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December 16, 2013

Mr. Walter L. Baker, Director
Department of Environmental Quality
Division of Water Quality
195 North 1950 West
P.O. Box 144870
Salt Lake City, Utah 84114-4870

Re: ATI Titanium LLC; UPDES Industrial Discharge Permit No. UT0025755
Level II Antidegradation Review (Level II ADR)

Dear Mr. Baker:

On August 19, 2013, ATI Titanium LLC (ATI) submitted to DWQ an application to renew ATI's UPDES permit number UT0025755. In DWQ's February 21, 2013, letter to ATI regarding the renewal DWQ requested that ATI submit a Level II antidegradation review (Level II ADR). This letter and its enclosures provide the final draft of the Level II ADR.

ATI has requested that DWQ renew ATI's UPDES permit with no increase in effluent concentration or loading limits. Indeed, ATI has proposed substantial reductions in the current permit's discharge limits. Accordingly, no Level II ADR is required for the renewal of the permit. *See* UAC R317-2-3.5.b.1.

DWQ's February 2013 letter acknowledged that a Level II ADR is not required but nonetheless requested that ATI submit a Level II ADR in conjunction with its permit renewal application. To accommodate this request, ATI submits the enclosed Level II ADR. By submitting the Level II ADR, ATI does not waive any argument that a Level II ADR is not required or waive any right to object to any permit decision or condition based on the Level II ADR or the antidegradation policy.

If you have any questions please call me at 541-812-7230.

Sincerely,

Michael Riley

Michael Riley
Manager, Environmental Operations & Compliance
ATI Wah Chang

Enclosures: ATI Level II ADR
ATI Level II ADR Appendix A

ANTIDEGRADATION REVIEW FORM
UTAH DIVISION OF WATER QUALITY

Instructions

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

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

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

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

For additional clarification on the antidegradation review process and procedures, please contact Nicholas von Stackelberg (801-536-4374) or Jeff Ostermiller (801-536-4370).

Antidegradation Review Form

Part A: Applicant Information

Facility Name: ATI - Rowley Operations

Facility Owner: ATI Titanium LLC

Facility Location: 12633 N. Rowley Road, North Skull Valley, Utah 84029

Form Prepared By: ATI Titanium LLC

Outfall Number: 001

Receiving Water: Great Salt Lake

What Are the Designated Uses of the Receiving Water (R317-2-6)?

Domestic Water Supply: None.
Recreation: None. (See Great Salt Lake, below.)
Aquatic Life: None. (See Great Salt Lake, below.)
Agricultural Water Supply: None.
Great Salt Lake: Class 5A (open waters at or below 4,208 feet elevation): Frequent primary and secondary contact recreation, waterfowl, shore birds and other water-oriented wildlife including their necessary food chain. Class 5E (transitional waters along the shoreline below 4,208 feet elevation to the current level of lake open water): Infrequent primary and secondary contract recreation, waterfowl, shore birds, and other water-oriented wildlife including their necessary food chain.

Category of Receiving Water (R317-2-3.2, -3.3, and -3.4): Category 3

UPDES Permit Number (if applicable): UT0025755

Effluent Flow Reviewed: 1.0 million gallons per day (MGD)
Typically, this should be the maximum daily discharge at the design capacity of the facility. Exceptions should be noted.

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

☐ A UPDES permit for a new facility, project, or outfall.

☐ A UPDES permit renewal with an expansion or modification of an existing wastewater treatment works.

☐ A UPDES permit renewal requiring limits for a pollutant not covered by the previous permit and/or an increase to existing permit limits.

☒ A UPDES permit renewal with no changes in facility operations.

Part B. Is a Level II ADR required?

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

B1. The receiving water or downstream water is a Class 1C drinking water source.

☐ **Yes** A Level II ADR is required (Proceed to Part C of the Form)

☒ **No** (Proceed to Part B2 of the Form)

B2. The UPDES permit is new or is being renewed and the proposed effluent concentration and loading limits are higher than the concentration and loading limits in the previous permit and any previous antidegradation review(s).

☐ **Yes** (Proceed to Part B3 of the Form)

☒ **No** No Level II ADR is required and there is no need to proceed further with review questions.

