Centrifugal Blower 1,700 SCFM @ 6.5 in H2O, MHP = 3 HP	Ambient Air	CS / SS		A
P-301	1	ERC Feed Pump	Centrifugal Pump, 441 GPM, SG = 1, TDH = 49.3 ft, MHP = 10 HP, Variable Speed Drive	Membrane Reject; pH 7~9	SS		B
P-301/302/303	3	Recirculation Pump	Centrifugal Pump, 353 GPM, SG = 1, TDH = 82.1 ft, MHP = 15 HP, Variable Speed Drive	Iron Slurry; pH 9.0	SS		B
P-351	1	ERC Clarifier Feed Pump	Centrifugal Pump, 49 GPM, SG = 1, TDH = 23 ft, MHP = 1 HP, Variable Speed Drive	Iron Slurry; pH 9.0	SS		B
P-356	1	ERC Sludge Discharge Pump	AOD Pump 9 GPM, SG = 1.1, TDH = 50 ft, Peak = 10 SCFM	Iron Slurry; pH 9.0	PP or Equivalent		B
P-367	1	Polishing Reseed Pump	Hose Pump, 7 GPM, SG = 1.1, TDH = 111.6 ft, MHP = 2 HP, Variable Speed Drive	Iron Slurry; pH 4.3	PP or Equivalent		B
P-371	1	Polishing Effluent Pump	Centrifugal Pump, 49 GPM, SG = 1, TDH = 114.9 ft, MHP = 3 HP, Variable Speed Drive	SO4 Brine Solution; pH 4.2	SS		B
Other Equipment							
EC-301/302/303	3	Electroreduction Cells	Constant Gap Cells, Anode Diameter = 6.5 ft (2m)	Iron Slurry; pH 9.0	SS316 Cathode, CS Anode		B
EQ-355	1	ERC-Polishing Module	2 Clarifier Basins & 2 Mixing Basins (20 ft L x 8 ft W x 8 ft H) c/w Agitators, and Rake Mechanisms	Iron Slurry; pH 4.2-9.0	SS		A
EQ-375	1	Polished Effluent Cartridge Filter		SO4 Brine Solution; pH 4.2	Epoxy Coated CS		B
Area 500 - Reagents							
Vessels							
TK-510	1	Cationic Flocculant Mix Tank	ID = 0.6 m, H = 0.8 m, Liquid V = 0.2 m3, Tank V = 0.2 m3	0.25% Flocculant; pH ~ 6.8, viscous	HDPE		A
TK-511	1	Cationic Flocculant Storage Tank	ID = 0.6 m, H = 0.8 m, Liquid V = 0.2 m3, Tank V = 0.2 m3	0.25% Flocculant; pH ~ 6.8, viscous	HDPE		A
TK-540	1	Sodium Hydroxide Storage Tank	ID = 6 ft, H = 8 ft, Liquid V = 1290 gallon, Tank V = 1500 gallon	10% NaOH Solution; very high pH	HDPE		B
TK-555	1	Sulfuric Acid Storage Tank	ID = 6 ft, H = 8 ft, Liquid V = 1290 gallon, Tank V = 1500 gallon	11% H2SO4 Solution; very low pH	HDPE		B
Agitators							
AG-510	1	Cationic Flocculant Mix Tank Agitator	Di = 0.2 m @ 180 RPM, MHP = 0.5 HP	0.25% Flocculant; pH ~ 6.8, viscous	SS316		A
AG-540	1	Sodium Hydroxide Storage Tank Agitator	Di = 27 in @ 120 RPM, MHP = 1 HP	10% NaOH Solution; very high pH	SS316		B
AG-555	1	Sulfuric Acid Storage Tank Agitator	Di = 27 in @ 120 RPM, MHP = 1 HP	11% H2SO4 Solution; very low pH	SS316		B
Pumps & Blowers							
P-503	1	Anionic Flocculant Pump	Metering Pump 2 GPH, SG = 1.01, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	0.25% Flocculant; pH ~ 6.8, viscous	HDPE		B
P-512	1	Cationic Flocculant Pump	Metering Pump 2 GPH, SG = 1.01, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	0.25% Flocculant; pH ~ 6.8, viscous	HDPE		B
P-541	1	Sodium Hydroxide Pump	Metering Pump 2 GPH, SG = 1.11, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	10% NaOH Solution; very high pH	HDPE		B
P-542	1	Sodium Hydroxide Pump	Metering Pump 2 GPH, SG = 1.04, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	10% NaOH Solution; very high pH	HDPE		B
P-550	1	Sulfuric Acid Pump	Metering Pump 32 GPH, SG = 1.5, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	98% H2SO4 Solution; very low pH	HDPE		B
P-556/557/558	3	Sulfuric Acid Pump	Metering Pump 16 GPH, SG = 1.09, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	11% H2SO4 Solution; very low pH	HDPE		B
P-560	1	Sulfuric Acid Pump	Metering Pump 2 GPH, SG = 1.09, TDH = 50 ft, MHP = 0.5 HP, Variable Speed Stepper Motor	11% H2SO4 Solution; very low pH	HDPE		B
Other Equipment							
EQ-510	1	Cationic Flocculant Makeup System	Manual Flocculant Makeup System: 0.6 lbs/day of dry cationic flocculant	Flocculant Powder	SS / Plastic		B
Area 600 - Utilities							
Vessels							
TK-640	1	Nitrogen Receiver	400 Gallon ASME Certified Pressure Vessel, 165 PSIG MAWP	Compressed Air/N2	Enamel Painted CS		A
Other Equipment							
EQ-640	1	Nitrogen Generator	Max Requirement 55 SCFM @ 99.9% N2 Purity	Compressed Air/N2	CS / SS		B

Notes:
1 - Agitator/Rake motor horsepower to be confirmed after final tank selections.
2 - Pump motor horsepower to be confirmed after hydraulic profile completion.

EQUIPMENT REGISTER

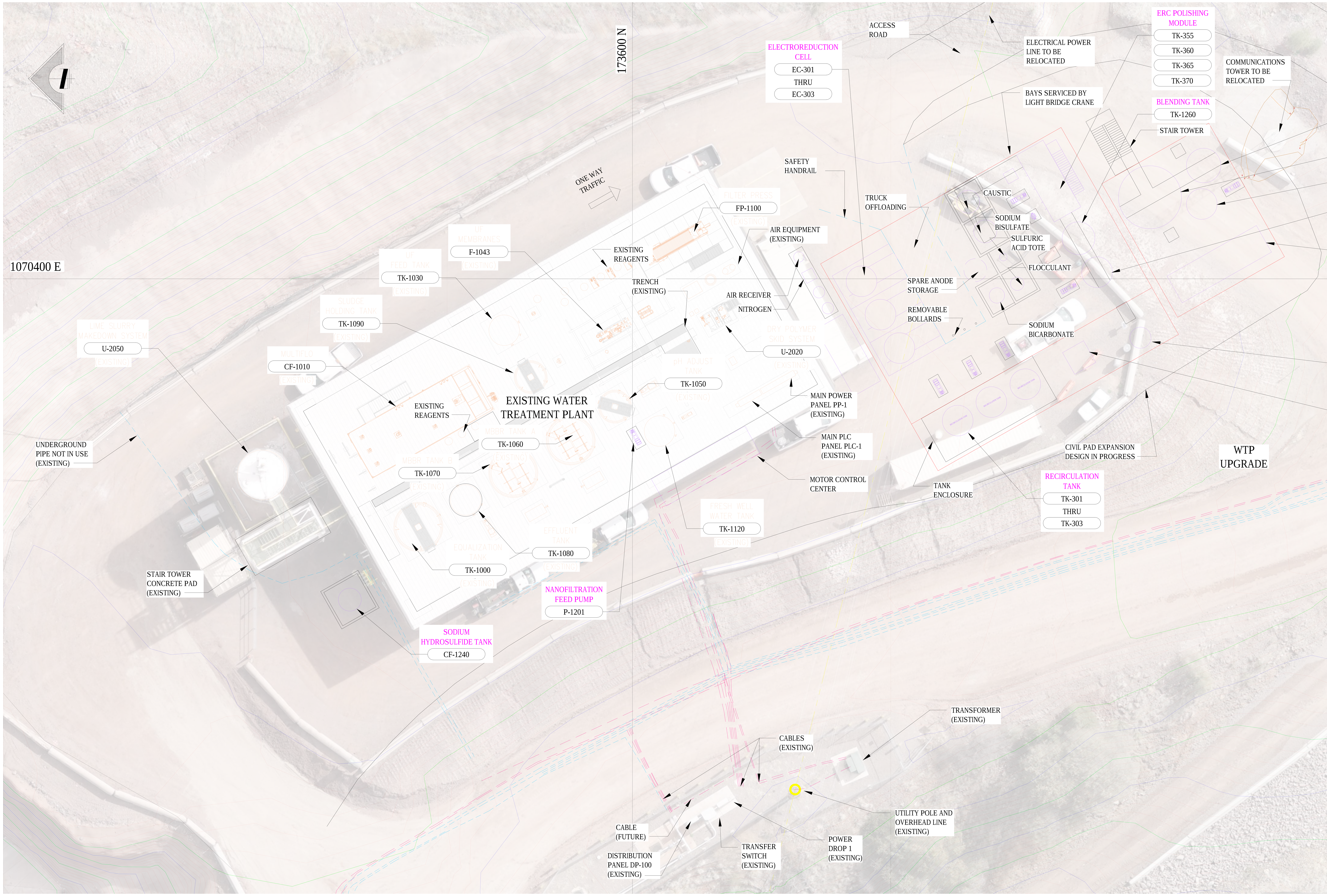
Date of Issue: 16-Apr-20
Project: M3-PN190449.003 WTP Upgrades
Client: South32
Date of Last Issue: 16-Apr-20

Distribution:
Matt Groff, Fiona Jordan, Robert Davidson, Tarlton Ferrin,

Information Status Key
P = Preliminary
V = Confirmed Design Value
C = Certified

REV DATE	AREA	TYPE	NO	ITEM	ITEM	ITEM (English)	SOUTH32 ASSET#	DESCRIPTION	DESIGN OPERATION/USE	COMMISSIONING SUB-SYSTEM	INFO STATUS	MOTOR SIZE (HP)	MOTOR SIZE (kW)	SPEC NO.	PO	PO Approved Date	CONTRACT	COMMENTS & SOURCE	COST
-	- -	-	- -	- -	-	-	-	-	-	-	-	86	84	-	-	-	-	-	0
AREA 24350 - WTP PLANT UPGRADE																			
19-Feb-20	24350 -	A	- 1230			DESATURATION REACTION TANK AGITATOR		For TK-1230 DESATURATION REACTION TANK, with turbomix, 480/3/60, VFD Driven	Continuous		P	3	2.2	1101	M004			For 24350-TK-1230	
12-Mar-20	24350 -	A	- 1230	- VF		DESATURATION REACTION TANK AGITATOR VFD		For A-1230, 480V	Continuous		P	-	-	4218	E001				
05-Mar-20	24350 -	A	- 1241			CLARIFIER RAKE		For CF-1240	Continuous		P	1	0.75	3403.1	M001			Included with CF-1240	
05-Mar-20	24350 -	A	- 1242			CLARIFIER FLOCCULATING TURBINE		480/3/60, VFD Driven	Continuous		P	0.5	0.37	3403.1	M001			Included with CF-1240	
05-Mar-20	24350 -	A	- 1242	- VF		CLARIFIER FLOCCULATING TURBINE VFD		For A-1242, 480V	Continuous		P	-	-	4218	E001				
19-Feb-20	24350 -	A	- 1261			BLENDING TANK - AGITATOR		For TK-1260 BLENDING TANK - 2, 480/3/60, VFD Driven	Continuous		P	1	0.75	1101	M004				
19-Feb-20	24350 -	A	- 1261	- VF		BLENDING TANK - AGITATOR VFD		For A-1261, 480V	Continuous		P	-	-	4218	E001				
19-Feb-20	24350 -	CF	- 1240			DESATURATION CLARIFIER		14 ft Dia x 14 ft Tank Height, 12 ft Vertical side wall height, Flocculating Clarifier, 76gpm, CS Epoxy coated wetted material of construction, 480/3/60	Continuous		P	-	-	3403.1	M001				
12-Mar-20	24350 -	CP	- 1200			MAIN CONTROL PANEL		Control Panel with Local HMI Screen	Continuous		P	-	-		J001				
12-Mar-20	24350 -	CP	- 1210			MEMBRANE CONTROL PANEL		Control Panel for the Membrane Filtration Skid, Fed from DP-1200, 120/1/60	Continuous		P	-	-	4606	P002			Included with MF-1210	
12-Mar-20	24350 -	CP	- 1240			CLARIFIER CONTROL PANEL		Control Panel for the Clarifier, Fed from DP-1200, 120/1/60	Continuous		P	-	-	3403.1	M001			Included with CF-1240	
19-Feb-20	24350 -	D	- 1510			AIR DRYER		Ingersoll Rand Model HLA 120, Heatless Desiccant Dryer, 120 CFM @ 125 psi	Intermittent		P	-	-	1601	M005				
12-Mar-20	24350 -	DP	- 1200			DISTRIBUTION PANEL		208/120V	Continuous		P	-	-		E003				
19-Feb-20	24350 -	F	- 1210			CARTRIDGE FILTER		5 micron, 40" long	Continuous		P	-	-	4606	P002			Included with MF-1210	
19-Feb-20	24350 -	F	- 1222			CIP CARTRIDGE FILTER		5 micron, 40" long	Intermittent		P	-	-	4606	P002			Included with MEMBRANE FILTER-1210	
19-Feb-20	24350 -	F	- 1223			MEMBRANE FILTER FLUSHING PUMP CARTRIDGE FILTER		5 micron, 40" long	Continuous		P	-	-	4606	P002			Included with MEMBRANE FILTER-1210	
05-Mar-20	24350 -	F	- 1271			DRUM FILTER WASH WATER FILTER			Continuous		P	-	-	3213	M002			Included with F-1270	
12-Mar-20	24350 -	H	- 1220			MEMBRANE FILTER CIP TANK HEATER		Insertion Heater, 480/3/60	Continuous		P	-	2	4606	P002			Included with MEMBRANE FILTER-1210	
12-Mar-20	24350 -	LP	# 1200			LIGHTING PANEL		200 AMP, 208/120/3/60	Continuous		P	-	-		E002				
12-Mar-20	24350 -	MC	- 1200			MOTOR CONTROL CENTER		Low Voltage MCC, 480V, 6 Sections	Continuous		P	-	-	4202	E001				
19-Feb-20	24350 -	P	- 1201			MEMBRANE FILTER FEED PUMP		Horizontal Centrifugal pump, 120gpm, 104 ft. TDH, 480/3/60	Continuous		P	7.5	5.6	2713	P001				
19-Feb-20	24350 -	P	- 1221			PERMEATE BOOSTER PUMP		Horizontal Centrifugal pump, 72gpm, 115 ft. TDH, 480/3/60, VFD Driven	Continuous		P	5	3.7	2713	P001				
12-Mar-20	24350 -	P	- 1221	- VF		PERMEATE BOOSTER PUMP VFD		For P-1221, 480V	Continuous		P	-	-	4218	E001				
19-Feb-20	24350 -	P	- 1222			MEMBRANE FILTER CIP PUMP		On MEMBRANE FILTER CIP (Cleaning in Place) Skid, Horizontal Centrifugal pump, 120 gpm, SS316 wetted material of construction, 92 ft TDH, 480/3/60	Intermittent		P	5	3.7	4606	P002			Included with MEMBRANE FILTER-1210	
19-Feb-20	24350 -	P	- 1223			MEMBRANE FILTER FLUSHING PUMP		Horizontal Centrifugal pump, 60gpm, 92 ft TDH, 480/3/60	Intermittent		P	3	2.2	4606	P002			Included with MEMBRANE FILTER-1210	
19-Feb-20	24350 -	P	- 1243			CLARIFIER SLUDGE DISCHARGE / RECYCLE PUMP		Underflow from Clarifier, Rotary Lobe Pump, 35gpm Design Capacity, 57 ft TDH, 480/3/60, VFD Driven	Continuous		P	2	1.5	2739	P005				
12-Mar-20	24350 -	P	- 1243	- VF		CLARIFIER SLUDGE DISCHARGE / RECYCLE PUMP VFD		For P-1243, 480V	Continuous		P	-	-	4218	E001				
19-Feb-20	24350 -	P	- 1252			SULFATE SLUDGE TRANSFER PUMP		Air Operated Diaphragm (AODD) pump, 70gpm, 480/3/60	Continuous		P	1	0.75	2707	P007				
19-Feb-20	24350 -	P	- 1281			TREATED WATER PUMP		Vertical Sump Pump, 120gpm design capacity, 34 ft TDH, 480/3/60	Continuous		P	2	1.5	2701	P006			Previous version had "pending hydraulic review"	
19-Feb-20	24350 -	P	- 1291			SUMP PUMP		Submersible Vertical Sump	Intermittent		P	2	1.5	2726	P009				
10-Mar-20	24350 -	P	- 2111			ANTISCALANT PUMP		Metering Pump, 3 gpd design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- XXXX			NaHS PUMP		Metering Pump, 1 gph design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- 2121			SODIUM HYPOCHLORITE PUMP		Metering Pump, 1 gph design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- 2131			SODIUM BISULFITE PUMP		Metering Pump, 1 gph design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- 2141			OXIDANT PUMP		Metering Pump, 2 gph design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- 2151			FERRIC CHLORIDE PUMP		Metering Pump, 5 gpd design capacity, 120/1/60	Intermittent		P	0.33	0.25	2704	P008				
10-Mar-20	24350 -	P	- 2161			DESATURATION POLYMER FEED PUMP		Dosing Pump	Intermittent		P	0.33	0.25	2704	P008				
19-Feb-20	24350 -	R	- 1510			AIR RECEIVER			Continuous		P	-	-	1610	M005				
19-Feb-20	24350 -	RO	- 1210			MEMBRANE FILTRATION SKID		3x2 skid mounted membrane filtration vessels, Housing - FRP	Continuous		P	-	-	4606	P002				
19-Feb-20	24350 -	TK	- 1220			PERMEATE TANK		X' Dia., X' H, Closed top, flat bottom, 500 gallons design capacity, Polyethylene wetted material of construction	Continuous		P	-	-	3308	P004				
19-Feb-20	24350 -	TK	- 1221			MEMBRANE FILTER CIP TANK		On MEMBRANE FILTRATION SKID CIP (Cleaning in Place) Skid, Closed top, Flat bottom	Intermittent		P	-	-	4606	P002			Included with MEMBRANE FILTER-1210	
19-Feb-20	24350 -	TK	- 1230			DESATURATION REACTION TANK		8' Dia x 12' SS, Vertical open top tank with cone bottom, 3000 gallons design capacity, FRP wetted material of construction	Continuous		P	-	-	3310	P003				
19-Feb-20	24350 -	TK	- 1260			BLENDING TANK		8' Dia. X 13.5' H (12.5' SWD), Vertical Tank, Open top, Flat bottom, 4000 gal Capacity, material of construction: FRP, Tank to include 4 mix baffles. Preferred model: Model C-OFV-8-5075 / Belding	Continuous		P	-	-	3310	P003			Previous version had "500 Gallons, HDPE wetted material of construction"	
12-Mar-20	24350 -	TX	- 1200			TRANSFORMER		Dry Type, 480-208V, 75 kVA			P	-	-	4202	E003				
19-Feb-20	24350 -	U	- 2054			LIME FEEDER		Volumetric Feeder, 127 lbs/h Hydrated Lime, XX lb/ft2, (Replaces Existing Feeder)	Intermittent		P	1	0.75	2516	M006			The WTP Upgrade asked for a feeder that transferred an additional 60 lbs/hr. The	

APPENDIX J: PROPOSED UPGRADE GENERAL ARRANGEMENTS DRAWINGS



OVERALL AREA PLAN

SCALE: 1" = 12'-0"

12' 0' 12' 24'

SCALE IN FEET

IMAGE DATE: FEB 20, 2020
COUNTORS 1 FT

DO NOT SCALE 11x17 DRAWINGS

SOUTH32

REFERENCES	
DWG. NO.	TITLE

REFERENCES	
DWG. NO.	TITLE

REVISIONS					
NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

REVISIONS					
NO.	DESCRIPTION	BY	APP'D	DATE	CLIENT

SCALE: AS NOTED		DATE
DESIGNED BY	TVF	APR 20
DRAWN BY	TVF	APR 20
CHECKED BY		
PROJECT MGR	MG	
CLIENT APPR.		