ATI requests the renewal of its UPDES permit with no increase in effluent concentration or loading limits, and in fact proposes a substantial reduction in the current effluent limits. Accordingly, a Level II ADR is not required. See R317-2-3.5b.1. Nonetheless, and without waiving any argument that a Level II ADR is not required or waiving the right to object to any permit decision or condition based on a Level II ADR, ATI submits with this form the information necessary for a Level II ADR.

B3. Will any pollutants use assimilative capacity of the receiving water, i.e. do the pollutant concentrations in the effluent exceed those in the receiving waters at critical conditions? For most pollutants, effluent concentrations that are higher than the ambient concentrations require an antidegradation review? For a few pollutants such as dissolved oxygen, an antidegradation review is required if the effluent concentrations are less than the ambient concentrations in the receiving water. (Section 3.3.3 of Implementation Guidance)

☒ **Yes** (Proceed to Part B4 of the Form)

Although ATI's actual and allowed discharge concentrations are well below the concentrations that might pose a risk of harm to the designated uses of the Great Salt Lake, the discharge concentrations for some substances exceed the ambient lake concentrations. Again, because ATI does not propose any increase in its

current permit discharge limits, and indeed proposes a substantial reduction in the current effluent limits, no Level II ADR is required, regardless whether the discharge concentrations exceed ambient lake concentrations. See R317-2-3.5b.1. Nonetheless, and without waiving any argument that a Level II ADR is not required or waiving the right to object to any permit decision or condition based on a Level II ADR, ATI submits with this form the information necessary for a Level II ADR.

☐ **No** No Level II ADR is required and there is no need to proceed further with review questions.

B4. Are water quality impacts of the proposed project temporary and limited (Section 3.3.4 of Implementation Guidance)? Proposed projects that will have temporary and limited effects on water quality can be exempted from a Level II ADR.

☐ **Yes** Identify the reasons used to justify this determination in Part B4.1 and proceed to Part G. No Level II ADR is required.

☒ **No** A Level II ADR is required (Proceed to Part C)

ATI's discharges are not temporary, but a Level II ADR is not legally required because no increase in ATI's existing authorized discharge concentrations and loadings is proposed, and in fact ATI proposes a substantial reduction in its current effluent limits. See R317-2-3.5b.1. Nonetheless, and without waiving any argument that a Level II ADR is not required or waiving the right to object to any permit decision or condition based on a Level II ADR, ATI submits with this form the information necessary for a Level II ADR.

B4.1 Complete this question only if the applicant is requesting a Level II review exclusion for temporary and limited projects (see R317-2-3.5(b)(3) and R317-2-3.5(b)(4)). For projects requesting a temporary and limited exclusion please indicate the factor(s) used to justify this determination (check all that apply and provide details as appropriate) (Section 3.3.4 of Implementation Guidance):

☐ Water quality impacts will be temporary and related exclusively to sediment or turbidity and fish spawning will not be impaired. [Not applicable.]

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

a) The length of time during which water quality will be lowered: ☐
b) The percent change in ambient concentrations of pollutants: ☐
c) Pollutants affected: ☐
d) Likelihood for long-term water quality benefits: ☐
e) Potential for any residual long-term influences on existing uses: ☐

f) Impairment of fish spawning, survival and development of aquatic fauna excluding fish removal efforts: [ ]

Additional justification, as needed: [ ]

Level II ADR

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

Optional Report Name: [ ]

Part C. Is the degradation from the project socially and economically necessary to accommodate important social or economic development in the area in which the waters are located?

The applicant must provide as much detail as necessary for DWQ to concur that the project is socially and economically necessary when answering the questions in this section. More information is available in Section 6.2 of the Implementation Guidance.

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

Construction. The project's 3-year construction resulted in more than $460 million in direct capital costs. Of this amount, approximately 50 percent was associated with more than 1 million hours of labor, much of which involved local labor. These construction costs provided additional indirect economic benefits to the local economy.

Operation. ATI currently employs 207 persons with an estimated 2013 annual payroll of $13.9 million. ATI provides additional, direct and indirect economic benefits to the local economy through payments to local vendors and contractors and through local tax payments. In 2012 ATI paid $623,000 in state taxes and $3.8 million in property taxes and $177,000 in other local taxes to Tooele County.