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WTP UPGRADES & MODIFICATIONS

ENVIRONMENTAL OVERALL AREA PLAN

PROJECT NO. M3-PN190449
DWG NO.
24350-EN-101
REV NO. P
DATE 06 MAY 20

ATTACHMENT B

Newfields Engineer of Record Memorandum

NewFields
Perspective. Vision. Solutions.

March 13, 2020
NewFields Job No. 475.0014.013

South32 (AMI)
2210 East Fort Lowell Road
Tucson, Arizona 85719

Attention: Mr. Brent Musslewhite

Re: Stability Analysis for the Water Treatment Plant Filter Cake and Core Cutting Material Placement in the Voluntary Remediation Program Tailings Storage Facility

Tailings and Potentially Acid Generating Material Remediation, Placement and Storage Project

NewFields has prepared this letter in response to a request from South32 (AMI) to place future Water Treatment Plant (WTP) filter cake and core cutting material in the Voluntary Remediation Program (VRP) Tailings Storage Facility (TSF) which is currently under construction as part of the Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project. Attached is a stability evaluation and technical specification that addresses placement of WTP filter cake and core cutting material (from trimming core recovered from the exploration drilling process) in the TSF.

The technical specification requires mixing of the materials with existing tailings, on site native borrow material or exploration decline development rock as well as defined geometric placement limits within the TSF. The stability evaluation was completed in accordance with the state of Arizona Best Available Demonstrated Control Technology (BADCT) guidelines and specifies placement zones within the TSF to maintain the required factors of safety for both static and seismic loading conditions.

If placement of WTP filter cake and core cutting material in the VRP TSF is performed in accordance with the technical specifications presented in the NewFields Technical Memorandum, “Stability Analysis for the Water Treatment Plant Filter Cake and Core Cutting Material Placement in the Voluntary Remediation Program Tailings Storage Facility,” the resulting static and pseudostatic factors of safety will meet or exceed the prescribed BADCT guidelines. The engineer of record, Craig M Thompson, has directed the work described herein and approves the approach presented in the technical specifications. Please reference the attached NewFields Technical Memorandum for details of the slope stability analysis and material placement technical specifications.

Sincerely,

Registered Professional Engineer (Civil)
CERTIFICATE NO.
63431
CRAIG M.
THOMPSON
3/13/20
Date Signed
ARIZONA, U.S.A.
EXPIRES 3/31/23

Craig Thompson, P.E.
Project Engineer

Reviewed by:

R. Michael Smith, P.E.
Principal

9400 Station Street
Suite 300
Lone Tree, CO 80124

T: 720.508.3300
F: 720.508.3339

TECHNICAL MEMORANDUM

To: South32 (AMI)

From: Mike Smith, P.E. and Craig Thompson, P.E.

Project: Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project

Project No: 475.0014.013

Subject: Stability Analysis for the Water Treatment Plant Filter Cake and Core Cutting Material Placement in the Voluntary Remediation Program Tailings Storage Facility

Date: March 13, 2020

NewFields has created this Technical Memo to provide a stability analysis and material placement Technical Specifications for filter cake material generated from the Water Treatment Plant (WTP) and core cutting material generated from trimming core recovered from the exploration drilling process. The materials are intended to be placed in the Voluntary Remediation Program (VRP) Tailings Storage Facility (TSF) which is currently under construction as part of the Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project.

1. PLACEMENT CRITERIA

NewFields developed material placement Technical Specifications for the WTP filter cake and core cutting material which can be referenced in Attachment A and B, respectively. The Technical Specifications were developed based on a control sample collected for each material and are intended to provide supplemental information to the approved NewFields' VRP TSF Technical Specifications for Earthworks, Materials and Construction (0014-SPT-EW) regarding placement of the materials in the VRP TSF. Reference the WTP filter cake and core cutting material Technical Specification for material properties, placement criteria, quality assurance testing frequencies and a figure showing area specific material placement zones.

2. ESTIMATED MATERIAL QUANTITIES

South32 (AMI) provided the following estimated future material quantities which will report to the VRP TSF:

- WTP filter cake material: ~3,650 cubic yards per year (~10 yards per day).
- Core cutting material: ~12 cubic yards per year (~1 yard per month).

3. STABILITY EVALUATION

A stability evaluation was completed to ensure the integrity of the TSF will not be impacted by the addition of the WTP filter cake and core cutting materials. Stability analyses for the TSF were performed using the computer program SLIDE 7 by RocScience. SLIDE is a two-dimensional slope stability program for evaluating circular or noncircular failure surfaces in soil or rock slopes using limit equilibrium methods. Spencer's procedure was used within the stability model and assumes all interslice forces are parallel and have the same inclination. The factor of safety can be defined as the resisting forces along a potential failure plane divided by the gravitational and dynamic driving forces. Factors of safety in excess of 1.0 indicate stability. Minimum acceptable factors of safety for static and pseudostatic conditions were established as 1.3 and 1.0, respectively in accordance with the Arizona Best Available Demonstrated Control Technology (BADCT) guidelines.

3.1. Design Ground Motions

To assess the stability of slopes during seismic loadings, pseudostatic analyses were completed. These analyses apply an additional destabilizing horizontal force to the sliding mass that represents the effects of earthquake motions and is related to the Peak Ground Acceleration (PGA) from expected seismic loading at the site. Very simply, the seismic force is the weight of the sliding mass multiplied by a horizontal pseudostatic earthquake coefficient (k_h).

These analyses utilize 0.055 g, which is one-half of the PGA, as k_h which is consistent with the stability evaluation presented in the NewFields design report, "Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project, Aquifer Protection Permit (APP), Best Available Demonstrated Control Technology (BADCT) Design" issued June 5, 2017.

3.2. Stability Model Development

The TSF static and pseudostatic stability were evaluated for the fully stacked VRP TSF using the sections presented in the plan view on Figure A (Attachment C). The sections were selected to represent the critical sections where WTP filter cake or core cutting material are allowed to be placed. The natural groundwater was not considered in the stability evaluation as levels within the subsurface are too deep to have an impact on the stability of the structures evaluated.

Sections A and B on Figure A consist of a TSF perimeter road embankment with a 2.5H:1V upstream slope and a 2.0H:1V downstream slope. The reclaimed tailings and exploration decline development rock are stacked with a composite 3.0H:1V slope up to 5,110 feet amsl. The sections include the composite HDPE geomembrane-LPSL and HDPE geomembrane-geosynthetic clay liner (GCL) liner systems. A piezometric surface was applied approximately 1.5 feet above the geomembrane to simulate minimal saturation at the base of the permanently reclaimed tailings.

Sections A and B on Figure A were created using aerial topography acquired in December 2019 to establish the perimeter road and stacking geometries for the VRP TSF. The base grades as well as the limits of the geomembrane-LPSL and geomembrane-GCL liner systems were developed using survey as-built data from construction. The limits of WTP filter cake and core cutting material were set internal to the stacking with a specified distance determined through an iterative slope stability modeling process. The zone identified for placement of WTP filter cake and core cutting material is larger than needed considering the estimated material quantities specified in Section 2 but the additional volume will provide a level of operational flexibility. Please note, exploration decline development rock and reclaimed tailings shall be placed in the WTP filter cake and core cutting material zone to occupy the remainder of the unused volume. Only the WTP filter cake and core cutting material is limited by geometric placement zones. Also, any zone identified as reclaimed tailings can be replaced by the stronger exploration decline development rock, if development rock is available at that time.

3.3. Material Properties

Material properties utilized in the stability assessment were based on the results of the subsurface exploration, laboratory test results, and NewFields' familiarity with similar materials and applications. The material properties are summarized in the following paragraphs and in Table 1.

Reclaimed Tailings: Properties of the reclaimed tailings from Tailings Piles 1, 2, and 4 were based on measured values derived from laboratory testing of the reclaimed tailings placed material in the TSF. The reclaimed tailings strength was modeled with a phi angle of 28 degrees. An assumed piezometric surface was also applied to this material to provide a bit more conservatism to the model.

Exploration Decline Development Rock: Properties for the exploration decline development rock were assigned based on assumed properties. A friction angle of 32 degrees has been conservatively assigned to the material.

WTP Filter Cake Material (mixed with tailings, on-site native borrow material and/or development rock): Strength properties of the WTP filter cake were based on measured values derived from a consolidated undrained triaxial compression test performed on a 3:1 mixture (by volume) of reclaimed tailings and WTP filter cake, respectively. Reclaimed tailings was selected as the mixing material to define the lower bound strength of all the potential mixing scenarios. This is because mixing with a coarser material such as on-site native borrow material or exploration decline development rock would produce a higher strength. The WTP filter cake mixture was modeled with a phi angle of 16 degrees. A laboratory test result data sheet can be referenced in Appendix D.

Core Cutting Material (mixed with tailings, on-site native borrow material and/or development rock): Strength properties of the core cutting material were based on measured values derived from the consolidated undrained triaxial compression test performed on the WTP filter cake mixture. An additional strength test was not performed for the core cutting material because the total quantity of core cutting material reporting to the TSF is nominal (12 cubic yards per year). Also, the WTP filter cake strength values are conservative because the material properties for the core cutting material are more favorable than the material properties of the WTP filter cake when evaluating material strength. The core cutting material mixture was modeled with a phi angle of 16 degrees.

Composite Liner Interface (HDPE – LPSL): The composite liner system of HDPE-LPSL was assigned an interface friction angle of 20 degrees. This value is based on soil-liner interface shear testing completed on the design liner type and LPSL material from the Trench Camp site with a friction layer installed on the surface of the LPSL.

Composite Liner Interface (HDPE – GCL): The composite liner system of HDPE-GCL was assigned an interface friction angle of 11 degrees. This value is based on interface shear testing completed on the design geosynthetic types.

Engineered Fill: Properties for the engineered embankment fill have been determined based on measured values from direct shear testing of placed Engineered Fill. A friction angle of 32 has been conservatively assigned to the material.

Foundation: The material properties used for the foundation materials beneath the TSF were assumed based on a very thin veneer of soil overlying hard rock.

TABLE 1 – MATERIAL PROPERTIES USED IN THE STABILITY ANALYSES

Material	Moist Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)
Reclaimed Tailings	120	28	0
Exploration Decline Development Rock	120	32	0
WTP Filter Cake (3:1 Mixture)	120	16	0
Core Cutting (3:1 Mixture)	120	16	0
HDPE-LPSL Interface (with friction layer)	135	20	0
HDPE-GCL Interface	120	11	0
Embankment Fill	120	32	0
Foundation	120	38	0

3.4. Stability Evaluation Results

Results indicate that the facilities will remain stable under both static and pseudostatic conditions. Results of the stability analysis are shown in Table 2 and stability output sheets are included in Attachment C. The results document the minimum static and pseudostatic, factors of safety and the critical failure mode. In general, block failure surfaces were determined to be the most critical.

TABLE 2 – CALCULATED MINIMUM FACTORS OF SAFETY

Section	Condition	Critical Failure Mode	Minimum Factor of Safety	
			Static	Pseudostatic
A	TSF Downstream	Block	1.5 (1.3 min)	1.3 (1.0 min)
B	TSF Upstream	Block	1.5 (1.3 min)	1.2 (1.0 min)

4. CONCLUSIONS

WTP filter cake and core cutting material placed in accordance with the attached Technical Specifications was modeled in a revised stability analysis. The stability analysis shows that if the materials achieve the conservative prescribed strength values shown in Table 1 and are placed in the zones specified in the Technical Specifications, the static and pseudostatic factors of safety are a minimum of 1.5 and 1.2, respectively. These factors of safety meet or exceed the minimum factors of safety set in the BADCT manual of 1.3 (static) and 1.0 (pseudostatic).

The stability of the VRP TSF is not significantly impacted from the WTP filter cake and core cutting materials for the following reasons:

- The zones specified for placement of the WTP filter cake and core cutting material are strategically located interior to the TSF stacking in an effort to avoid the failure envelope.
- In general, the stability of the structures like the VRP TSF are principally controlled by the interface strength between the geomembrane-LPSL (geosynthetic-soil) or the geomembrane-GCL (geosynthetic-geosynthetic). Although the stacked material strength contributes to the stability, it is not the primary component governing failure in this case.
- The WTP filter cake and core cutting material quantity is relatively low when compared to the quantity of material placed in the VRP TSF.

As such, placing the WTP filter cake and core cuttings as outlined in the Technical Specifications does not have a material impact on the stability of the VRP TSF.

Although the production of WTP filter cake and core cutting material is continuous, the weekly quantity of material delivered to the TSF is small. It may be practical to utilize a staging area, located on the flat areas of the current TSF stacking, to store small stockpiles for multiple weeks or months until a sufficient quantity of material has accumulated to allow for efficient placement. The staging area could also be used to dry the WTP filter cake and core cutting material as well as mix it with reclaimed tailings, on-site native borrow material and/or exploration decline development rock prior to placement. If a staging area is used, adequate drainage should be provided to ensure removal of any meteoric runoff from the staging area.

5. REFERENCES

Hynes, M.E., Franklin, A.G., (1984), "Rationalizing the Seismic Coefficient Method," Department of the Army, U.S. Army Corps of Engineers, Miscellaneous Paper GL-84-13.

Kramer, S.L. (1996), "Geotechnical Earthquake Engineering," Prentice-Hall.

NewFields Mining Design & Technical Services, (2017), "Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project, Aquifer Protection Permit (APP), Best Available Demonstrated Control Technology (BADCT) Design" dated June 5.

ATTACHMENT A

NewFields
Perspective. Vision. Solutions.

TECHNICAL MEMORANDUM

9400 Station Street
Suite 300
Lone Tree, CO 80124

T: 720.508.3300
F: 720.508.3339

To: South32 (AMI)

From: Mike Smith, P.E. and Craig Thompson, P.E.

Project: Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project

Project No: 475.0014.011

Subject: Technical Specifications for Earthworks Materials and Construction – WTP Filter Cake

Date: March 13, 2020

The purpose of this Technical Memorandum is to provide updated Technical Specifications for the placement of filter cake in the tailings storage facility (TSF) from the existing Water Treatment Plant (WTP) as part of the Tailings and Potentially Acid Generation (PAG) Material Remediation, Placement, and Storage Project. The information below provides supplemental information regarding NewFields' Technical Specifications for Earthworks, Materials and Construction (0014-SPT-EW).

WTP Filter Cake Placement Procedure

The WTP filter cake is anticipated to be hauled and placed in the TSF at a rate of approximately 3,650 cubic yards per year. It will be hauled to the TSF in approximately 20 cubic yard increments.

The anticipated material properties are as follows based on a control sample obtained November 20th, 2019:

- 100 percent passing (by dry weight) the no. 200 sieve.
- Non-plastic soil.
- Moisture content was 363% (based on dry weight of solids) upon arrival to the TSF.

Upon placement in the TSF, the WTP filter cake shall be spread and dried to reduce the material moisture content. The filter cake shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3 (tailings/on site native borrow/development rock) to 1 (filter cake). After mixing, the material shall be moisture conditioned to within 2 percent below and 3 percent above the optimum moisture content. The material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698. Slight variations from the specified moisture range above may be acceptable subject to acceptance by the Engineer (NewFields) and provided the required compacted densities are achieved. The WTP filter cake material shall be compacted with appropriate compaction equipment capable of achieving compaction through the full thickness of the lift.

Care shall be taken to ensure that the mixed material is not rutting, pumping or exhibiting excessive deflection during compaction under haul traffic loading. If the surface exhibits excessive deflection, the material in the area of question will require stabilization using a combination of moisture reduction through active drying and recompaction, selective placement of rock material and recompaction or other means of stabilization such as geogrid placement in these areas.

WTP filter cake material placement shall occur only in the area shown on Figure 1 (attached). To the greatest extent possible, filter cake material placement shall not be in one continuous area or layer. Placement of each load of filter cake material shall be spread out so that distance between each placement area is maximized. Placement of filter cake material shall be temporarily suspended due to weather concerns if the materials and installation cannot comply with the guidance parameters stated above.

The specification requirements listed above are based on index testing results from a filter cake sample obtained on November 20th, 2019. If the filter cake material properties change or the estimated quantity of filter cake placed in the TSF increases, the Engineer (NewFields) shall be notified to re-evaluate the functionality of the TSF.

Testing Frequency

Quality control and quality assurance tests to determine compliance of the Work with the Technical Specifications will be performed in accordance with the latest edition of standard procedures, and in general, these will be adopted from recognized organizations such as the American Society of Testing and Materials (ASTM). The following tables (Table 1 and 2) outline the test methods and the minimum testing requirements for the project:

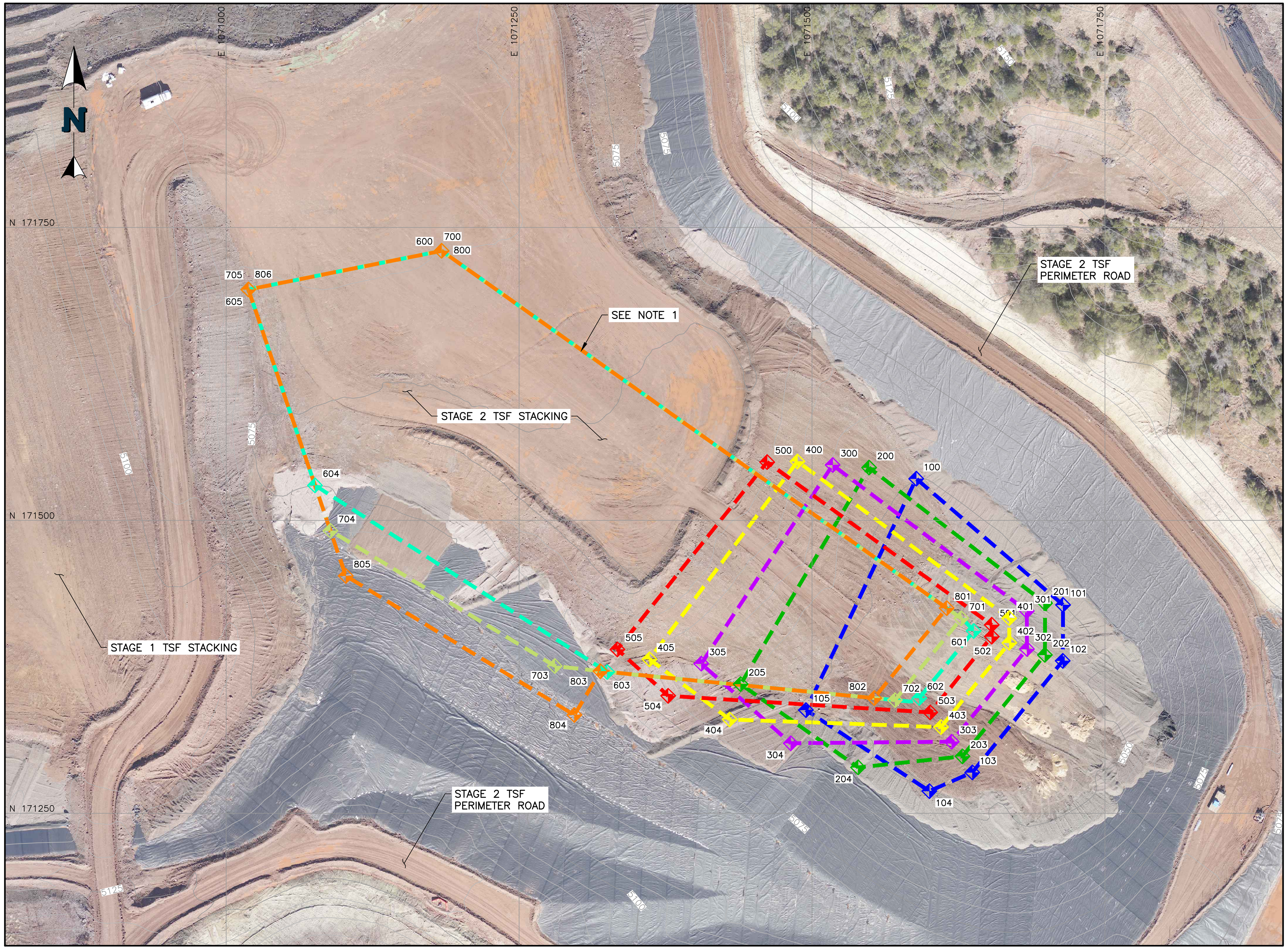
TABLE 1: TEST METHODS

Test	Type of Test	Test Method (ASTM)
C1, R1	Atterberg Limits	D4318
C2, R2	Moisture Content	D3017
C3, R3	Particle Size Distribution	D6913 [a]
C4, R4	Laboratory Compaction-Mod. Proctor	D1557
R5a	Nuclear Density	D6938
R5b	Sand Cone	D1556
R5c	Water Replacement	D5030
Notes: **C = Control Tests; R = Record Tests** [a] **Hydrometer tests down to the 2-micron size will be carried out as directed by the Engineer but will generally not be required; all samples to be washed over a No.200 sieve.**		

TABLE 2: TEST FREQUENCY – WTP FILTER CAKE (3 TO 1 RATIO)

Test	Type of Test	Minimum Frequency (one per)
C1, R1	Atterberg Limits	2,000 yd^3
C2, R2	Moisture Content	1,000 yd^3
C3, R3	Particle Size Distribution	2,000 yd^3
C4, R4	Laboratory Compaction	Soil type or every 15,000 yd^3
R5a	Nuclear Density (General Fill Placement)	1,000 yd^3
R5b/R5c	Sand Cone or Water Replacement Density	15,000 yd^3
Note: Required number of tests shall be determined by whichever method of determining the frequency requires the most tests. If material is too coarse for testing per ASTM then use test fill method per USACE EM 1110-2-1911.		

The testing frequencies stated in Tables 1 and 2 shall only apply when WTP filter cake material is placed as a mixture with tailings and/or on site native borrow material that is less than 30% rock by weight (materials above ¾-inch size). When WTP filter cake is mixed with exploration decline development rock or any material containing more than 30% rock, the placement method shall adhere to the technical specifications developed for placement of exploration decline development rock in the TSF.



BELOW ELEV. 5,050' SETTING OUT DATA		
POINT	NORTHING	EASTING
100	171,536	1,071,589
101	171,428	1,071,714
102	171,380	1,071,714
103	171,285	1,071,637
104	171,269	1,071,600
105	171,338	1,071,495

ELEV. 5,055' TO 5,050' SETTING OUT DATA		
POINT	NORTHING	EASTING
200	171,545	1,071,549
201	171,429	1,071,699
202	171,385	1,071,699
203	171,299	1,071,628
204	171,289	1,071,539
205	171,360	1,071,439

ELEV. 5,060' TO 5,055' SETTING OUT DATA		
POINT	NORTHING	EASTING
300	171,547	1,071,518
301	171,423	1,071,683
302	171,390	1,071,683
303	171,311	1,071,619
304	171,310	1,071,482
305	171,378	1,071,405

ELEV. 5,065' TO 5,060' SETTING OUT DATA		
POINT	NORTHING	EASTING
400	171,550	1,071,488
401	171,417	1,071,668
402	171,396	1,071,668
403	171,324	1,071,610
404	171,330	1,071,430
405	171,381	1,071,361

ELEV. 5,070' TO 5,065' SETTING OUT DATA		
POINT	NORTHING	EASTING
500	171,550	1,071,462
501	171,411	1,071,653
502	171,401	1,071,653
503	171,336	1,071,601
504	171,350	1,071,377
505	171,390	1,071,334

ELEV. 5,075' TO 5,070' SETTING OUT DATA		
POINT	NORTHING	EASTING
600	171,730	1,071,184
601	171,406	1,071,638
602	171,348	1,071,592
603	171,371	1,071,325
604	171,530	1,071,076
605	171,697	1,071,019

ELEV. 5,080' TO 5,075' SETTING OUT DATA		
POINT	NORTHING	EASTING
700	171,730	1,071,184
701	171,416	1,071,627
702	171,347	1,071,571
703	171,376	1,071,281
704	171,491	1,071,089
705	171,697	1,071,019

ELEV. 5,108 TO 5,080' SETTING OUT DATA		
POINT	NORTHING	EASTING
800	171,730	1,071,184
801	171,425	1,071,615
802	171,348	1,071,553
803	171,371	1,071,319
804	171,334	1,071,297
805	171,453	1,071,102
806	171,697	1,071,019

LEGEND:

EXISTING GROUND CONTOURS
BELOW ELEV. 5,050'
ELEV. 5,055' TO 5,050'
ELEV. 5,060' TO 5,055'
ELEV. 5,065' TO 5,060'
ELEV. 5,070' TO 5,065'
ELEV. 5,075' TO 5,070'
ELEV. 5,080' TO 5,075'
ELEV. 5,108' TO 5,080'

0 50 100 FEET

NOTE:

1. REFER TO TECHNICAL SPECIFICATIONS FOR AREA SPECIFIC PLACEMENT ZONES AND PROCEDURES FOR WTP FILTER CAKE MATERIALS.

NewFields

CLIENT: SOUTH32 (AMI)

PROJECT: TAILINGS AND POTENTIALLY ACID GENERATING (PAG) MATERIAL REMEDIATION, PLACEMENT AND SOTRAGE

TITLE: WTP FILTER CAKE MATERIAL PLACEMENT AREAS

FILENAME: 0014.013.102F

FIGURE NO.: 1

REVISION: 0

P:\Projects\0014.013 Hermosa Engineering Support - Stage 1 Construction\A-CAD\FIGS\0014.013.102F.dwg-1/23/2020 9:45 AM

ATTACHMENT B

NewFields
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9400 Station Street
Suite 300
Lone Tree, CO 80124

T: 720.508.3300
F: 720.508.3339

TECHNICAL MEMORANDUM

To: South32 (AMI)

From: Mike Smith, P.E. and Craig Thompson, P.E.

Project: Tailings and Potentially Acid Generating (PAG) Material Remediation, Placement and Storage Project

Project No: 475.0014.011

Subject: Technical Specifications for Earthworks Materials and Construction – Core Cutting Material

Date: March 13, 2020

The purpose of this Technical Memorandum is to provide updated Technical Specifications for the placement of core cutting solids in the tailings storage facility (TSF) as part of the Tailings and Potentially Acid Generation (PAG) Material Remediation, Placement, and Storage Project. The core cutting material will be generated from trimming core recovered from the exploration drilling process. The information below provides supplemental information regarding NewFields' Technical Specifications for Earthworks, Materials and Construction (0014-SPT-EW).

<u>Core Cutting Material Placement Procedure</u>

The core cutting material is anticipated to be hauled and placed in the TSF utilizing 55 gallon drums at a rate of approximately 12 cubic yards per year.

The anticipated material properties are as follows based on a control sample obtained January 2nd, 2019:

- Particle Size Distribution (by dry weight)
  - 100 percent passing the 1-inch sieve
  - 76.1 percent passing the no. 4 sieve
  - 72.3 percent passing the no. 10 sieve
  - 68.8 percent passing the no. 40 sieve
  - 64.4 percent passing the no. 200 sieve
- Material will be saturated upon arrival to the TSF.

Upon placement in the TSF, the core cutting material shall be spread and dried to reduce the material moisture content. The core cutting material shall then be mixed with tailings, on site native borrow material and/or development rock at a minimum ratio of 3 (tailings/on site native borrow/development rock) to 1 (core cutting material). After mixing, the material shall be moisture conditioned to within 2 percent below and 3 percent above the optimum moisture content. The material shall be placed in 12-inch maximum loose lifts and compacted to 90 percent of the maximum dry density as determined by ASTM D698. Slight variations from the specified moisture range above may be acceptable subject to acceptance by the Engineer (NewFields) and provided the required compacted densities are achieved. The core cutting material shall be compacted with appropriate compaction equipment capable of achieving compaction through the full thickness of the lift.

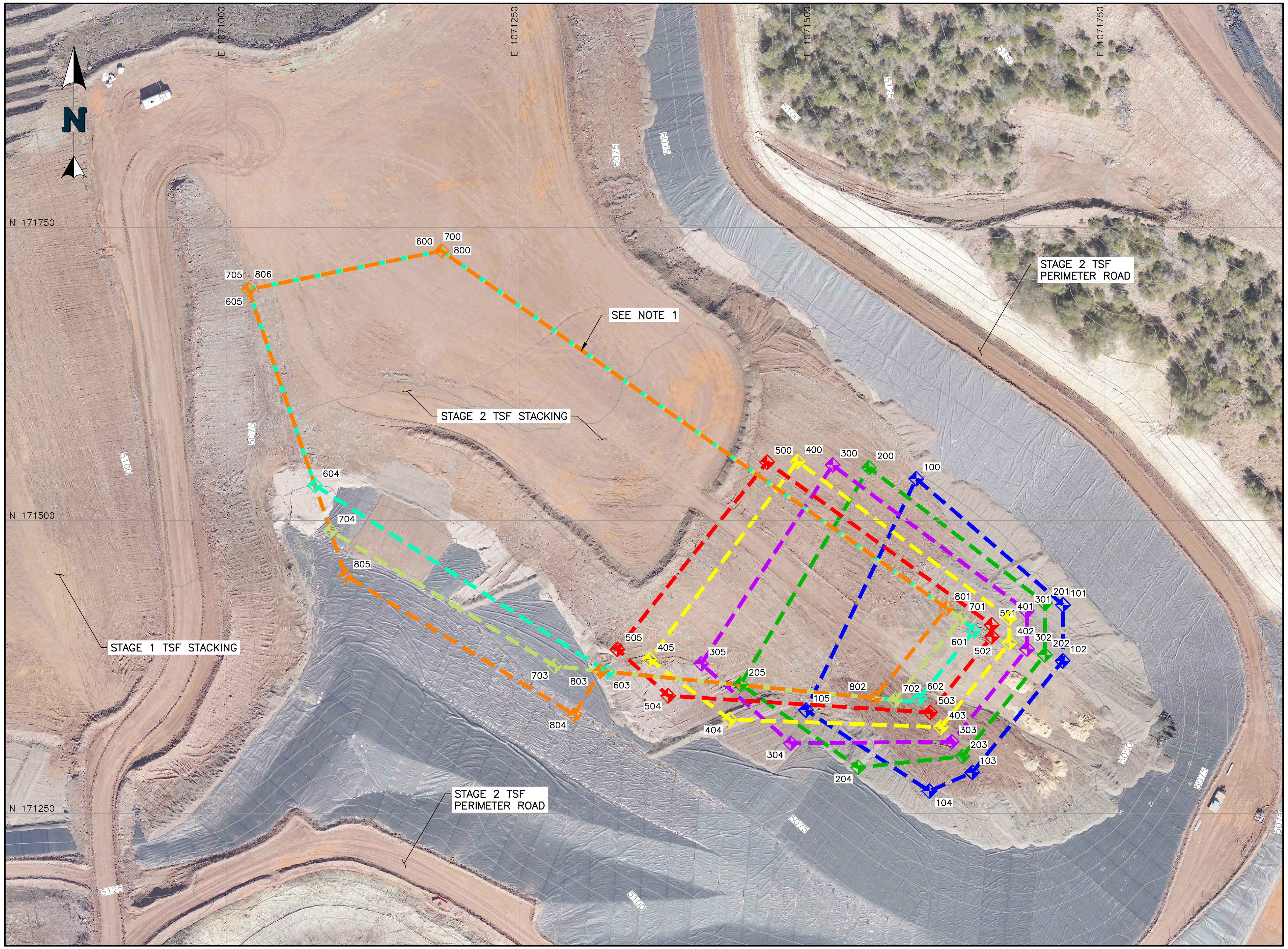
Care shall be taken to ensure that the mixed material is not rutting, pumping or exhibiting excessive deflection during compaction under haul traffic loading. If the surface exhibits excessive deflection, the material in the area of question will require stabilization using a combination of moisture reduction through active drying and recompaction, selective placement of rock material and recompaction or other means of stabilization such as geogrid placement in these areas.

Core cutting material placement shall occur only in the area shown on Figure 1 (attached). To the greatest extent possible, core cutting material placement shall not be in one continuous area or layer. Placement of each load of core cutting material shall be spread out so that distance between each placement area is maximized. Placement of core cutting material shall be temporarily suspended due to weather concerns if the materials and installation cannot comply with the guidance parameters stated above.

The specification requirements listed above are based on index testing results from a composite core cutting sample obtained on January 2nd, 2019. If the core cutting material properties change or the estimated quantity of core cutting placed in the TSF increases, the Engineer (NewFields) shall be notified.

Testing Frequency

Independent core cutting material quality assurance tests are not required due to the nominal quantity of core cutting material to be placed in the TSF.



BELOW ELEV. 5,050' SETTING OUT DATA		
POINT	NORTHING	EASTING
100	171,536	1,071,589
101	171,428	1,071,714
102	171,380	1,071,714
103	171,285	1,071,637
104	171,269	1,071,600
105	171,338	1,071,495

ELEV. 5,055' TO 5,050' SETTING OUT DATA		
POINT	NORTHING	EASTING
200	171,545	1,071,549
201	171,429	1,071,699
202	171,385	1,071,699
203	171,299	1,071,628
204	171,289	1,071,539
205	171,360	1,071,439

ELEV. 5,060' TO 5,055' SETTING OUT DATA		
POINT	NORTHING	EASTING
300	171,547	1,071,518
301	171,423	1,071,683
302	171,390	1,071,683
303	171,311	1,071,619
304	171,310	1,071,482
305	171,378	1,071,405

ELEV. 5,065' TO 5,060' SETTING OUT DATA		
POINT	NORTHING	EASTING
400	171,550	1,071,488
401	171,417	1,071,668
402	171,396	1,071,668
403	171,324	1,071,610
404	171,330	1,071,430
405	171,381	1,071,361

ELEV. 5,070' TO 5,065' SETTING OUT DATA		
POINT	NORTHING	EASTING
500	171,550	1,071,462
501	171,411	1,071,653
502	171,401	1,071,653
503	171,336	1,071,601
504	171,350	1,071,377
505	171,390	1,071,334

ELEV. 5,075' TO 5,070' SETTING OUT DATA		
POINT	NORTHING	EASTING
600	171,730	1,071,184
601	171,406	1,071,638
602	171,348	1,071,592
603	171,371	1,071,325
604	171,530	1,071,076
605	171,697	1,071,019

ELEV. 5,080' TO 5,075' SETTING OUT DATA		
POINT	NORTHING	EASTING
700	171,730	1,071,184
701	171,416	1,071,627
702	171,347	1,071,571
703	171,376	1,071,281
704	171,491	1,071,089
705	171,697	1,071,019

ELEV. 5,108 TO 5,080' SETTING OUT DATA		
POINT	NORTHING	EASTING
800	171,730	1,071,184
801	171,425	1,071,615
802	171,348	1,071,553
803	171,371	1,071,319
804	171,334	1,071,297
805	171,453	1,071,102
806	171,697	1,071,019

LEGEND:

- EXISTING GROUND CONTOURS
- BELOW ELEV. 5,050'
- ELEV. 5,055' TO 5,050'
- ELEV. 5,060' TO 5,055'
- ELEV. 5,065' TO 5,060'
- ELEV. 5,070' TO 5,065'
- ELEV. 5,075' TO 5,070'
- ELEV. 5,080' TO 5,075'
- ELEV. 5,108' TO 5,080'

0 50 100 FEET

NOTE:

1. REFER TO TECHNICAL SPECIFICATIONS FOR AREA SPECIFIC PLACEMENT ZONES AND PROCEDURES FOR CORE CUTTING MATERIALS.

P:\Projects\0014.013 Hermosa Engineering Support - Stage 1 Construction\A-CAD\FIGS\0014.013.102F.dwg-1/23/2020 9:45 AM

NewFields

CLIENT: SOUTH32 (AMI)

PROJECT: TAILINGS AND POTENTIALLY ACID GENERATING (PAG) MATERIAL REMEDIATION, PLACEMENT AND SOTRAGE

TITLE: CORE CUTTING MATERIAL PLACEMENT AREAS

FILENAME: 0014.013.102F

FIGURE NO.: 1

REVISION: 0

ATTACHMENT C

0 100 200 FEET

LEGEND:

EXISTING GROUND CONTOURS

PROJECT BOUNDARY

SECTION LINES

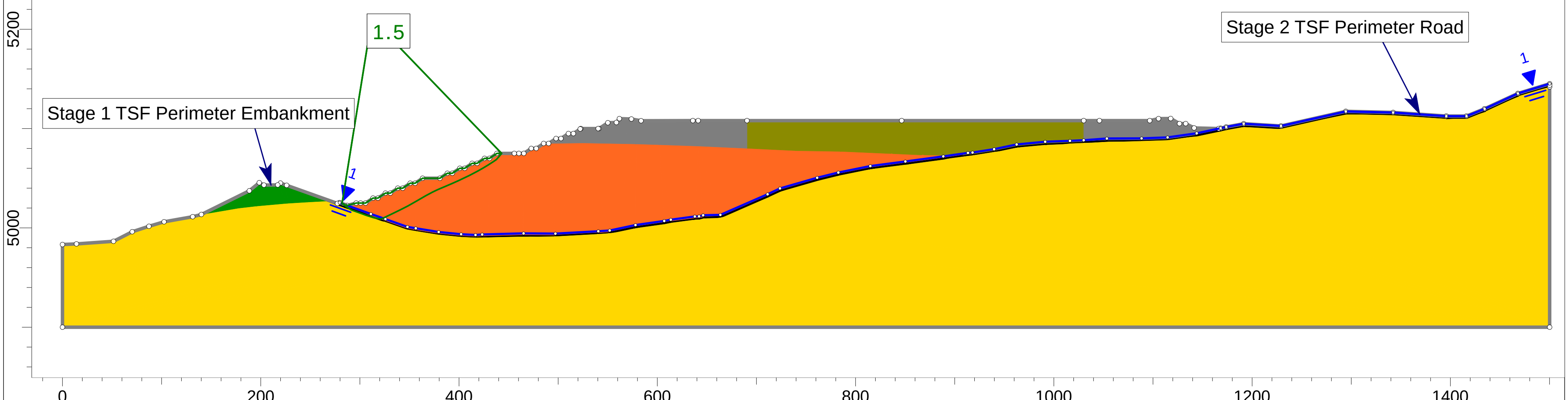
NOTE:

1. REFER TO TECHNICAL SPECIFICATIONS FOR AREA SPECIFIC PLACEMENT ZONES FOR WTP FILTER CAKE AND CORE CUTTING MATERIALS.

NewFields	CLIENT	SOUTH32 (AMI)
PROJECT	TAILINGS AND POTENTIALLY ACID GENERATING (PAG) MATERIAL REMEDIATION, PLACEMENT AND SOTRAGE	
TITLE	WTP FILTER CAKE AND CORE CUTTING MATERIAL PLACEMENT AREAS AND STABILITY SECTIONS	FILENAME 0014.013.101F; FIGURE NO. A; REVISION 0

P:\Projects\0014.013 Hermosa Engineering Support — Stage 1 Construction\A-CAD\FIGS\0014.013.101F.dwg—1/22/2020 3:08 PM

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Reclaimed Tailings		120	Mohr-Coulomb	0	28	Piezometric Line 1	
Exploration Decline Development Rock		120	Mohr-Coulomb	0	32	Piezometric Line 1	
WTP Filter Cake/Core Cutting		120	Mohr-Coulomb	0	16	Piezometric Line 1	
HDPE-LPSL Interface		135	Mohr-Coulomb	0	20	None	0
HDPE-GCL INTERFACE		120	Mohr-Coulomb	0	11	None	0
Foundation		120	Mohr-Coulomb	0	38	None	0
Embankment Fill		120	Mohr-Coulomb	0	32	None	0

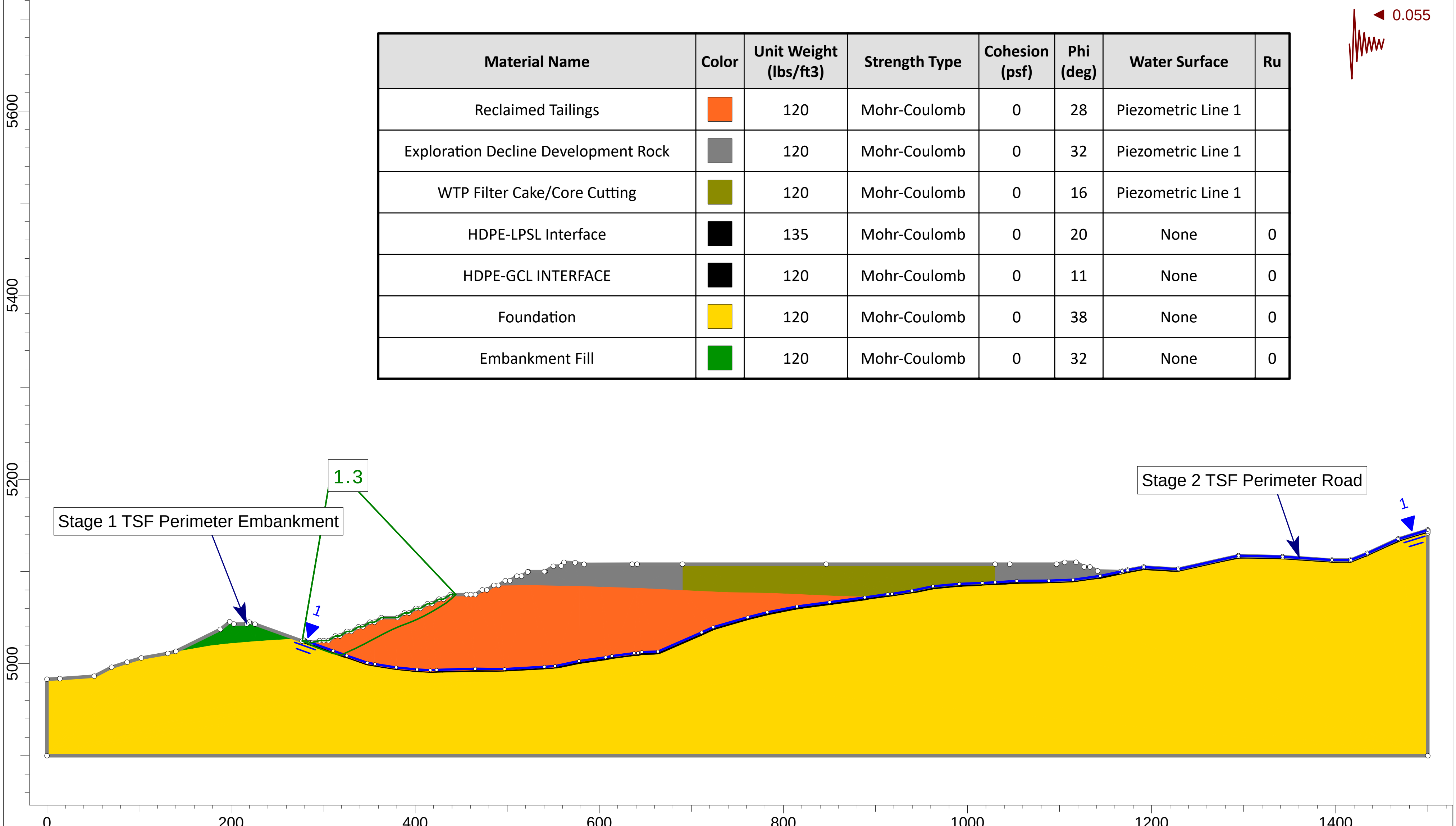


Voluntary Remediation Program Tailings Storage Facility

Analysis Description	Static WTP Filter Cake/Core Cutting Slope Stability Analysis
Drawn By	JTC/CMT
Scale	1:1800
Company	South32 (AMI)
Date Printed	1/22/2020
File Name	Section A - VRP TSF -Static.slmd

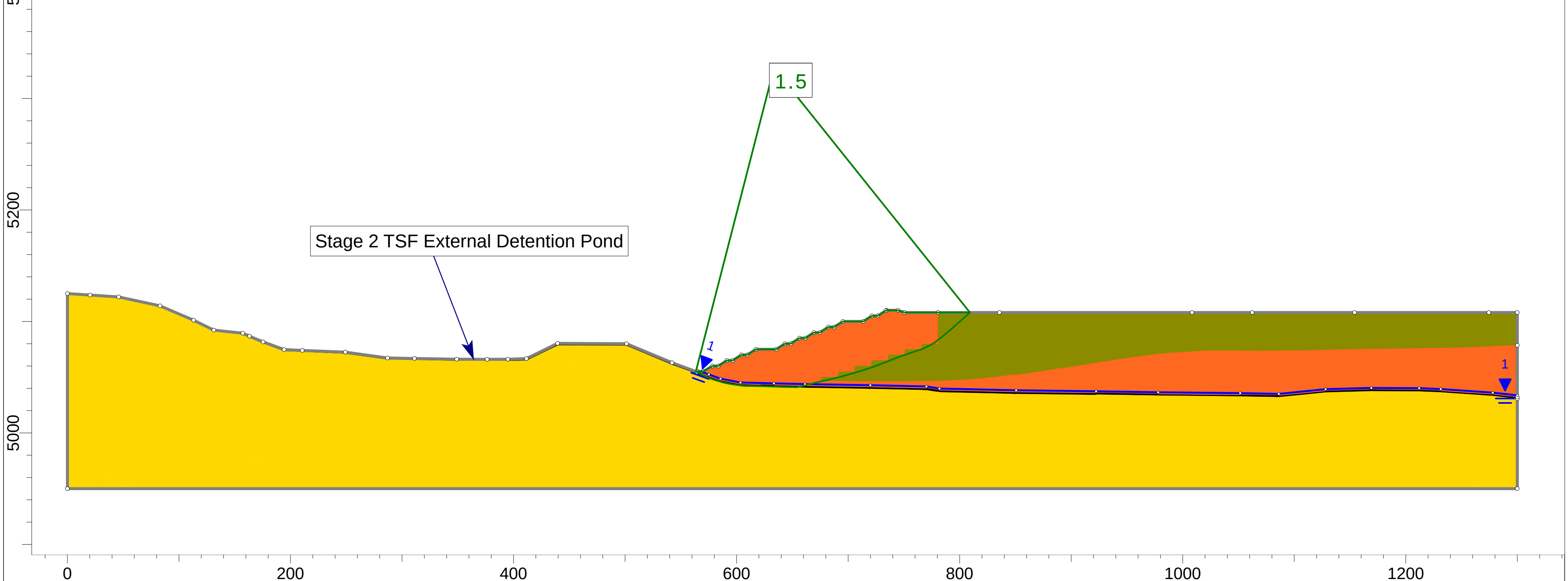
SLIDEINTERPRET 8.022

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Reclaimed Tailings		120	Mohr-Coulomb	0	28	Piezometric Line 1	
Exploration Decline Development Rock		120	Mohr-Coulomb	0	32	Piezometric Line 1	
WTP Filter Cake/Core Cutting		120	Mohr-Coulomb	0	16	Piezometric Line 1	
HDPE-LPSL Interface		135	Mohr-Coulomb	0	20	None	0
HDPE-GCL INTERFACE		120	Mohr-Coulomb	0	11	None	0
Foundation		120	Mohr-Coulomb	0	38	None	0
Embankment Fill		120	Mohr-Coulomb	0	32	None	0



NewFields	Voluntary Remediation Program Tailings Storage Facility		
	Analysis Description Pseudostatic WTP Filter Cake/Core Cutting Material Slope Stability Analysis		
	Drawn By JTC/CMT	*Scale* 1:1800	*Company* South32 (AMI)
SLIDEINTERPRET 8.022	*Date Printed* 1/22/2020		*File Name* Section A - VRP TSF - Pseudostatic.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Reclaimed Tailings		120	Mohr-Coulomb	0	28	Piezometric Line 1	
WTP Filter Cake/Core Cutting		120	Mohr-Coulomb	0	16	Piezometric Line 1	
HDPE-LPSL Interface		135	Mohr-Coulomb	0	20	None	0
HDPE-GCL INTERFACE		120	Mohr-Coulomb	0	11	None	0
Foundation		120	Mohr-Coulomb	0	38	None	0



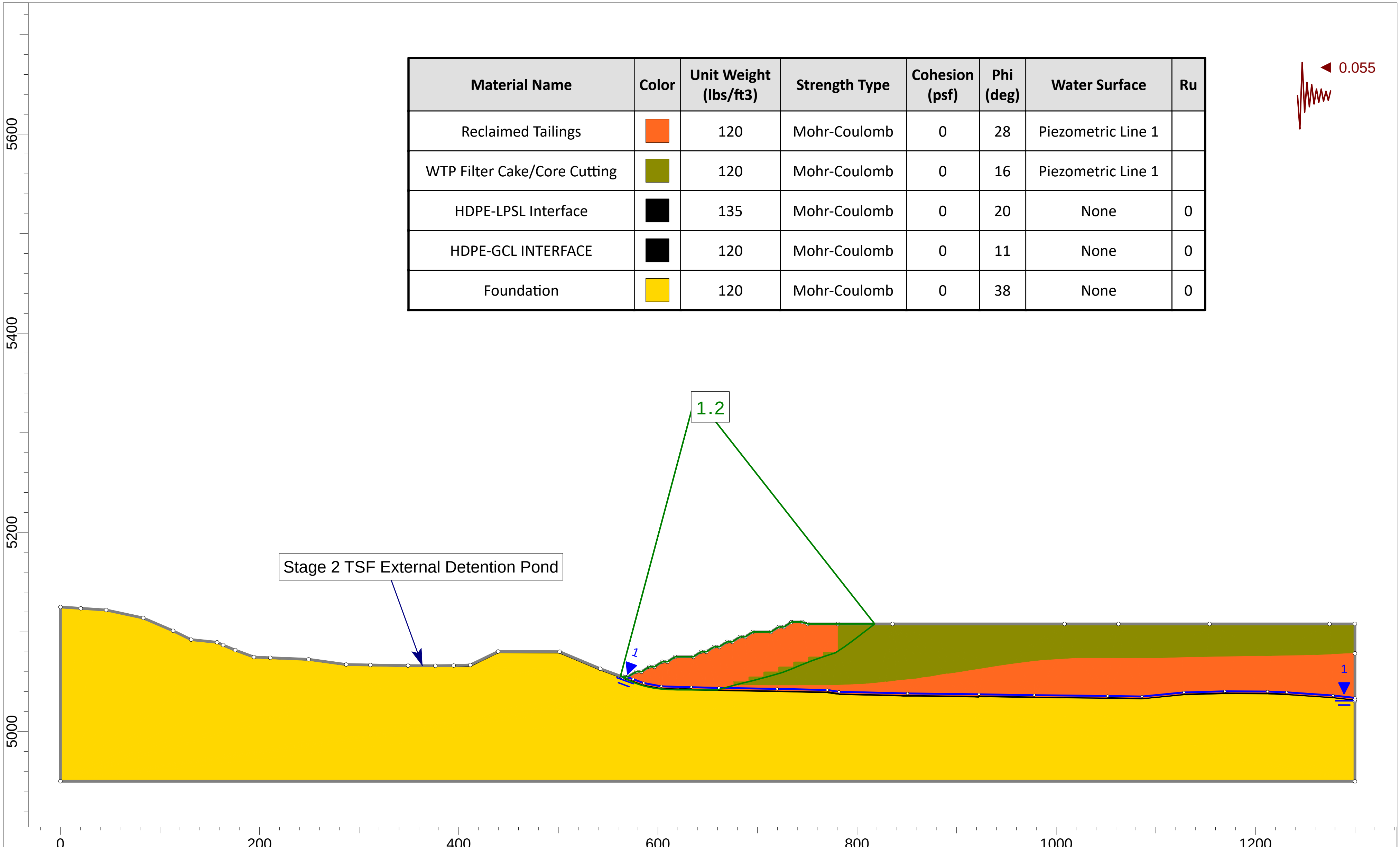
NewFields

SLIDEINTERPRET 8.022

Voluntary Remediation Programe Tailings Storage Facility

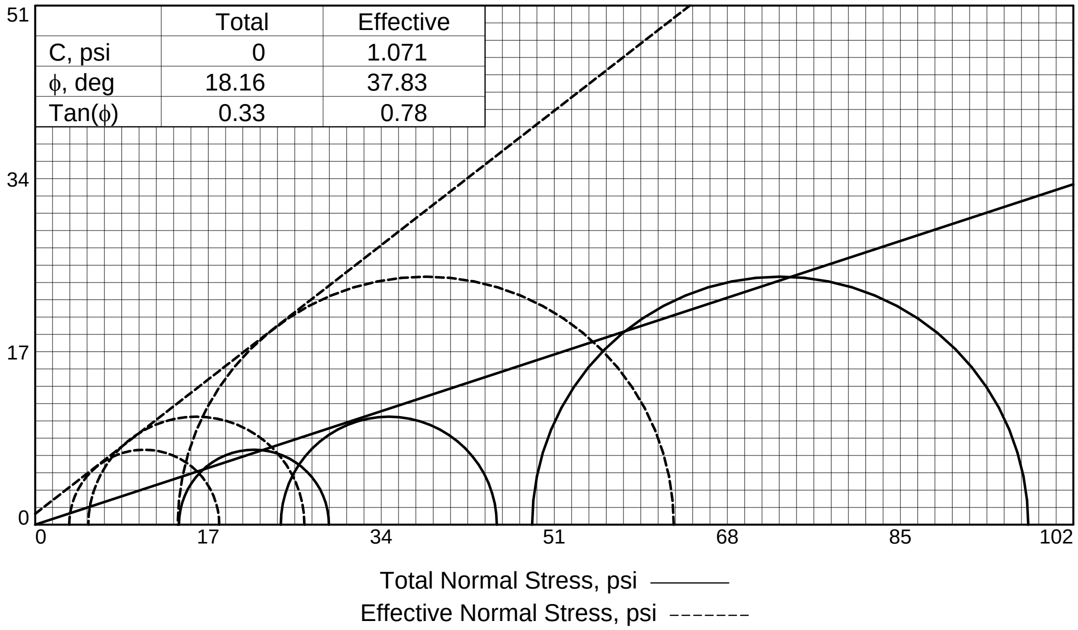
Analysis Description	Static WTP Filter Cake/Core Cutting Material Slope Stability Analysis		
Drawn By JTC/CMT	*Scale* 1:1600	*Company*	South32 (AMI)
Date Printed	1/22/2020	*File Name*	Section B - VRP TSF - Static.slmd

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Reclaimed Tailings		120	Mohr-Coulomb	0	28	Piezometric Line 1	
WTP Filter Cake/Core Cutting		120	Mohr-Coulomb	0	16	Piezometric Line 1	
HDPE-LPSL Interface		135	Mohr-Coulomb	0	20	None	0
HDPE-GCL INTERFACE		120	Mohr-Coulomb	0	11	None	0
Foundation		120	Mohr-Coulomb	0	38	None	0

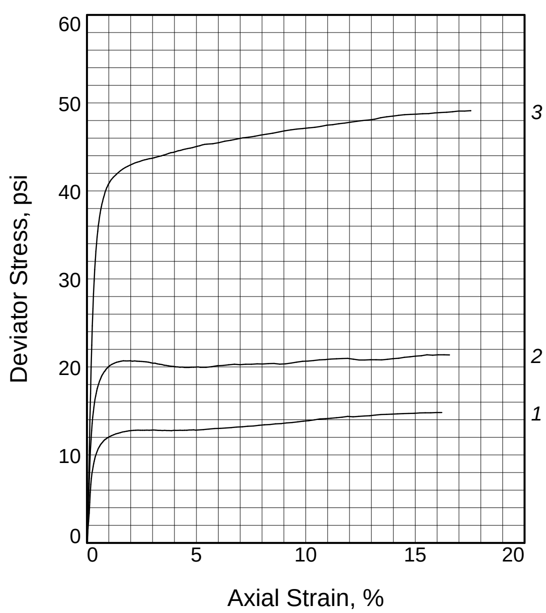


NewFields	Voluntary Remediation Program Tailings Storage Facility		
	Analysis Description Pseudostatic WTP Filter Cake/Core Cutting Material Slope Stability Analysis		
	Drawn By JTC/CMT	*Scale* 1:1600	*Company* South32 (AMI)
SLIDEINTERPRET 8.022	*Date Printed* 1/23/2020		*File Name* Section B - VRP TSF - Pseudostatic.slmd

ATTACHMENT D



	Total	Effective
C, psi	0	1.071
ϕ, deg	18.16	37.83
Tan(ϕ)	0.33	0.78



Sample No.		1	2	3
Initial	Water Content, %	26.8	26.8	26.8
	Dry Density, pcf	88.4	88.3	88.6
	Saturation, %	79.9	79.6	80.3
	Void Ratio	0.9062	0.9093	0.9014
	Diameter, in.	2.790	2.798	2.795
	Height, in.	5.640	5.630	5.620
At Test	Water Content, %	30.8	26.6	16.0
	Dry Density, pcf	92.0	98.1	117.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8328	0.7174	0.4330
	Diameter, in.	2.754	2.700	2.540
	Height, in.	5.567	5.437	5.130
Strain rate, in./min.		0.001	0.001	0.001
Eff. Cell Pressure, psi		14.12	24.13	48.83
Fail. Stress, psi		14.74	21.23	48.74
Total Pore Pr., psi		82.52	90.34	109.16
Strain, %		15.0	15.0	15.1
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		18.08	26.45	62.74
$\bar{\sigma}_3$ Failure, psi		3.34	5.22	14.00

Type of Test:
CU with Pore Pressures
Sample Type: Remolded
Description: T/FC#1

LL= NP **PI=** NP
Assumed Specific Gravity= 2.70
Remarks: Failure Selected at 15% Strain

Figure ________

Client: Arizona Minerals Inc.