Other social and economic benefits. ATI's Rowley facility is the second largest producer of titanium in the United States. Because titanium is used in aircraft, medical devices, and other essential products, it is critical to the United States' security and economic interests. To protect these interests, the United States must maintain sufficient productive capacity to avoid shortages during wartime or international boycotts or other crises that might limit the ability to import titanium. Among the essential uses of titanium are:

DEFENSE:

- *Titanium metal is a critical component in military aircraft and missiles because of its strength at high temperatures and its excellent strength-to-weight ratio. Titanium is also used to reduce weight in armored vehicles.*

- *In naval applications titanium is the material of choice where sea water corrosion is a concern, such as fire pumps and heat exchangers.*

FOOD/MEDICINE:

- *Titanium has numerous medical applications due to its superior resistance to corrosion in the body. It is used for bone implants such as rods, pins, screws, discs, cranial plates, and hip joints.*
- *In the pharmaceutical industry titanium is needed for vessels, pumps, heat exchangers, and instrumentation so as not to contaminate medications with potentially toxic nickel or chromium, as might occur with traditional stainless steel alloys.*
- *Titanium is important in food production as a corrosion-resistant metal for vessels and heat exchangers to produce fertilizers. Also, titanium pumps and heat exchangers are used for desalination of brackish water and sea water to produce potable water for consumption.*

ENERGY

- *Titanium is a very cost-effective metal for heat exchangers used to produce electricity in areas where brackish water or sea water is used for cooling.*
- *Titanium/carbon composite structural systems are the design of choice for the new generation of commercial aircraft (e.g., the Boeing 787). These materials will achieve a 25% fuel savings over the present generation of aircraft.*
- *In production from deep ocean wells, titanium provides excellent corrosion resistance.*
- *Titanium is the material of choice for critical systems that experience heat, stress, or corrosion.*

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

ATI is adjacent to the only magnesium producer in the United States. Because magnesium is one of the principal materials used in the production of titanium, ATI's location eliminates the adverse environmental and other effects that would be associated with transporting magnesium to the facility. In addition, ATI realizes significant energy savings from its ability (1) to obtain molten magnesium from an adjacent facility for direct use in ATI's processes and (2) to return a byproduct of the manufacturing process, molten magnesium chloride, to an adjacent facility to be used directly in the electrolytic process that generates magnesium. These energy savings result in environmental benefits by reducing the demand for electrical energy that is produced through processes that may generate air pollution and other adverse environmental effects.

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

ATI is in a relatively remote area, with the exception of the adjacent magnesium production plant, the nearby landfill, and Rocky Mountain Power substation. There are no other significant industrial, commercial, residential, or recreational uses in the immediate vicinity. In particular, wastewater discharges from the facility to the Great Salt Lake will not affect recreational or commercial uses of the lake because the discharges will have no significant effect on the lake's chemistry, physical characteristics, or biota, and there are no significant recreational or commercial uses of the lake in the vicinity of ATI's discharge.[1]

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

As discussed in Part D, below, ATI's discharge does not significantly reduce the assimilative capacity of the lake. Moreover, ATI is unaware of any plans for future growth and development in the area that would make use of this portion of the lake's assimilative capacity, including any plans for new or expanded discharges of municipal or industrial wastewater in the vicinity of ATI's outfall.

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

There is a small effluent discharge pipe placed in riprap that discharges into the channel to the Great Salt Lake. No structures or equipment associated with ATI's facility are in or adjacent to the Great Salt Lake proper, and ATI has no plans for any such structures or equipment.

[1] Three other point sources in the region, but well outside ATI's area of discharge, discharge to the Great Salt Lake – Kennecott Utah Copper Corporation, Morton Salt Company and Cargill Salt Company. These facilities will achieve all applicable statutory and regulatory requirements through compliance with their UPDES permits.

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

ATI submitted an Ecological Risk Assessment (ERA) as part of its original UPDES permit application in 2008. The ERA evaluated substances that might be found in ATI's wastewater and identified five substances of potential concern for the designated uses of the Great Salt Lake: arsenic, chromium, iron, nickel, and titanium. The ERA determined the lowest observed adverse effect level (LOAEL) and no observed adverse effect level (NOAEL) for each of these substances. The LOAELs and NOAELs were included in ATI's UPDES permit as daily maximum and monthly average discharge limits, respectively. Based on the ERA and these discharge limits, there are no substances in ATI's discharge at concentrations that pose a potential threat to designated uses. Moreover, ATI does not propose to increase the discharge limits or to increase the concentration or mass of any other substances in its discharge and in fact ATI is proposing a substantial reduction to current effluent limits.