Project: Hermosa TSF CQA

Source of Sample: TF
Sample Number: 20-014
Proj. No.: 475.0014.011 **Date Sampled:** 1/30/20

NewFields

Tested By: K.Magner **Checked By:** K.Magner

ATTACHMENT C

Aquifer Protection Permit Redline

STATE OF ARIZONA
AQUIFER PROTECTION PERMIT NO. P-512235
~~MINOR~~ OTHER AMENDMENT
PLACE ID 150279, LTF 71251

1.0 AUTHORIZATION

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2 and 3, Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 1 and 2, A. A. C. Title 18, Chapter 11, Article 4 and amendments thereto, and the conditions set forth in this permit, the Arizona Department of Environmental Quality (ADEQ) hereby authorizes Arizona Minerals Inc. to operate the Trench Camp Property located approximately 5 miles south of the Town of Patagonia, Arizona, over groundwater of the Santa Cruz groundwater basin, in Section 32 in Township 22S, Range 16E and in Township 23S, Range 16E ; and un-surveyed Sections 3 and 4, of the Gila and Salt River Baseline and Meridian.

This permit becomes effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods) unless suspended or revoked pursuant to A.A.C. R18-9-A213. The permittee shall construct, operate and maintain the permitted facilities:

1. Following all the conditions of this permit including the design and operational information documented or referenced below, and
2. Such that Aquifer Water Quality Standards (AWQS) are not violated at the applicable point(s) of compliance (POC) set forth below or if an AWQS for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant and as determined at the applicable POC occurs as a result of the discharge from the facility.

1.1 PERMITTEE INFORMATION

Facility Name:	Hermosa Project Trench Camp Property - Tailings Storage Facility (TSF)
Facility Address:	749 Harshaw Road Patagonia, Arizona 85624
County:	Santa Cruz County
Permittee:	Arizona Minerals Inc.
Permittee Address:	2210 East Fort Lowell Road Tucson, Arizona 85719
Permitted Flow Rate:	172,000 gallons per day (gpd)
Facility Contact:	Sarah Richman
Emergency Phone No.:	(520) 485-1304
Latitude/Longitude:	31° 27' 59.4" N/110° 43' 35.8" W
Legal Description:	Section 32 in Township 22S, Range 16E and in Township 23S, Range 16E; and un-surveyed Sections 3 and 4, of the Gila and Salt River Baseline and Meridian.

1.2 AUTHORIZING SIGNATURE

____
David Dunaway, Manager, Groundwater Protection
Water Quality Division
Arizona Department of Environmental Quality

Signed this _______ day of _________________, ~~2019~~ 2020

THIS AMENDED PERMIT SUPERCEDES ALL PREVIOUS PERMITS

2.0 SPECIFIC CONDITIONS [A.R.S. §§ 49-203(4), 49-241(A)]

2.1 Facility / Site Description [A.R.S. § 49-243(K)(8)]

Arizona Minerals Inc. (AMI) shall construct and operate the Hermosa Project Trench Camp Property - Tailings Storage Facility (TSF) located approximately 5 miles south of the Town of Patagonia, Arizona. AMI purchased the historic, January and Norton Mine Claims and the Trench Camp Mine claims and associated Tailings Pile/waste rock from the ASARCO Trust in early 2016. The historic Mine Claims are closed and not considered APP regulated facilities and thus exempt according to the Arizona Revised Statue (A.R.S.) § 49 -201.7 and A.R.S. § 49-250.B.11. The APP application has been submitted for APP-regulated discharges associated with ADEQ's Voluntary Remediation Program (VRP) project related to eliminating discharges of mine impacted water from January Adit mine workings and tailing piles (which includes potentially acid generating (PAG) waste rock) seepage to Alum Gulch.

The Trench Camp historic tailings piles (1 through 4) are currently located within an unlined natural basin in a three pile configuration. Tailings Pile #1 contains tailings and potential acid generating (PAG) waste rock. Stockpile #2 and #4 contain only tailings and have been combined into one pile referred to as Tailings Pile #2 and are generally divided by the 5,100 foot contour elevation. In addition Tailings Pile # 3 contains only tailings.

The Trench Camp TSF ~~will be~~is designed as a lined permanent storage area for the remediation of the existing tailings piles, sited above. Placement of the existing tailings piles on the lined permanent containment is part of the VRP program in Arizona under the site code 505143-2. Tailings, PAG waste rock and impacted soils beneath the existing tailings piles are to be excavated and placed in the lined Trench Camp TSF as an earthen material. PAG development rock from site surface construction and from a planned exploration decline or shaft, filter cake from the water treatment plant, and core cuttings solids will also be stored in the lined TSF as a co-mingled material with the existing tailings and PAG waste rock. Additionally, it may be placed on the exterior face of the existing tailings and PAG waste rock thereby acting as rock armor, to prevent water and wind erosion prior to closure.

The Trench Camp TSF shall be constructed in three ~~phase~~stages and will consist of a lined tailings storage facility, two stormwater retention ponds and an underdrain collection pond. The process solutions in the Trench Camp TSF will be collected through an underground collection system and gravity fed to the double lined underdrain collection pond (UCP). The UCP will be constructed downgradient of the Trench Camp TSF. The captured process solutions, precipitation that falls within the UCP and water from the January Adit (the January and Norton Mine Claims) will be piped to an ~~Active~~ active ~~Water Treatment Plant (~~WTP~~)~~ for processing and discharge to Alum Gulch under AZPDES permit No AZ0026387.

Interim Phase

The existing material from Tailings Pile #1 which includes 112,800 tons of tailings, 223,600 tons of waste rock and 15,500 tons of native material for a total of approximately 352,000 tons of material will be excavated, hauled and temporality placed on Tailings pile #2 and #4 to prepare to for the construction of the Phase 1 TSF footprint. The temporary placement of Tailing Pile 1 on Tailings Piles 2 and 4 will consist of 5H:1V slopes, a 50 foot setback from the brow of the existing slope on Tailings Pile 2, and an approximate maximum height of approximately 30 ft.

~~Phase~~ Stage 1

~~Phase~~Stage 1 of the Trench Camp TSF will cover approximately 680,000 square feet (ft^2). 1,212,000 tons of material will be relocated to the newly constructed Trench Camp TSF. This material includes the 762,700 tons of tailings (112,800 tons from Tailings Pile #1 plus 649,900 tons of tailings from Tailings Pile 2 and 4), 223,600 tons of waste rock from Tailings Pile #1, 49,200 tons of native material (15,500 tons from Tailings Pile #1 and 33,700 tons from Tailings Pile #2 and 4), and 176,400 tons of development rock from the exploration decline.

~~Phase~~ Stage 2

~~Phase~~Stage 2 of the Trench Camp TSF will cover approximately 580,000 ft^2. Approximately 1,050,000 tons of material including 213,800 tons of material from Tailings Pile #3, 12,300 tons of native material, and 823,600 tons of development rock ~~from the exploration decline~~ will be relocated to the Trench Camp TSF.

The total materials to be placed on the Trench Camp TSF will be 2,580,000 tons which includes 317,800 tons of contingency storage on a total area of approximately 1,260,000 square feet.

Permit Amendment
ADEQ has reviewed and approved the Alert Levels (ALs) and Aquifer Quality Limits (AQLs) at the Point of Compliance (POC) designated as POC-2, in Section 4.2, Table 4.2.3.

The site includes the following permitted discharging facilities:

Facility Name	Latitude	Longitude
Lined Tailings Storage Facility (TSF)	31° 27' 59.4"North	110° 43' 35.8" West
Underdrain Collection Pond (UCP)	31° 27' 59" North	110° 43' 39.2" West
AZPDES Outfall 001	31° 28' 15" North	110° 43' 43" West

Annual Registration Fee [A.R.S. § 49-242 and A.A.C. R18-14-104]
The annual registration fee for this permit is payable to ADEQ each year. The permitted flow for fee calculation is 172,000 gallons per day (gpd). If the facility is not yet constructed or is incapable of discharge at this time, the permittee may be eligible for reduced fees under the rule. Send all correspondence requesting reduced fees to the Water Quality Division of ADEQ. Please reference the permit number, LTF number and why reduced fees are requested under the rule.

Financial Capability [A.R.S. § 49-243(N) and A.A.C. R18-9-A203]
The Permittee shall be required to demonstrate financial capability under A.R.S. § 49-243(N) and A.A.C. R18-9-A203. The Permittee shall be required to maintain financial capability throughout the life of the facility. The closure costs are $2,130,908, and post-closure costs are $5,808,472, for a total of $7,939,380. The financial assurance mechanism shall be demonstrated through A.A.C. R18-9-A203(C)(2). Updated closure costs, post-closure costs and the associated financial assurance mechanism shall be provided per the Compliance Schedule, Section 3.3 and 3.4.

2.2 Best Available Demonstrated Control Technology (BADCT) [A.R.S. § 49-243(B) and A.A.C. R18-9-A202(A)(5)]

2.2.1 Engineering Design

The Trench Camp TSF and the UCP ~~will~~ employ prescriptive BADCT components (in accordance with the Arizona Mining BADCT Guidance Manual (AMBGM)). BADCT has been determined in accordance with the AMBGM. The design of the UCP incorporates enhanced discharge control measures (such as double liner and leak collection and recovery systems) that go beyond the prescriptive components identified in the AMBGM for non-stormwater impoundments.

2.2.1.1 Tailings Impoundment (~~Phase~~Stage 1 and 2 TSF)

The TSF will be constructed in two ~~Phase~~Stages. BADCT for each ~~Phase~~Stage is provided below:

~~Phase~~Stage 1
Prior to placement of the tailings material, the basin area shall be cleared of any vegetation and stripped of any growth media and graded to have maximum slopes of 2.5H (horizontal):1V (vertical). A composite liner system consisting of a 12 inch thick low permeability soil layer (LPSL) having a coefficient of permeability that is less than or equal to 1.0 x 10-6 centimeters/second (cm/sec) overlain by a double-sided textured 60 mil high density polyethylene (HDPE) liner shall be placed over the graded area. The geomembrane shall be anchored in the perimeter road at a setback of 3 feet (ft.) with trenched dimensions of 3 ft. deep by 2 ft. wide. An 18 inch (in.) protective layer composed of 1 1/2 in. minus granular material shall be placed over the geomembrane. An underdrain collection system, consisting of a series of pipes shall be placed in topographic lows to collect drainage from the base of the facility and convey them to the UCP via the concrete encased underdrain outlet pipe works. At the outlet point of the underdrain pipes, valves shall be installed to control flow to the Underdrain Collection Pond. The maximum elevation of the ~~Phase~~Stage 1 TSF shall not exceed 5,110 ft.

External and internal stormwater channels shall be constructed to appropriately capture and convey stormwater from a 100-year/24-hour storm event. A geomembrane lined external stormwater

detention basin having the capacity of 2.66 million gallons (8.16 ac. ft.) shall be constructed to route runoff from the east side (upstream) of ~~Phase~~Stage 1 to the underdrain collection system via a pipe located
in the basin low point. After Tailings Piles 1, 2 and 4 are relocated to the ~~Phase~~Stage 1 TSF, the external stormwater detention basin pipe shall be capped and the detention basin shall be expanded as part of the ~~Phase~~Stage 2 TSF basin construction. Two internal detention basins designed to contain contact stormwater, one having a capacity of 847,214 gallons (2.6 acre feet (ac. ft.)) shall be constructed in the northwestern portion of ~~Phase~~Stage 1 TSF, and another having a capacity of 488,777 gallons (1.5 ac. ft.) shall be constructed near the northeastern portion of ~~Phase~~Stage 1 TSF.

~~Phase~~Stage 2

The ~~Phase~~Stage 2 TSF shall be constructed in a manner similar to that of ~~Phase~~Stage 1 TSF. The permittee may use geosynthetic clay liner (GCL) in lieu of the LPSL if field conditions allow its use and it is approved by the design engineer. The maximum elevation of the ~~Phase~~Stage 2 TSF shall match up with the ~~Phase~~Stage 1 TSF elevation and shall not exceed 5,110 ft. During the ~~Phase~~Stage 2 construction, the 2.6 ac. ft. internal detention basin located at the northwestern portion will be expanded to contain a volume of 3,258,514 gallons (10 ac. ft.) of contact stormwater, and another 260,681 gallons (0.8 ac. ft.) internal detention basin will be constructed in the eastern portion of the ~~Phase~~Stage 2 TSF. The 1.5 ac. ft. internal detention basin located at the northeastern portion of the ~~Phase~~Stage I TSF will be covered by materials deposited in this ~~phase~~stage.

A geomembrane lined external stormwater detention basin having the capacity of 3.2 million gallons (9.82 ac. ft.) to detain upstream unimpacted runoff on the east side of ~~Phase~~Stage 2 shall be constructed. The unimpacted runoff captured in this detention pond shall be pumped around the TSF until closure is substantially complete.

A minimum of four (4) piezometers shall be placed immediately adjacent to the geomembrane surface within the protective layer next to an underdrain collection pipe within the TSF to measure hydraulic head on the liner system, at the locations and as per the design submitted in the application. The phreatic surface in these piezometers shall be maintained below 1.5 feet.

2.2.1.2 Underdrain Collection Pond (UCP)

The UCP shall be located downstream of ~~Phase~~Stage 1 TSF. Valves placed at the inlet end to the UCP from the ~~Phase~~Stage I TSF, shall remain completely open unless it needs be pumped completely dry for repairs. The UCP crest shall be approximately 200 ft. wide by 345 ft. long and 42 ft. deep. The pond shall be designed with a 25 ft. wide perimeter access road around the crest, which widens to 50 ft. on the southern edge where the pumps shall be sited for pump maintenance that may be required. The UCP shall be constructed to maintain a minimum of 2 feet of freeboard from the spillway invert to contain flows from the 100-yr/24-hr storm event, and the maximum operational volume of 2,200,000 gallons. The UCP shall be sized to contain 8,900,000 gallons up to the spillway elevation while maintaining a minimum of seven (7) feet of total freeboard. The pond slopes shall be 2H:1V, and the bottom of the pond shall be graded at 1% to a low point in the corner of the pond. At the low point, two parallel sloping decant structures shall be constructed for housing submersible pumps to reclaim fluids for treatment at the Water Treatment Plant (WTP).

The liner system for the UCP consists of geonet placed between two 60 mil HDPE double sided textured geomembrane layers overlying 6-inches of low permeability soil layer. The HDPE liner shall be secured in an engineered anchor trench around the impoundment perimeter. A leak collection and removal system (LCRS) shall be installed between the two HDPE liners. The LCRS shall be equipped with a level control to activate a pump, and the outflow shall be measured with a flow totalizer. A record of these measurements shall be maintained in a log book maintained at the site.

A minimum of two (2) piezometers shall be placed along the maximum section of the UCP, at the locations and as per the design submitted in the application. The phreatic surface in these piezometers shall be maintained below 1.5 feet.

2.2.1.3 Water Treatment Plant (WTP)

The WTP is designed for treating underdrain seepage and storm water runoff from the TSF and water from the January Adit mine workings. The flow rate from the UCP and the January Adit mine workings are anticipated to fluctuate up to a maximum of 120 gallons per minute (gpm) from each source, with a maximum combined flow from both sources not to exceed 120 gpm.

The WTP process consists of pH adjustment to 10.5 followed by liquid/solids separation. This process includes various ~~tanks~~ elements including: an equalization tank, a multiflo tank (consisting of reaction, flocculation, and clarifier compartments) ~~tank~~, an ultrafiltration unit ~~clarifier~~, a pH adjustment tank, a Moving Bed Biofilm Reactor (for treatment of residual ammonia), an electro-reduction circuit (for selenate removal) a thickening tank, a filtrate tank, and a filter press.

Treated water will be used for on-going mine exploration, construction soil conditioning, and future milling and mining operations. Periodic, short-term discharge of treated water or a portion of treated water to Alum Gulch may be necessary during periods of exploration or mine development. Releases from the WTP ~~will be~~are authorized under an AZPDES permit.

2.2.2 Site-specific Characteristics

Not applicable

2.2.3 Pre-operational Requirements

The permittee shall submit as-built design drawings signed, dated, and sealed by an Arizona-registered Professional Engineer for the construction of the TSF and UCP. The reports shall include the results of compaction testing and shall verify that the TSF and UCP are constructed in accordance with the design drawings and QA/QC procedures submitting in the application and that seams and welds have passed required testing. The as-built reports shall be submitted as per Compliance Schedule Section 3.0; Items 3.1 and 3.2.

2.2.4 Operational Requirements

At a minimum, permitted facilities shall be inspected for performance levels listed in Section 4.2, Table 4.2.1. Results of these inspections shall be documented and maintained on location for at least 10 years from the date of each inspection, as required by Section 2.7.2 of this permit. If damage is identified during an inspection that could cause or contribute to a discharge, proper repairs shall be promptly performed and documented as described in Section 2.5.2 and Section 2.7.2.

2.3 Discharge Limitations [A.R.S. §§ 49-201(14), 49-243 and A.A.C. R18-9-A205(B)]

The permittee shall operate and maintain all permitted facilities to prevent unauthorized discharges pursuant to A.R.S. § 49-201(12) resulting from failure or bypassing of BADCT pollutant control technologies.