Nonetheless, in order to provide information for a Level II ADR, ATI has listed below as "parameters of concern" the six substances whose monthly average or quarterly discharge concentrations have exceeded Great Salt Lake ambient concentrations. The listing is in alphabetical order and does not imply that these substances in the facility's effluent present any threat to designated uses. Under "Pollutants Evaluated that are not Considered Parameters of Concern," ATI has listed other substances for which it has discharge monitoring data and ambient concentration data for the Great Salt Lake.

For purposes of these tables: The "Ambient Concentration" is the average Gilbert Bay "shallow brine" concentration if data from Gilbert Bay is available or, if not, the average shallow concentrations from the "South Arm" of the Great Salt Lake. The "Effluent Concentration" is the highest monthly average or quarterly discharge concentration in the facility's effluent. All concentrations are in milligrams per liter (mg/L); "ND" means "not detected" at an analytical detection limit noted in parentheses following "ND ".

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1	Copper	0.0018	0.0076
2	Iron	0.096	0.47
3	Nickel	0.004	0.0159

4	Selenium	0.00036	0.0041
5	Titanium	0.34	1.21
6	Zinc	0.003	0.019 (Typically ND 0.005)

Pollutants Evaluated that are not Considered Parameters of Concern[2]:

Pollutant	Ambient Concentration	Effluent Concentration	Justification
Arsenic	0.07	0.0042	Less than ambient concentration.
Aluminum	No data available	ND (0.1)	Not detected in the discharge.
Cadmium	0.0002	ND (0.00018)	Not detected in the discharge.
Chromium	0.012	0.012	Typically less than ambient concentration.
Cyanide	No data available	ND (0.005)	Not detected in the discharge.
Lead	0.0011	ND (0.0004)	Not detected in the discharge.
Mercury	0.0000039	ND (0.00015)	Not detected in the discharge.
Silver	No data available	ND (0.004)	Not detected in the discharge.

Although the facility's maximum monthly average or quarterly discharge concentrations for copper, iron, nickel, selenium, titanium, and zinc exceed the ambient lake concentrations of these substances, these concentrations do not pose any risk of harm to the lake's designated uses--even at the point of discharge and prior to any dilution in the lake. Moreover, the effect of ATI's discharges on the assimilative capacity of the lake is insignificant because:

- *The current and proposed discharge limits are conservatively protective and, for those substances for which the ERA determined a NOAEL, are substantially less than the NOAEL . Lake concentrations would need to be substantially higher than the proposed discharge concentration limits before harm to designated uses (and thereby a violation of narrative water quality criteria) would be expected.*

- *In order to avoid the risk of exceeding a discharge limit due to the variability of the effluent, ATI has designed and operated its wastewater*

[2] *ATI's UPDES permit includes technology-based discharge limits for total suspended solids (TSS) (monthly average of 25 mg/L; daily maximum of 35 mg/L), pH (6.5 to 9.0), and oil and grease (daily maximum of 10 mg/L). ATI does not have ambient Great Salt Lake data for these substances, but discharges within these limits do not pose any risk of harm to designated lake uses and do not have any material effect on the lake's assimilative capacity.*

treatment system to ensure that actual discharge concentrations are substantially less than the discharge limits.

- *Except in the immediate vicinity of the outfall, the extraordinarily large volume of the lake in relation to the discharge volume will dilute the discharge to concentrations that are not materially above the ambient lake concentrations.*

- *Because of the relative remoteness of the facility, no other current or future dischargers are likely to need additional assimilative capacity in the vicinity of ATI's outfall. There are no municipal wastewater treatment facilities that discharge to the Great Salt Lake in the vicinity of ATI, and, because there are no substantial residential or commercial areas within many miles of the facility, no municipal discharge in this area of the lake is likely in the foreseeable future. The only significant nearby industrial or commercial facilities are the adjacent U.S. Magnesium plant, a landfill, and an electrical power substation, none of which discharge process wastewater to the lake. ATI is unaware of any plans for future industrial or other facilities in the area that would discharge process wastewater to the lake in the vicinity of ATI's outfall.*

The ERA evaluated other substances and concluded that they were not of potential concern for ATI's discharge, including cadmium, copper, lead, and mercury, which ATI nonetheless monitors pursuant to its UPDES permit. Since ATI began discharging to the lake, cadmium, lead, and mercury have not been found in ATI's discharge at levels above the analytical detection limit. ATI also monitors its discharge for aluminum, cyanide, silver and zinc pursuant to its UPDES permit. Since ATI began discharging to the lake, aluminum, cyanide and silver have not been found in ATI's discharge at levels above the analytical detection limit, and the average zinc discharge concentration measured in the past two years has been at or near the detection limit. Accordingly, ATI's discharges of these and other substances do not use any of the lake's assimilative capacity.

Part E. Alternative Analysis Requirements of a Level II Antidegradation Review.

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

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

☒ **Yes** (Proceed to Part F)

☐ **No or Does Not Apply** (Proceed to E2)

ATI requests the renewal of its UPDES permit with no increase in the allowed discharge flow or effluent concentration limits, and in fact proposes a substantial reduction to current effluent limits. Accordingly, a Level II ADR is not required. See R317-2-3.5b.1. In addition, alternative treatment and discharge options were considered in conjunction with the issuance of ATI's original UPDES permit, and no economically feasible treatment or discharge alternatives were identified. Nonetheless, and without waiving any argument that a Level II ADR is not required or waiving the right to object to any permit decision or condition based on a Level II ADR, ATI submits with this form the information necessary for a Level II ADR.

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

Report Name: ***ATI Antidegradation Review Appendix A: Alternative Treatment and Discharge Options***

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

See Appendix A. ATI's existing wastewater treatment system meets all effluent limits in its UPDES permit, including WQBELs and technology-based effluent limits. No categorical effluent limits apply.

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

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

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

The existing treatment system, which employs oil skimming pretreatment followed by chemical precipitation, sedimentation, and filtration, is ATI's preferred treatment option for the reasons discussed in Appendix A.

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

☒ **Yes**

☐ **No**

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

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

☐

Part F. Optional Information

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

☒ **No**

☐ **Yes**

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

☒ **No**

☐ **Yes**

Report Name: ☐

ATI seeks renewal of its UPDES permit without any increase in the permit's discharge limits and in fact ATI is proposing a substantial reduction to current effluent limits. Thus, ATI does not propose any water quality degradation. Moreover, for the reasons described above, discharges that are consistent with the existing discharge limits do not pose any risk of harm to designated uses of the Great Salt Lake and do not use any material portion of the lake's assimilative capacity.

Part G. Certification of Antidegradation Review

G1. Applicant Certification

The form should be signed by the same responsible person who signed the accompanying permit application or certification.

Based on my inquiry of the person(s) who manage the system or those persons directly responsible for gathering the information, the information in this form and associated documents is, to the best of my knowledge and belief, true, accurate, and complete.

Print Name: LEE WEBER

Signature:

Date: 12/16/13

G2. DWQ Approval

To the best of my knowledge, the ADR was conducted in accordance with the rules and regulations outlined in UAC R-317-2-3.

Water Quality Management Section

Print Name: Christopher Bither

Signature:

Date: 12/28/13

APPENDIX A

ATI TITANIUM ANTIDEGRADATION REVIEW

ALTERNATIVE TREATMENT AND DISCHARGE OPTIONS

This appendix addresses the questions in Part E of the Utah Division of Water Quality's Antidegradation Review Form, and in particular questions E2 and E3:

> **"E2. Attach as an appendix to this form a report that describes the following factors for all alternative treatment options (see 1) a technical description of the treatment process, including construction costs and continued operation and maintenance expenses, 2) the mass and concentration of discharge constituents, and 3) a description of the reliability of the system, including the frequency where recurring operation and maintenance may lead to temporary increases in discharged pollutants. Most of this information is typically available from a Facility Plan, if available.**
>
> **"E3. Describe the proposed method and cost of the baseline treatment alternative. The baseline treatment alternative is the minimum treatment required to meet water quality based effluent limits (WQBEL) as determined by the preliminary or final wasteload analysis (WLA) and any secondary or categorical effluent limits."**

As discussed in the responses to Part D of the Antidegradation Review Form, the pollutants of potential concern in ATI's discharge are the "metals" arsenic, chromium, iron, nickel, selenium, and titanium. This appendix evaluates treatment and discharge alternatives in the context of these pollutants of potential concern.