2.3.1 Tailings Storage Facility (TSF)

The total deposition of tailings and development rock under this permit shall not cause the ultimate dam crest elevation to exceed an elevation of 5,110 feet amsl as per Section 4.2.1. If the permittee wishes to deposit a greater quantity of material, or modify the ultimate height of the dam, then the permittee shall apply for a permit amendment pursuant to Section 6.9 and Section 3.7 in the Compliance Schedule.

2.3.2 Underdrain Collection Pond (UCP)

Discharge to the UCP shall be limited to tailings seepage water, mine workings water, exploration decline water, and precipitation falling on the TSF (including the embankment, perimeter road and construction areas).

2.4 Point of Compliance (POC) [A.R.S. § 49-244]

Well Number	POC Locations	Latitude (North)	Longitude (West)	ADWR Number
POC-1	Conceptual location downgradient	31° 28' 15.21"	110° 43' 42.45"	TBD

	of the TSF			
POC-2	200 feet downgradient of the AZPDES Outfall-001 (MW3)	31° 28' 18.91"	110° 43' 48.83"	55-920120
POC-3	Conceptual location approximately one mile to the north-northwest and downgradient of the WTP outfall	31° 29' 1.7"	110° 44' 16.4"	TBD

Groundwater monitoring is required under this permit at POC-2. Groundwater monitoring is not required at POC-1 and 3, unless as contingency monitoring. The Director may amend this permit to designate an additional point or points of compliance if information on groundwater gradient or groundwater usage indicates the need.

2.5 Monitoring Requirements [A.R.S. § 49-243(K)(1), A.A.C. R18-9-A206(A)]

Unless otherwise specified in this permit, all monitoring required in this permit shall continue for the duration of the permit, regardless of the status of the facility. Unless otherwise provided, monitoring shall commence the first full monitoring period following permit issuance. All sampling, preservation and holding times shall be in accordance with currently accepted standards of professional practice. Trip blanks, equipment blanks and duplicate samples shall also be obtained, and Chain-of-Custody procedures shall be followed, in accordance with currently accepted standards of professional practice. Copies of laboratory analyses and Chain-of-Custody forms shall be maintained at the permitted facility. Upon request, these documents shall be made immediately available for review by ADEQ personnel.

2.5.1 Pre-Operational Monitoring

Not applicable

2.5.2 Facility / Operational Monitoring

Operational monitoring inspections shall be conducted according to Section 4.2, Table 4.2.1.

If any damage of the pollution control structures is identified during inspection that could cause or contribute to a discharge, proper repair procedures shall be performed. All repair procedures and materials used shall be documented in the facility log book as per Section 2.7.2.

2.5.3 Groundwater Monitoring and Sampling Protocols

Groundwater monitoring is required under the terms of this permit at POC-2 per Section 4.2.3.

Static water levels shall be measured and recorded prior to sampling. Wells shall be purged of at least three borehole volumes (as calculated using the static water level) or until field parameters (pH, temperature, and conductivity) are stable, whichever represents the greater volume. If evacuation results in the well going dry, the well shall be allowed to recover to 80 percent of the original borehole volume, or for 24 hours, whichever is shorter, prior to sampling. If after 24 hours there is not sufficient water for sampling, the well shall be recorded as “dry” for the monitoring event. An explanation for reduced pumping volumes, a record of the volume pumped, and modified sampling procedures shall be reported and submitted with the SMRF.

The permittee may conduct the sampling using the low-flow purging method as described in the Arizona Water Resources Research Center, March 1995 *Field Manual for Water Quality Sampling*. The well must be purged until indicator parameters stabilize. Indicator parameters shall include dissolved oxygen, turbidity, pH, temperature, and conductivity.

2.5.3.1 POC Well Replacement

In the event that one or more of the designated POC wells should become unusable or inaccessible due to damage or any other event, a replacement POC well shall be constructed and installed upon approval by ADEQ. If the replacement well is 50 feet or less from the original well, the ALs and/or aquifer quality limits (AQLs) calculated for the designated POC well shall apply to the replacement well.

2.5.4 Surface Water Monitoring and Sampling Protocols

Routine surface water monitoring is not required under the terms of this permit.

2.5.5 Analytical Methodology

All samples collected for compliance monitoring shall be analyzed using Arizona state-approved methods. If no state-approved method exists, then any appropriate EPA-approved method shall be used. Regardless of the method used, the detection limits must be sufficient to determine compliance with the regulatory limits of the parameters specified in this permit. If all methods have detection limits higher than the applicable limit, the permittee shall follow the contingency requirements of Section 2.6 and may propose "other actions" including amending the permit to set higher limits. Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification unless exempted under A.R.S. § 36-495.02. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods. A list of Arizona state-certified laboratories can be obtained at the address below:

Arizona Department of Health Services
Office of Laboratory Licensure and Certification
250 North 17th Avenue
Phoenix, Arizona 85007
Phone: (602) 364-0720

2.5.6 Installation and Maintenance of Monitoring Equipment

Monitoring equipment required by this permit shall be installed and maintained so that representative samples required by the permit can be collected. If new groundwater wells are determined to be necessary, the construction details shall be submitted to the Groundwater Protection Value Stream for approval prior to installation and the permit shall be amended to include any new monitoring points.

2.6 Contingency Plan Requirements
[A.R.S. § 49-243(K)(3), (K)(7) and A.A.C. R18-9-A204 and R18-9-A205]

2.6.1 General Contingency Plan Requirements

At least one copy of this permit and the approved contingency and emergency response plan submitted in the application on June 5, 2017 shall be maintained at the location where day-to-day decisions regarding the operation of the facility are made. The permittee shall be aware of and follow the contingency and emergency plans.

Any AL exceedance, or violation of an AQL, DL, or other permit condition shall be reported to ADEQ following the reporting requirements in Section 2.7.3, unless more specific reporting requirements are set forth in Sections 2.6.2 through 2.6.5.

Some contingency actions involve verification sampling. Verification sampling shall consist of the first follow-up sample collected from a location that previously indicated a violation or the exceedance of an AL. Collection and analysis of the verification sample shall use the same protocols and test methods to analyze for the pollutant or pollutants that exceeded an AL or violated an AQL or DL. Where verification sampling is specified in this permit, it is the option of the permittee to perform such sampling. If verification sampling is not conducted within the timeframe allotted, ADEQ and the permittee shall presume the initial sampling result to be confirmed as if verification sampling had been conducted.

The permittee is responsible for compliance with contingency plans relating to the exceedance of an AL or violation of a DL, AQL or any other permit condition. The permittee is subject to enforcement action for the failure to comply with any contingency actions in this permit.

2.6.2 Exceeding of Alert Levels and Performance Levels

2.6.2.1 Exceeding of Performance Levels Set for Freeboard

In the event that freeboard performance levels in the Underdrain Collection Pond listed in

Section 4.2, Table 4.2.1 are not maintained, the permittee shall:

1. As soon as practicable, cease or reduce discharging to the impoundment to prevent overtopping. Remove and properly dispose or recycle to other operations the excess fluid in the reservoir until the water level is restored at or below the permitted freeboard limit.
   Within 5 days of discovery, evaluate the cause of the incident and adjust operational conditions or identify design improvements to the affected system as necessary to avoid future occurrences. Within 30 days of discovery, initiate repairs to the affected system, structure, or other component as necessary to return the system to compliance with this permit, or remove the affected system(s) from service as specified in Section 2.8 (Temporary Cessation) and Section 2.9 (Closure) of this permit. Record any repair procedures, methods, and materials used to restore the facility to operating condition in the facility log/recordkeeping file.
2. If design improvements are necessary, submit an amendment application within 90 days of discovery.
3. The facility is no longer on alert status once the operational indicator no longer indicates that the freeboard performance level is being exceeded. The permittee shall, however, complete all tasks necessary to return the facility to its pre-alert operating condition.

2.6.2.2 Exceeding of Performance Levels Set for Conditions Other Than Freeboard

1. If an operational performance level (PL) listed in Section 4.2, Table 4.2.1 has been observed or noted during required inspection and operational monitoring, such that the result could cause or contribute to an unauthorized discharge, the permittee shall immediately investigate to determine the cause of the condition. The investigation shall include the following:
   a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the operational performance condition.
   b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences.
2. The PL exceedance, results of the investigation, and any corrective action taken shall be reported to the Groundwater Protection Value Stream, within 30 days of the discovery of the condition. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
3. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5 and any necessary contingency measures to resolve problems identified by the investigation which may have led to a PL being exceeded. To implement any other corrective action the permittee may choose to obtain prior approval from ADEQ according to Section 2.6.6.

2.6.2.3 Exceeding of Alert Level 1 for Normal Liner Leakage

If the impoundment Alert Level 1 (AL1) has been exceeded, as defined in Section 4.2, Table 4.2.4, the permittee shall take the following actions:

1. Within 5 days of AL #1 exceedance, notify Groundwater Protection Value Stream in accordance with Section 2.7.6 Permit Violation and Alert Level Status Reporting. Continue monitoring to determine if the leakage rate is increasing.
2. If the leakage rate continues to exceed AL#1 for 15 days following notification of initial AL #1 exceedance, perform a visual inspection of the liner above the solution level, to determine the location of the leaks in the primary liner.
3. Within 45 days of AL #1 exceedance, if liner damage is evident, the permittee shall complete liner repairs.
4. Within 45 days of AL #1 exceedance, if the visual inspection does not identify the location of leaks, formulate a corrective action plan to determine their location and repair them.
5. Within 90 days of AL #1 exceedance and following formulation of a corrective action plan, the permittee shall complete liner repairs.
6. Within 75 days of AL #1 exceedance (if repairs were completed in Step 3), or 120 days of AL #1 exceedance (if corrective action plan was implemented per Steps 4 and 5), if no alert level exceedance is observed for 30 consecutive days, notify Groundwater Protection Value Stream and document assessment and/or repairs in the log book.

7. Within 120 days of AL #1 exceedance (if repairs were completed in Step 3), or 165 days of AL #1 exceedance (if corrective action plan was implemented per Steps 4 and 5), if 30 consecutive days without an AL #1 exceedance is not achieved, notify Groundwater Protection Value Stream and reassess the entire liner system and complete any necessary repairs as described in Steps 2 and 3 (and if necessary Steps 4 and 5 also). Repeat the assessment and liner repair cycle until requirements of Step No. 6 are attained.
8. A liner leakage assessment and repair report shall be included in the next annual report described in Section 2.7.1 (Annual Reporting) of this permit. The permittee may also submit the liner leakage assessment report to the ADEQ prior to the annual report due date. This liner leakage assessment and repair report shall be submitted to the Groundwater Protection Value Stream. Upon review of the report, ADEQ may require that the permittee take additional corrective actions to address the problems identified from the assessment of the liner and perform other applicable repair procedures.

2.6.2.4 Exceeding of Alert Level 2 for Liner Failure or Rip

If the impoundment Alert Level 2 (AL2) has been exceeded, as defined in Section 4.2, Table 4.2.4, the Permittee shall take the following actions:

1. As soon as practicable, cease all discharge to the impoundment, implement control measures to prevent new solution buildup that may subsequently report to the impoundment, and immediately notify Groundwater Protection Value Stream of the AL #2 exceedance.
2. Within 15 days of initial AL #2 exceedance, perform a visual inspection of the liner above the solution level to identify the location of the leak(s). The permittee shall complete liner repairs and discharge to the impoundment shall not be re-initiated until the leak(s) have been identified and repaired.
3. Within 60 days of initial AL #2 exceedance if leaks were found and fixed and if no AL #2 exceedance is observed for 30 consecutive days, submit a liner leakage assessment and repair report to ADEQ. The report shall include the results of the initial liner evaluation, methods used to locate the leak(s), repair procedures and quality assurance/quality control implemented to restore the liner to optimal operational status, and other information necessary to ensure the future occurrence of the incidence will be minimized.
4. Within 30 days of initial AL #2 exceedance if the visual inspection does not identify the location of leaks and AL #2 exceedance continues, formulate a corrective action plan to determine their location and repair them. The corrective action plan will take into account the schedule for a 3rd party contractor to perform electronic leak detection or other methods if required.
5. Within 75 days of initial AL #2 exceedance and following formulation of a corrective action plan, the permittee shall complete liner repairs
6. Within 105 days of AL #2 exceedance and implementation of the corrective action plan per Steps 4 and 5, if no AL #2 exceedance is observed for 30 consecutive days, notify Groundwater Protection Value Stream and document assessment and/or repairs in the log book.
7. Within 105 days of initial AL #2 exceedance, (if repairs were completed in Step 3), or 150 days of AL #2 exceedance (if corrective action plan was implemented per Steps 4, 5, and 6) if 30 consecutive days without an AL #2 exceedance is not achieved, repeat Steps 1 through 7 until AL #2 is not exceeded for 30 consecutive days. When the Steps 1 through 7 are repeated, the notification date is reset. Discharge to the impoundment shall not be re-initiated until the leak(s) have been identified and repaired.
8. Liner leakage assessment and repair reports required by Section 2.6.2.2, shall be referenced in the next annual report described in Section 2.7.1 (Annual Reporting) of this permit.

2.6.2.5 Exceeding of Alert Levels (ALs) Set for Discharge Monitoring

1. If a discharge monitoring AL set in Section 4.2, Table 4.2.2 has been exceeded, the permittee shall immediately investigate to determine the cause of the AL exceedance. The investigation shall include the following:

a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the violation;
b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences;
c. Sampling of individual waste streams composing the wastewater for the parameters being exceeded.

2. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation, which may have led to an AL exceedance. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6.
3. Within 30 days of an AL exceedance, the permittee shall submit the laboratory results to the Groundwater Protection Value Stream, along with a summary of the findings of the investigation, the cause of the AL exceedance, and actions taken to resolve the problem.
4. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

2.6.2.6 TSF Slope Conditions

The permittee shall monitor the TSF perimeter road and dry stack TSF for general slope conditions as per Section 4.2, Table 4.2.1 to identify unusual scour or degradation of materials, sloughing, rolling rocks or visible seepage. If the TSF exhibits any signs that require maintenance, AMI shall take the following actions:
1. After discovery prevent vehicle and/or foot traffic in the area.
2. Notify the design engineer.
3. If necessary, perform remedial actions approved by the engineer.
4. Monitor the area for signs of decreasing slope stability.

2.6.2.7 TSF and UCP Piezometric Head

The permittee shall monitor the piezometric head per Section 4.2, Table 4.2.1. If the piezometers read a phreatic surface in excess of 1.5 ft AMI shall take the following actions:
1. Notify the design engineer.
2. Monitor the phreatic surface within the TSF.
3. Initiate an evaluation to determine the cause of the incident. Identify the circumstances that resulted in the elevated phreatic surface. Implement corrective actions including pumping, if necessary, to resolve the problems identified in the evaluation.
4. If necessary, perform a slope stability analysis on the dry stack TSF with the elevated phreatic surface to determine if any reduction in safe operation of the facility has occurred.
5. Record in the facility log book, the piezometer number, reading and location. Hydrographs of this and all other piezometers will be recorded on at least a monthly basis to allow quick inspection and evaluation of historic facility operations.

2.6.2.8 Exceeding of Alert Levels in Groundwater Monitoring

2.6.2.8.1 Alert Levels for Indicator Parameters

None required by this permit.

2.6.2.8.2 Alert Levels for Pollutants with Numeric Aquifer Water Quality Standards

1. If an AL for a pollutant set in Section 4.2, Table 4.2.3 has been exceeded, the Permittee shall request that the laboratory verify the sample results within five (5) days of becoming aware of an AL exceedance. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms the AL exceedance or if the Permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring for that parameter to Quarterly from Semi-Annually. In addition, the permittee shall immediately initiate an investigation of the cause of the AL exceedance,

including inspection of all discharging units and all related pollution control devices, review of any operational and maintenance practices that might have resulted in an unexpected discharge, and hydrologic review of groundwater conditions including upgradient water quality.

3. The Permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to an AL exceedance. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6. Alternatively, the permittee may submit a technical demonstration, subject to written approval by the Groundwater Protection Value Stream, that although an AL is exceeded, pollutants are not reasonably expected to cause a violation of an AQL. The demonstration may propose a revised AL or monitoring frequency for approval in writing by the Groundwater Protection Value Stream.
4. Within 30 days after confirmation of an AL exceedance, the permittee shall submit the laboratory results to the Groundwater Protection Value Stream along with a summary of the findings of the investigation, the cause of the AL exceedance, and actions taken to resolve the problem.
5. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
6. The increased monitoring required as a result of ALs being exceeded may be reduced to the regularly scheduled frequency, if the results of three (3) consecutive monthly sampling events demonstrate that no parameters exceed the AL.
7. If the increased monitoring required as a result of an AL exceedance continues for more than six (6) sequential sampling events, the Permittee shall submit a second (2nd) report documenting an investigation of the continued AL exceedance within 30 days of the receipt of laboratory results of the sixth (6th) sampling event.

2.6.2.8.3 Alert Levels to Protect Downgradient Users from Pollutants Without Numeric Aquifer Water Quality Standards

Not applicable

2.6.2.8.4 Alert Level for Groundwater Level

Not applicable

2.6.3 Discharge Limit Violation

2.6.3.1 Surface Impoundments: Liner Failure, Containment Structure Failure, or Unexpected Loss of Fluid for a Reason other than Overtopping

In the event of liner failure, containment structure failure, or unexpected loss of fluid as described in Section 2.3, the permittee shall take the following actions:

1. As soon as practicable, cease all discharges as necessary to prevent any further releases to the environment, including removal of any fluid remaining in the impoundment as necessary, and capture and containment of all escaped fluids.
2. Within 24-hours of discovery, notify the Groundwater Protection Value Stream.
3. Within 24 hours of discovery of a failure estimate the quantity released, collect representative samples of the fluid remaining in affected impoundments and drainage structures, analyze sample(s) according to Section 4.3, Table 4.3.1 and report in accordance with Section 2.7.3 (Permit Violation and AL Status Reporting). In the 30-day report required under Section 2.7.3, include a copy of the analytical results and forward the report to Groundwater Protection Value Stream.
4. Within 15 days of discovery, initiate an evaluation to determine the cause for the incident. Identify the circumstances that resulted in the failure and assess the condition of the discharging facility and liner system. Implement corrective actions as necessary to resolve the problems identified in the evaluation. Initiate repairs to any failed liner, system, structure, or other component as needed to restore proper functioning of the discharging facility. The permittee shall not resume discharge to the facility until repairs of any failed liner or structure are performed.

Repair procedures, methods, and materials used to restore the system(s) to proper operating condition shall be described in the facility log/recordkeeping file and available for ADEQ review. Record in the facility log/recordkeeping file the amount of fluid released, a description of any removal method and volume of any fluid removed from the impoundment and/or captured from the release area. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).