ATI Titanium Wastewater Treatment Process

The U.S. Environmental Protection Agency (EPA) has established categorical "best available technology economically achievable" (BAT) effluent limits and new source performance standards (NSPS) for titanium manufacturing facilities. However, titanium manufacturing facilities that practice only vacuum distillation for titanium sponge purification and that do not practice electrolytic recovery of magnesium are exempt from these standards. *See* 40 C.F.R. § 421.300. ATI's facility meets this exemption.

Nonetheless, ATI's wastewater treatment system employs the same treatment technologies on which EPA based its categorical BAT and NSPS discharge limits. These technologies include oil skimming pretreatment followed by chemical precipitation, sedimentation, and filtration. *See* EPA, *Development Document for Effluent Limitations and Standards for Nonferrous Metals Manufacturing* 4979 (1989). The treatment system removes metals from the wastewater by forming insoluble metal hydroxides. This is accomplished by adjusting pH in a two stage reaction vessel using calcium hydroxide (lime). The resulting metal particulate is flocculated and allowed to settle in a specifically designed inclined plate separator.

The settled metal solids are removed and sent to a plate and frame filter press for dewatering and subsequent disposal. The treated clear water is then sent for final pH adjustment and discharge.

Water management includes the recycling of scrubber effluent and cooling water to reduce discharge flows, as well as the treatment of groundwater with reverse osmosis to produce potable water for use at the site. (See below.)

TREATMENT TECHNOLOGY	DESCRIPTION	METALS TREATMENT	CAPITAL COSTS	EXPECTED O&M COSTS
Chemical Precipitation	Causes dissolved or suspended contaminants to settle out of solution as a solid precipitate.	ATI metals = 1-10 mg/l	$500,000 -$750,000	$0.54/1000gal

1. Alternative Treatment Technologies

Alternative treatment technologies for reducing metals in the discharge include the following:

(1) *Reverse Osmosis (RO)* - An RO unit was installed by ATI for treatment of groundwater to produce 0.28 million gallons per day (MGD) of potable water for site use at a cost between $ 2,600,000 and $ 2,800,000. If a second RO unit were installed to treat up to 0.5 MGD of wastewater, it would require an additional capital outlay of more than $3,500,000 and additional operation and maintenance (O&M) expense. Treating ATI's wastewater through RO would also require management of the concentrate that it produces, which would be an estimated 25% of the total volume (*i.e.*, up to 125,000 gallons per day). This concentrated wastewater stream would require substantial additional economic, energy, and environmental costs to manage (*e.g.*, transportation, disposal, evaporation, distillation).

TREATMENT TECHNOLOGY	DESCRIPTION	METAL/TDS TREATMENT	CAPITAL COSTS	ESTIMATED O&M COSTS
Reverse Osmosis	Water is demineralized using a semipermeable membrane at high pressure. Wastewater must have a very low solids content. As such, prefiltering and softening may be required. Up to 50% of the treated stream can be rejected by the RO membrane and retained in the concentrate.	ATI metals = <1 mg/l – 1 µg/l	$3,500,000 - $4,800,000	$1.0-1.8/1000gal *(Wastewater Treatment Technologies: A General Review* United Nations 2003 pg.58) NOTE This cost does not include necessary transportation and disposal costs for the RO concentrate.

(2) *Distillation (Vapor Compression Evaporation)* - A desalinization treatment system via Vapor Compression was estimated in 2000 to require $16,200,000 in capital costs with an O&M cost of $4,600/day. This cost was calculated assuming an electricity cost of $0.025 per kilowatt hour *(Earthtech – 2000)*. Since 2000, the price of electricity has increased to $0.05 per kilowatt hour, thereby dramatically increasing the cost of O&M.