5. As soon as practicable, remove fluid remaining in the surface impoundment as necessary to prevent further releases to the subsurface and/or to perform repairs. Record in the facility log/recordkeeping file the amount of fluid removed a description of the removal method, and other disposal arrangements. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection / Log/Recordkeeping File).
6. Within 30 days of discovery of the incident, submit a report to Groundwater Protection Value Stream as specified in Section 2.7.3. Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, conduct an assessment of the impacts to soil and/or groundwater resulting from the incident. If soil or groundwater is impacted such that it could or did cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ, for approval, a corrective action plan to address such impacts, including identification of remedial actions and a schedule for completion of activities. At the approval of ADEQ, the permittee shall implement the approved plan.
8. Within 30 days of completion of corrective actions, submit to Groundwater Protection Value Stream, a written report as specified in Section 2.6.6 (Corrective Actions).
9. Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.2 Overtopping of a Surface Impoundment

If overtopping of fluid from a permitted surface impoundment occurs, and results in a discharge pursuant to A.R.S. § 49-201(12), the Permittee shall:

1. As soon as practicable, cease all discharges to the surface impoundment to prevent any further releases to the environment.
2. Within 24 hours of discovery, notify Groundwater Protection Value Stream.
3. Within 24 hours, collect representative samples of the fluid contained in the surface impoundment. Samples shall be analyzed for the parameters specified in Section 4.3, Table 4.3.1. Within 30 days of the incident, submit a copy of the analytical results to Groundwater Protection Value Stream.
4. As soon as practicable, remove and properly dispose of excess water in the impoundment until the water level is restored at or below the appropriate freeboard as described in Section 4.2, Table 4.2.1. Record in the facility log/recordkeeping file the amount of fluid released, a description of the removal method and volume of any fluid removed from the impoundment and/or captured from the release area. The facility log/recordkeeping file shall be maintained according to Section 2.7.2 (Operation Inspection/LogBook/Recordkeeping File).
5. Within 30 days of discovery, evaluate the cause of the overtopping and identify the circumstances that resulted in the incident. Implement corrective actions and adjust operational conditions as necessary to resolve the problems identified in the evaluation. Repair any systems as necessary to prevent future occurrences of overtopping.
6. Within 30 days of discovery of overtopping, submit a report to ADEQ as specified in Section 2.7.3(2) (Permit Violation and Alert Level Status Reporting). Include a description of the actions performed in Subsections 1 through 5 listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.
7. Within 60 days of discovery, and based on sampling in Item No. 3 above, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident.
8. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at the applicable point of compliance, submit to ADEQ for approval, a

corrective action plan to address such impacts, including identification of remedial actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, the permittee shall implement the approved plan.

9. Within 30 days of completion of corrective actions, submit to ADEQ, a written report as specified in Section 2.6.6 (Corrective Actions). Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.3.3 Inflows of Unexpected Materials to a Surface Impoundment

The types of materials that are expected to be placed in the permitted surface impoundments are specified in Section 2.3 (Discharge Limitations). If any unexpected materials flow to a permitted surface impoundment, the Permittee shall:

1. As soon as practicable, cease all unexpected inflows to the surface impoundment(s).
2. Within 24-hours of discovery, notify the Groundwater Protection Value Stream.
3. Within five (5) days of the incident, identify the source of the material and determine the cause for the inflow. Characterize the unexpected material and contents of the affected impoundment, and evaluate the volume and concentration of the material to determine if it is compatible with the surface impoundment liner. Based on the evaluation of the incident, repair any systems or equipment and/or adjust operations, as necessary to prevent future occurrences of inflows of unexpected materials.
4. Within 30 days of an inflow of unexpected materials, submit a report to ADEQ as specified in Section 2.7.3(2) (Permit Violation and Alert Level Status Reporting). Include a description of the actions performed in Subsections 1 through 3 listed above.
5. Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, mitigation, or other actions.

2.6.3.4 Exceeding of Discharge Limitation for Tailings Deposition Height

1. If the DL for tailings deposition height set in Section 4.2, Table 4.2.1 has been exceeded, the permittee shall immediately investigate to determine the cause of the DL being exceeded. The investigation shall include a review of recent process logs, reports, and other operational control information to identify the cause of the exceedance.
2. The Permittee shall initiate actions to return to compliance with the DL as soon as practicable.
3. Within 30 days of a DL being exceeded, the Permittee shall submit to the ADEQ Groundwater Protection Value Stream, a summary of the findings of the investigation, the cause of the DL being exceeded, and actions taken to resolve the problem.
4. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

2.6.3.5 Slope and Berm Failures

If the slope for the TSF or the UCP becomes unstable to the point of failure and results in a discharge, AMI will take the following actions:

1. Immediately after discovery, prevent vehicle and/or foot traffic in the area.
2. Notify the ADEQ WQCS within 24 hours.
3. Notify the design engineer immediately.
4. Within 15 days of discovery, initiate an evaluation to determine the cause of the incident. Identify the circumstances that resulted in the failure and assess the condition of the facility and liner system. Implement corrective actions as necessary to resolve the problems identified in the evaluation. Initiate repairs to the slope and/or any failed liner. Repair procedures, methods, and materials used to restore the system(s) to proper operating condition shall be described in the facility log/recordkeeping file and available for ADEQ review.
5. Within 30 days of discovery of the incident, submit a report to ADEQ. Include a description of the actions performed in the steps listed above. Upon review of the report, ADEQ may request additional monitoring or remedial actions.

6. Within 60 days of discovery, conduct an assessment of the impacts to the subsoil and/or groundwater resulting from the incident. If soil or groundwater is impacted such that it could cause or contribute to an exceedance of an AQL at an applicable monitoring well or a POC (if installed), submit to ADEQ, for approval, a corrective action plan to address problems identified in the assessment, including identification of releases to the environment, remedial actions and/or monitoring, and a schedule for completion of activities. At the direction of ADEQ, implement the approved plan.
7. Within 30 days of completion of corrective actions, submit a written report to ADEQ. Upon review of the report, ADEQ may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.4 Aquifer Quality Limit Violation

1. If an AQL set in Section 4.2 Table 4.2.3 has been exceeded, the permittee may conduct verification sampling within 5 days of becoming aware of an AQL exceedance. The permittee may use the results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.
2. If verification sampling confirms that the AQL is violated for any parameter or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring to Quarterl*y* from Semi-Annually. In addition, the permittee shall immediately initiate an evaluation for the cause of the violation, including inspection of all discharging units and all related pollution control devices, and review of any operational and maintenance practices that might have resulted in unexpected discharge.

   The permittee also shall submit a report according to Section 2.7.3(2), which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. A verified exceedance of an AQL will be considered a violation unless the permittee demonstrates within 90 days or a longer time period if agreed to by ADEQ that the exceedance was not caused or contributed to by pollutants discharged from the facility. Unless the permittee has demonstrated that the exceedance was not caused or contributed to by pollutants discharged from the facility, the permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water or groundwater, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ approved contingency plan, or separately approved according to Section 2.6.6.
3. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, or other actions.
4. The permittee shall notify any downstream or downgradient users who may be directly affected by the discharge.

2.6.5 Emergency Response and Contingency Requirements for Unauthorized Discharges pursuant to A.R.S. § 49-201(12) and pursuant to A.R.S. § 49-241 That Are Not Addressed Elsewhere in Section 2.6

2.6.5.1 Duty to Respond

The permittee shall act immediately to correct any condition resulting from a discharge pursuant to A.R.S. § 49-201(12) if that condition could pose an imminent and substantial endangerment to public health or the environment.

2.6.5.2 Discharge of Hazardous Substances or Toxic Pollutants

In the event of any unauthorized discharge pursuant to A.R.S. **§** 49-201(12) of suspected hazardous substances (A.R.S. **§** 49-201(19)) or toxic pollutants (A.R.S. **§** 49-243(I)) on the facility site, the permittee shall promptly isolate the area and attempt to identify the discharged material. The permittee shall record information, including name, nature of exposure and follow-up medical treatment, if necessary, on persons who may have been exposed during the incident. The permittee shall notify the Groundwater Protection Value Stream and the Southern Regional Office within 24 hours upon discovering the discharge of hazardous material which (a) has the potential to cause an

AWQS or AQL to be exceeded, or (b) could pose an endangerment to public health or the environment.

2.6.5.3 Discharge of Non-hazardous Materials

In the event of any unauthorized discharge pursuant to A.R.S. **§** 49-201(12) of non-hazardous materials from the facility, the permittee shall promptly attempt to cease the discharge and isolate the discharged material. Discharged material shall be removed and the site cleaned up as soon as possible. The permittee shall notify the Groundwater Protection Value Stream and the Southern Regional Office within 24 hours of discovering the discharge of non-hazardous material which has the potential to cause an AQL exceedance, or could pose an endangerment to public health or the environment.

2.6.5.4 Reporting Requirements

The permittee shall submit a written report for any unauthorized discharges required to be reported under Sections 2.6.5.2 and 2.6.5.3 to the Groundwater Protection Value Stream and the Southern Regional Office within 30 days of the discharge or as required by subsequent ADEQ action. The report shall summarize the event, including any human exposure, and facility response activities and include all information specified in Section 2.7.3. If a notice is issued by ADEQ subsequent to the discharge notification, any additional information requested in the notice shall also be submitted within the time frame specified in the notice. Upon review of the submitted report, ADEQ may require additional monitoring or corrective actions.

2.6.6 Corrective Actions

Specific contingency measures identified in Section 2.6 have already been approved by ADEQ and do not require written approval to implement.

With the exception of emergency response actions taken under Section 2.6.5, the permittee shall obtain written approval from the Groundwater Protection Value Stream prior to implementing a corrective action to accomplish any of the following goals in response to exceedance of an AL or violation of an AQL, DL, or other permit condition:

1. Control of the source of an unauthorized discharge;
2. Soil cleanup;
3. Cleanup of affected surface waters;
4. Cleanup of affected parts of the aquifer;
5. Mitigation to limit the impact of pollutants on existing uses of the aquifer.

Within 30 days of completion of any corrective action, the operator shall submit to the Groundwater Protection Value Stream, a written report describing the causes, impacts, and actions taken to resolve the problem.

2.7 Reporting and Recordkeeping Requirements [A.R.S. § 49-243(K)(2) and A.A.C. R18-9-A206(B) and R18-9-A207]

2.7.1 Self-Monitoring Report Form

1. The permittee shall complete the Self-Monitoring Reporting Forms (SMRFs) provided by ADEQ, and submit the completed report through the myDEQ online reporting system.
2. The permittee shall complete the SMRF to the extent that the information reported may be entered on the form. If no information is required during a reporting period, the permittee shall enter "not required" on the form, include an explanation.
3. The tables contained in Section 4.2 list the monitoring parameters and the frequencies for reporting results on the SMRF:
   - Table 4.2.2 Compliance Discharge Monitoring
   - Table 4.2.3 Groundwater Compliance Monitoring

   The parameters listed in the above-identified tables from Section 4.0 are the only parameters for which SMRF reporting is required.

4. In addition to the SMRF, the information contained in A.A.C. R18-9-A206(B)(1) shall be included for exceeding an alert level (AL) or violation of an Aquifer Quality Limit (AQL), discharge limit (DL), or any other permit condition being reported in the current reporting period.

2.7.2 Operation Inspection / Log Book Recordkeeping

A signed copy of this permit shall be maintained at all times at the location where day-to-day decisions regarding the operation of the facility are made. A log book (paper copies, forms, or electronic data) of the inspections and measurements required by this permit shall be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book shall be retained for ten years from the date of each inspection, and upon request, the permit and the log book shall be made immediately available for review by ADEQ personnel. The information in the log book shall include, but not be limited to, the following information as applicable:

1. Name of inspector;
2. Date and time inspection was conducted;
3. Condition of applicable facility components;
4. Any damage or malfunction, and the date and time any repairs were performed;
5. Documentation of sampling date and time; and
6. Any other information required by this permit to be entered in the log book.

Monitoring records for each measurement shall comply with A.A.C. R18-9-A206(B)(2).

2.7.3 Permit Violation and Alert Level Status Reporting

1. The permittee shall notify the Groundwater Protection Value Stream in writing within five (5) days (except as provided in Section 2.6.5) of becoming aware of a violation of any permit condition, discharge limitation or of an AL exceedance for which notification requirements are not specified in Sections 2.6.2 through 2.6.5.

2. The permittee shall submit a written report to the Groundwater Protection Value Stream within 30 days of becoming aware of the violation of any permit condition or discharge limitation. The report shall document all of the following:
   a. Identification and description of the permit condition for which there has been a violation and a description of the cause;
   b. The period of violation including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue;
   c. Any corrective action taken or planned to mitigate the effects of the violation, or to eliminate or prevent a recurrence of the violation;
   d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS;
   e. Proposed changes to the monitoring which include changes in constituents or increased frequency of monitoring; and
   f. Description of any malfunction or failure of pollution control devices or other equipment or processes.

2.7.4 Operational, Other or Miscellaneous Reporting

2.7.4.1 Annual Report

If an Alert Level #1 or Alert Level #2 has been exceeded as discussed in Sections 2.6.2.3 and 2.6.2.4, the permittee shall submit an annual report that summarizes the results of the liner assessment. The Liner Leakage Assessment Report shall also include information including but not limited to the following: number and location of holes identified; a table summarizing the exceedances including the frequency and quantity of fluid removed, and corrective actions taken.

When required the annual report is to be submitted by January 30 of each year to cover activities from January 1 through December 31st of the previous year, consistent with Section 2.7.6.

2.7.5 Reporting Location

All Self-Monitoring Report Forms (SMRFs) shall be submitted through the myDEQ portal accessible on the ADEQ website at:http://www.azdeq.gov/welcome-mydeq

All other documents required by this permit to be submitted to the Groundwater Protection Value Stream shall be directed to:

Arizona Department of Environmental Quality
Groundwater Protection Value Stream
Mail Code 5415B-3
1110 West Washington Street
Phoenix, Arizona 85007
Phone (602) 771-4449

2.7.6 Reporting Deadline
The following table lists the due dates:

Monitoring conducted during quarter:	**Quarterly Report due by:**
January-March	April 30
April-June	July 30
July-September	October 30
October-December	January 30

The following table lists the due date for the Annual report per Section 2.7.4.1 and the semi-annual groundwater compliance monitoring required by Section 4.2, Table 4.2.3:

Monitoring conducted:	**Report due by:**
Annual: January-December	January 30
Semi-Annual: January-June	July 30
Semi-Annual: July-December	January 30

2.7.7 Changes to Facility Information in Section 1.0
The Groundwater Protection Value Stream shall be notified within ten days of any change of facility information including Facility Name, Permittee Name, Mailing or Street Address, Facility Contact Person, or Emergency Telephone Number.

2.8 Temporary Cessation [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A209(A)]
The permittee shall give written notice to the Groundwater Protection Value Stream and the Southern Regional Office before ceasing operation of the facility for a period of 60 days or greater. The permittee shall take the following measures upon temporary cessation:

- Submittal of Self-Monitoring Report Forms (SMRFs) is still required; report "temporary cessation" in the comment section.

At the time of notification the permittee shall submit for ADEQ approval a plan for maintenance of discharge control systems and for monitoring during the period of temporary cessation. Immediately following ADEQ approval, the permittee shall implement the approved plan. If necessary, ADEQ shall amend permit conditions to incorporate conditions to address temporary cessation. During the period of temporary cessation, the permittee shall provide written notice to the Groundwater Protection Value Stream and the Southern Regional Office of the operational status of the facility every three years. If the permittee intends to permanently cease operation of any facility, the permittee shall submit closure notification, as set forth in Section 2.9 below.

2.9 Closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(B)]
For a facility addressed under this permit, the permittee shall give written notice of closure to the Groundwater Protection Value Stream of the intent to cease operation without resuming activity for which the facility was designed or operated. Submittal of SMRFs is still required; report "closure in process" in the comment section.

2.9.1 Closure Plan

Within 90 days following notification of closure, the permittee shall submit for approval to the Groundwater Protection Value Stream, a closure plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3).

If the closure plan achieves clean-closure immediately, ADEQ shall issue a letter of approval to the permittee. If the closure plan contains a schedule for bringing the facility to a clean-closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

2.9.2 Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the Groundwater Protection Value Stream indicating that the approved closure plan has been implemented fully and providing supporting documentation to demonstrate that clean-closure has been achieved (soil sample results, verification sampling results, groundwater data, as applicable). If clean-closure has been achieved, ADEQ shall issue a letter of approval to the permittee at that time. If any of the following conditions apply, the permittee shall follow the terms of post-closure stated in this permit:

1. Clean-closure cannot be achieved at the time of closure notification or within one year thereafter under a diligent schedule of closure actions;
2. Further action is necessary to keep the facility in compliance with the AWQS at the applicable POC or, for any pollutant for which the AWQS was exceeded at the time this permit was issued, further action is necessary to prevent the facility from further degrading the aquifer at the applicable POC with respect to that pollutant;
3. Activities are necessary to verify that actions or controls specified as closure requirements in an approved closure plan or strategy are routinely inspected or maintained;
4. Remedial, mitigative or corrective actions or controls are necessary to comply with A.R.S. § 49-201(30) and Title 49, Chapter 2, Article 3; and
5. Further action is necessary to meet property use restrictions.

2.10 Post-closure [A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9 A209(C)]

Post-closure requirements shall be established based on a review of facility closure actions and will be subject to review and approval by the Groundwater Protection Value Stream.

In the event clean-closure cannot be achieved pursuant to A.R.S. § 49-252, the permittee shall submit for approval to the Groundwater Protection Value Stream a post-closure plan that addresses post-closure maintenance and monitoring actions at the facility. The post-closure plan shall meet all requirements of A.R.S. §§ 49-201(30) and 49-252 and A.A.C. R18-9-A209(C). Upon approval of the post-closure plan, this permit shall be amended or a new permit shall be issued to incorporate all post-closure controls and monitoring activities of the post-closure plan.

2.10.1 Post-Closure Plan

A specific post-closure plan may be required upon the review of the closure plan.

2.10.2 Post-Closure Completion

Not required at the time of permit issuance.

3.0 COMPLIANCE SCHEDULE [A.R.S. § 49-243(K)(5) and A.A.C. R18-9-A208]

Unless otherwise indicated, for each compliance schedule item listed below, the permittee shall submit the required information to the Groundwater Protection Value Stream.

No.	Description	Due by:	Permit Amendment Required?
3.1	The permittee shall submit as-built design drawings signed, dated, and sealed by an Arizona-registered Professional Engineer for the Trench Camp TSF BADCT components per Section 2.2.3. The certification shall indicate that the facilities were constructed in accordance with plans approved by ADEQ and QA/QC documentation completed for liner and subgrade preparation.	Within 90 days after completion of construction	No
3.2	The permittee shall submit as-built design drawings signed, dated, and sealed by an Arizona-registered Professional Engineer for the Underdrain Collection Pond BADCT components per Section 2.2.3. The certification shall indicate that the facility was constructed in accordance with plans approved by ADEQ and QA/QC documentation completed for liner and subgrade preparation.	Within 90 days after completion of construction	No
	The permittee shall submit as-built design drawings for the WTP.	Within 90 days after completion of construction	No
3.3	The financial assurance mechanism listed in Section 2.1, Financial Capability, is being maintained as per A.R.S. 49-243.N.4 and A.A.C. R18-9-A203(H) for all estimated closure and post-closure costs including updated costs submitted under Section 3.0, No. 4 below. The demonstration shall include a statement that the closure and post-closure strategy has not changed, the discharging facilities listed in the permit have not been altered in a manner that would affect the closure and post-closure costs, and discharging facilities have not been added. The demonstration shall also include information in support of a performance surety bond as required in A.A.C. R18-9-A203(C)(2).	Every 6 years from January 8, 2018, for the duration of the permit.	No
3. 4	The permittee shall submit updated cost estimates for facility closure and post-closure, as per A.A.C. R18-9-A201(B)(5) and A.R.S. 49-243.N.2.a, and an updated financial assurance demonstration for the updated cost estimate as per A.A.C. R18-9-A203(C)(2).	Every 6 years from January 8, 2018, for the duration of the permit.	Yes
3.5	If the permittee wishes to deposit a greater quantity of material, or to increase the crest elevation above 5,110 feet amsl, then the permittee shall apply for a permit amendment.	Within six months of determination to increase tailings crest elevation	Yes

TABLES OF MONITORING REQUIREMENTS

4.1 PRE-OPERATIONAL MONITORING (or CONSTRUCTION REQUIREMENTS)

Not Required

4.2 COMPLIANCE AND OPERATIONAL MONITORING

Table 4.2.1 Facility Inspection Monitoring (Log Book)
Table 4.2.2 Compliance Discharge Monitoring
Table 4.2.3 Groundwater Compliance Monitoring for POC-2
Table 4.2.4 Leak Collection and Removal System Monitoring (Log Book)

4.3 Contingency Monitoring

Table 4.3.1 Compliance Discharge Characterization for BADCT Failures

4.0 TABLES OF MONITORING REQUIREMENTS and BADCT DEMONSTRATIONS

4.2 PRE-OPERATIONAL MONITORING (or CONSTRUCTION REQUIREMENTS)

Not applicable.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.1
FACILITY INSPECTION (OPERATIONAL MONITORING) - LOG BOOK[1]

TAILINGS STORAGE FACILITY - Log Book

Parameter	Performance Standard	Monitoring Frequency
Facility Height	Does not exceed 5110 ft amsl	Annually
Structural Integrity	No visible structural weakness, seepage erosion, sloughing, rolling rocks, or other hazardous conditions	Monthly
Piezometric Head	The phreatic surface in the piezometers shall be less than 1.5 feet[2]	Weekly

PIEZOMETER LOCATION

Piezometer ID	Association	Latitude	Longitude
P1	TSF	31° 28' 01.3135" N	110° 43' 36.4235" W
P2	TSF	31° 27' 58.5711" N	110° 43' 39.4789" W
P3	TSF	31° 27' 59.3730" N	110° 43' 32.8978" W
P4	TSF	31° 27' 56.4873" N	110° 43' 28.0662" W
P5	UCP	31° 28' 10.9482" N	110° 43' 41.0728" W
P6	UCP	31° 28' 10.4521" N	110° 43' 40.7503" W

NOTE: If replacement of a piezometer is necessary due to malfunction, the permittee may install a replacement piezometer in the same general location, and no permit amendment is necessary. The locational information may be updated in the permit, during any future amendment.

UNDERDRAIN COLLECTION POND - Log Book

Parameter	Performance Standard	Monitoring Frequency
Freeboard	Minimum of seven (7) feet	Weekly or after a significant rainstorm or other natural disaster
Anchor trench integrity	No impairment	Monthly
Embankment integrity	No visible structural weakness, seepage erosion, or other hazardous conditions	Monthly
Liner Integrity	No visible cracks, punctures, or deteriorations of liner	Monthly
Integrity of Pumping System	Good working condition	Monthly
Sediments/sludge	Remove sediments/sludge as needed to maintain at least 90 percent of designed capacity	Monthly

[1] The permittee shall record the inspection performance levels in a log book as per Section 2.7.2. In the case of an exceedance, identify which structure exceeds the performance level in the log book.
[2] If the phreatic surface is in excess of 1.5 feet, the permittee shall follow the contingency action per Section 2.6.2.7.

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.2
COMPLIANCE DISCHARGE MONITORING

Sampling Point Number	**Sampling Point Identification**			**Latitude**	**Longitude**
1	AZPDES Outfall 001			31° 28' 15" N	110° 43' 43" W
Parameter	**AL**[3]	**DL**[4]	**Units**	**Monitoring Frequency**	**Reporting Frequency**
Flow	N/A	0.172	mgd[5]	Daily[6]	Quarterly
Temperature	Monitor[7]	Monitor	Degrees	Quarterly	Quarterly
pH (field)	Monitor	Monitor	S.U.	Quarterly	Quarterly
Specific Conductance (field)	Monitor	Monitor	µmhos/cm	Quarterly	Quarterly
Nitrate (as N)	8.0	10.0	mg/L	Quarterly	Quarterly
Nitrite (as N)	0.8	1.0	mg/L	Quarterly	Quarterly
Nitrate-Nitrite as N	8.0	10.0	mg/L	Quarterly	Quarterly
Total Dissolved Solids	Monitor	Monitor	mg/L	Quarterly	Quarterly
Total Alkalinity	Monitor	Monitor	mg/L	Quarterly	Quarterly
Sulfate	Monitor	Monitor	mg/L	Quarterly	Quarterly

[3] AL = Alert Levels
[4] DL = Discharge Limits
[5] Mgd=Million gallons per day
[6] "Daily" means the days that effluent from the Water Treatment Plant is discharged to the AZPDES Outfall 001. On the days effluent from the Water Treatment Plant is NOT being discharged to the AZPDES Outfall 001, indicate "No Flow" on the SMRF reporting form.
[7] Monitor = Analysis is required but limits are not established.

4.2.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.2
COMPLIANCE DISCHARGE MONITORING – continued

Parameter[8]	AL[9]	DL[10]	Units	Monitoring Frequency	Reporting Frequency
Antimony	0.0048	0.006	mg/L	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/L	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/L	Quarterly	Quarterly
Barium	1.60	2.00	mg/L	Quarterly	Quarterly
Cadmium	0.008	0.010	mg/L	Quarterly	Quarterly
Chromium	0.08	0.1	mg/L	Quarterly	Quarterly
Cyanide (free)	0.16	0.2	mg/L	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/L	Quarterly	Quarterly
Lead	0.04	0.05	mg/L	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/L	Quarterly	Quarterly
Nickel	0.08	0.1	mg/L	Quarterly	Quarterly
Selenium	0.04	0.05	mg/L	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/L	Quarterly	Quarterly
Iron	Monitor[11]	Monitor	mg/L	Quarterly	Quarterly
Copper	Monitor	Monitor	mg/L	Quarterly	Quarterly
Manganese	Monitor	Monitor	mg/L	Quarterly	Quarterly
Zinc	Monitor	Monitor	mg/L	Quarterly	Quarterly
Gross Alpha (including Radium 226)[12,13]	Monitor	Monitor	pCi/L	Quarterly	Quarterly
Radium 226 + Radium 228	Monitor	Monitor	pCi/L	Quarterly	Quarterly

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8 Metals shall be analyzed as dissolved metals.
9 AL = Alert Levels
10 DL = Discharge Limit
11 Monitoring is required, but no limit is established.
12 If the gross alpha particle activity is greater than 15 pCi/L, then calculate adjusted gross alpha particle activity
13 The adjusted gross alpha particle activity is the gross alpha particle activity, including radium 226, and any other alpha emitters, if present in the water sample, minus radon and total uranium (the sum of uranium 238, uranium 235 and uranium 234 isotopes). The gross alpha analytical procedure (evaporation technique: EPA Method 900.0) drives off radon gas in the water samples. Therefore, the Adjusted Gross Alpha should be calculated using the following formula: (Laboratory Reported Gross Alpha MINUS Sum of the Uranium Isotopes).

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.3

COMPLIANCE GROUNDWATER MONITORING (POC-2)

Sampling Point Number	Sampling Point Identification			Latitude	Longitude
2	300 feet downgradient of the AZPDES Outfall-001 (MW3)			31° 28' 18.91"	110° 43' 48.83"
Parameter[14]	**AL[15]**	**AQL[16]**	**Units**	**Monitoring Frequency**	**Reporting Frequency**
Depth to Water Level	Monitor[17]	Monitor	Feet	Semi-Annually[18]	Semi-Annually
Water Level Elevation	Monitor	Monitor	Feet amsl[19]	Semi-Annually	Semi-Annually
Temperature	Monitor	Monitor	Degrees	Semi-Annually	Semi-Annually
pH	Monitor	Monitor	S.U.	Semi-Annually	Semi-Annually
Specific Conductance	Monitor	Monitor	µmhos/cm	Semi-Annually	Semi-Annually
Nitrate (as N)	8	10	mg/L	Semi-Annually	Semi-Annually
Nitrite (as N)	0.8	1	mg/L	Semi-Annually	Semi-Annually
Nitrate-Nitrite as N	8	10	mg/L	Semi-Annually	Semi-Annually
Total Dissolved Solids	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually
Total Alkalinity	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually
Sulfate	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually

[14] Metals shall be analyzed as dissolved metals.
[15] AL = Alert Levels
[16] AQL = Aquifer Quality Limits
[17] Monitor = Analysis is required but an AQL and/or AL is not established in the permit
[18] Semi-Annual monitoring shall be conducted as follows: During each semi-annual period described in Sections 2.6.2.8.2, 2.6.4, and 2.7.6 sampling shall occur within seven days of a discharge from the WTP outfall, but not exceeding one sampling event per semi-annual period. If no discharge should occur during a semi-annual period, no sample is required for that period. Should sampling frequency increase to Quarterly monitoring, sampling shall be conducted in the same manner as described above, except the period for sampling will be quarterly as described in Sections, 2.6.2.8.2, 2.6.4, and 2.7.6.
[19] amsl = above mean sea level

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.3
COMPLIANCE GROUNDWATER MONITORING (continued)

Parameter	AL[20]	AQL[21]	Units	Monitoring Frequency	Reporting Frequency
Antimony	0.0048	0.006	mg/L	Semi-Annually	Semi-Annually
Arsenic	0.04	0.05	mg/L	Semi-Annually	Semi-Annually
Beryllium	0.0032	0.004	mg/L	Semi-Annually	Semi-Annually
Barium	1.6	2	mg/L	Semi-Annually	Semi-Annually
Cadmium	Not Established[22]	0.011	mg/L	Semi-Annually	Semi-Annually
Chromium	0.08	0.1	mg/L	Semi-Annually	Semi-Annually
Cyanide (free)	0.16	0.2	mg/L	Semi-Annually	Semi-Annually
Fluoride	3.2	4.0	mg/L	Semi-Annually	Semi-Annually
Lead	0.04	0.05	mg/L	Semi-Annually	Semi-Annually
Mercury	0.0016	0.002	mg/L	Semi-Annually	Semi-Annually
Nickel	0.08	0.1	mg/L	Semi-Annually	Semi-Annually
Selenium	0.04	0.05	mg/L	Semi-Annually	Semi-Annually
Thallium	0.0016	0.002	mg/L	Semi-Annually	Semi-Annually
Iron	Monitor[23]	Monitor	mg/L	Semi-Annually	Semi-Annually
Copper	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually
Manganese	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually
Zinc	Monitor	Monitor	mg/L	Semi-Annually	Semi-Annually
Gross Alpha (including Radium 226)[24,25]	12	15	pCi/L	Semi-Annually	Semi-Annually
Radium 226 + Radium 228	4	5	pCi/L	Semi-Annually	Semi-Annually

[20] AL = Alert Levels
[21] AQL = Aquifer Quality Limits
[22] Not Established means monitoring is required but no limits are specified.
[23] Monitoring is required, but no limit is established.
[24] If the gross alpha particle activity is greater than 15 pCi/L, then calculate adjusted gross alpha particle activity
[25] The adjusted gross alpha particle activity is the gross alpha particle activity, including radium 226, and any other alpha emitters, if present in the water sample, minus radon and total uranium (the sum of uranium 238, uranium 235 and uranium 234 isotopes). The gross alpha analytical procedure (evaporation technique: EPA Method 900.0) drives off radon gas in the water samples. Therefore, the Adjusted Gross Alpha should be calculated using the following formula: (Laboratory Reported Gross Alpha MINUS Sum of the Uranium Isotopes).

4.2 COMPLIANCE (or OPERATIONAL) MONITORING

TABLE 4.2.4
LEAK COLLECTION AND REMOVAL SYSTEM MONITORING (Log Book)

LCRS Sump	Alert Level 1 (gpd)	Alert Level 2 (gpd)	Monitoring Method	Monitoring Frequency
Underdrain Collection Pond (UCP) Sump	3,456	22,896	Automated	Daily

Note: The volume of liquid pumped from the LCRS shall be monitored on a continuous basis using a totalizer and entered in a facility log book on a daily basis. The Alert Level 1 (AL1) or Alert Level 2 (AL2) shall be exceeded when the amount of leakage pumped from the sump for the UCP is greater than the applicable quantity above. Contingency requirements of Sections 2.6.2.3 and 2.6.2.4 shall be followed for AL1 and AL2 exceedances, respectively. An exceedance of AL 1 or AL2 is not a violation of the permit unless the permittee fails to perform actions as required under the Sections referenced above.

4.3 CONTINGENCY MONITORING

TABLE 4.3.1
CONTINGENCY DISCHARGE CHARACTERIZATION FOR BADCT FAILURES AND OVERTOPPING[26]

Parameter	Units	Monitoring Frequency[27]
pH (field)	Standard Units	One sample
Total Dissolved Solids (TDS)	mg/L	One sample
Specific Conductance (lab)	umhos/cm	One sample
Hardness [28]	Standard Units	One sample
Nitrate (as N)	mg/L	One sample
Nitrite (as N)	mg/L	One sample
Nitrate-Nitrite as N	mg/L	One sample
Total Alkalinity	mg/L	One sample
Sulfate	mg/L	One sample
Antimony	mg/L	One sample
Arsenic	mg/L	One sample
Beryllium	mg/L	One sample
Barium	mg/L	One sample
Cadmium	mg/L	One sample
Chromium	mg/L	One sample
Cyanide (free)	mg/L	One sample
Fluoride	mg/L	One sample
Lead	mg/L	One sample
Mercury	mg/L	One sample
Nickel	mg/L	One sample
Selenium	mg/L	One sample
Thallium	mg/L	One sample
Iron	mg/L	One sample
Copper	mg/L	One sample
Manganese	mg/L	One sample
Zinc	mg/L	One sample

[26] Monitor under this table per Section 2.6.3.1, Surface Impoundments, Liner Failure, Containment Structure Failure, Unexpected Loss of Fluid, or Section 2.6.3.2, Overtopping of an Impoundment.
[27] One sample shall be taken within 24 hours of discovery of an event.
[28] Hardness may be expressed as the sum of calcium plus magnesium as calcium carbonate ($CaCO3$)
mg/L = milligrams per liter umhos/cm = micromhos per centimeter

5.0 REFERENCES AND PERTINENT INFORMATION

The terms and conditions set forth in this permit have been developed based upon the information contained in the following, which are on file with the Department:

1. APP Application, dated: December 11, 2018
2. Contingency Plan, dated: June 5, 2017
3. Hydrology memo dated: April 1, 2019 revised April 4, 2019
4. Public Hearing, dated: NA
5. Public Hearing, dated: NA

6.0 NOTIFICATION PROVISIONS

6.1 Annual Registration Fees

The permittee is notified of the obligation to pay an Annual Registration Fee to ADEQ. The Annual Registration Fee is based on the amount of daily influent or discharge of pollutants in gallons per day (gpd) as established by A.R.S. **§** 49-242.

6.2 Duty to Comply [A.R.S. §§ 49-221 through 263]

The permittee is notified of the obligation to comply with all conditions of this permit and all applicable provisions of Title 49, Chapter 2, Articles 1, 2 and 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Articles 1 through 4, and Title 18, Chapter 11, Article 4 of the Arizona Administrative Code. Any permit non-compliance constitutes a violation and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit amendment, suspension, or revocation.

6.3 Duty to Provide Information [A.R.S. §§ 49-243(K)(2) and 49-243(K)(8)]

The permittee shall furnish to the Director, or an authorized representative, within a time specified, any information which the Director may request to determine whether cause exists for amending or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

6.4 Compliance with Aquifer Water Quality Standards [A.R.S. §§ 49-243(B)(2) and 49-243(B)(3)]

The permittee shall not cause or contribute to a violation of an Aquifer Water Quality Standard (AWQS) at the applicable point of compliance (POC) for the facility. Where, at the time of issuance of the permit, an aquifer already exceeds an AWQS for a pollutant, the permittee shall not discharge that pollutant so as to further degrade, at the applicable point of compliance for the facility, the water quality of any aquifer for that pollutant.

6.5 Technical and Financial Capability [A.R.S. §§ 49-243(K)(8) and 49-243(N) and A.A.C. R18-9-A202(B) and R18-9-A203(E) and (F)]

The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, trust fund, or other financial assurance mechanism provided as a demonstration of financial capability in the permit application, pursuant to A.A.C. R18-9-A203(C), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

6.6 Reporting of Bankruptcy or Environmental Enforcement [A.A.C. R18-9-A207(C)]

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. the filing of bankruptcy by the permittee; or
2. the entry of any order or judgment not issued by the Director against the permittee for the enforcement of any environmental protection statute or rule.

6.7 Monitoring and Records [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A206]

The permittee shall conduct any monitoring stipulated in the permit necessary to assure compliance with this permit, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223 and §§ 49-241 through 49-252.

6.8 Inspection and Entry [A.R.S. §§ 49-1009, 49-203(B), and 49-243(K)(8)]

In accordance with A.R.S. §§ 41-1009 and 49-203(B), the permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to enter and inspect the facility as reasonably necessary to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, and Title 18, Chapter 9, Articles 1 through 4 of the Arizona Administrative Code and the terms and conditions of this permit.

6.9 Duty to Modify [A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A211]

The permittee shall apply for and receive a written amendment before deviating from any of the designs or operational practices authorized by this permit.

6.10 Permit Action: Amendment, Transfer, Suspension, and Revocation [A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

This permit may be amended, transferred, suspended, or revoked for cause, under the rules of the Department. The permittee shall notify the Groundwater Protection Value Stream in writing within 15 days after any change in the owner or operator of the facility. The notification shall state the permit number, the name of the facility, the date of property transfer, and the name, address, and phone number where the new owner or operator can be reached. The operator shall advise the new owner or operators of the terms of this permit and the need for permit transfer in accordance with the rules.

7.0 ADDITIONAL PERMIT CONDITIONS

7.1 Other Information [A.R.S. § 49-243(K)(8)]

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit the correct facts or information.

7.2 Severability [A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

The provisions of this permit are severable, and if any provision 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. The filing of a request by the permittee for a permit action does not stay or suspend the effectiveness of any existing permit condition.

7.3 Permit Transfer

This permit may not be transferred to any other person except after notice to and approval of the transfer by the Department. No transfer shall be approved until the applicant complies with all transfer requirements as specified in A.A.C. R18-9-A212(B) and (C).