TREATMENT TECHNOLOGY	DESCRIPTION	METAL/TDS TREATMENT	CAPITAL COSTS	ESTIMATED O&M COSTS
Vapor Compression Distillation	A compressor raises the condensing temperature and pressure of evaporated water sufficiently to reuse the vapor as the primary heat source for evaporation. The compressor draws suction from the evaporating water as pressure and temperature rises. Concentrated wastes are formed containing salts and metals	ATI metals = < 1 µg/l	$16,200,000 *(Earthtech 2000)*	$9-10/1000gal *(Earthtech 2000)*

(3) *Ion Exchange* (IE) - The effective use of IE for metals removal requires a narrow tolerance for total dissolved solids (TDS). Both the size of the required IE and chemical regenerate become prohibitive. Theoretically, one equivalent of acid and one equivalent of alkali are required in an IE process for the removal of one equivalent of salt or mineral from water. In practice, 2-3 equivalents of acid and 1-2 equivalents of alkali per equivalent of salt removed are required. *(Standard Handbook – Environmental Engineering)*

TREATMENT TECHNOLOGY	DESCRIPTION	METAL/TDS TREATMENT	CAPITAL COSTS	EXPECTED O&M COSTS
Ion Exchange	Ion exchange is a reversible chemical reaction wherein an ion from solution is exchanged for a similarly charged ion attached to an immovable solid.	ATI metals = <1 mg/l –1 µg/l	$1,000,000 – $1,300,000 (www.dow.com/liquidseps/design/ix_ro.htm)	$1.5-2.10/1000gal *(Wastewater Treatment Technologies: A General Review* United Nations 2003 pg 64)

(4) *Filtration* - The estimated costs for the installation of a microfiltration (MF) or ultrafiltration (UF) system to treat 0.5 MGD to remove insoluble metals are $1,350,000 and $2,000,000, respectively. O&M costs for replacement membrane modules are very expensive ($25,000 to $35,000/12 membrane module – 6 would be needed).

TREATMENT TECHNOLOGY	DESCRIPTION	METAL/TDS TREATMENT	CAPITAL COSTS	EXPECTED O&M COSTS
Microfiltration (MF) and Ultrafiltration (UF)	MF and UF are low pressure processes for separating larger size solutes from aqueous solutions by means of a semi-permeable membrane.	ATI metals =1 mg/l – 10 µg/l	MF & UF = $1,200,000 -$2,000,000 *(UN - 2003)*	UF = $1/1000gal MF = $0.80/1000gal *(Wastewater Treatment Technologies: A General Review* - United Nations 2003 pg.61)

RO, distillation, IE, and filtration treatment technologies are theoretically capable of reducing metals concentrations to a greater degree than the technology employed by ATI, particularly if one conservatively assumes that ATI's chemical precipitation treatment does not remove all of

the insoluble metals fraction. The increased capital costs of achieving these reductions, however, range from $500,000 to over $15,000,000. At best, these treatment options double the capital costs of treatment; at worst, they increase the costs thirty times.

The operational and maintenance costs of increased removal of metals through alternative treatment technologies would at least approximately double the costs of treatment per 1000 gallons, and could increase the costs over eighteen times. Again, this increased treatment efficiency assumes that chemical precipitation does not remove most of the insoluble metals. This assumption is likely very conservative, however, given the well-established treatment efficiencies obtained by chemical precipitation for the metals present in ATI's effluent. ATI, on average, has achieved more than a 80% reduction in the influent concentration of the metals present, and as much as 99% reduction in titanium.

Additional factors to consider are:

- The costs of treating wastewater using RO or IE are dependent on the feed TDS concentration. The costs presented here assume a 300-400 ppm TDS range versus the ATI influent concentration of 10,000 ppm. Although costs do not increase linearly with increasing TDS concentrations, a 30-fold increase in TDS will have a dramatic effect on the overall O&M cost per gallon of wastewater treated, especially if transportation and disposal costs are included for the RO reject concentrate.

- The costs presented here are from historical data compiled from existing projects and operations in published documents. Differences between these projects and ATI could affect the cost estimates, but this conceptual level review provides a good order-of-magnitude estimate. In addition, the historical costs are likely to be substantially higher now.

- RO processes are heavy consumers of power. "A single-stage, thin-film composite RO system with a pump efficiency of 87% and a motor efficiency of 93% requires 4 kwh per 1,000 gallons of produced water, while a double pass RO system consumes 8 kwh per 1000 gallons. . . . Seawater RO will consume 25-30 kwh per 1000." *(UN, 2003 Pg 59)* As noted above, power consumption (and therefore O&M costs) increases dramatically with increasing TDS concentrations.

- RO produces an average blowdown of 25 percent of the total volume processed. This concentrated effluent stream is several times more concentrated than the source water and must be managed appropriately. Further treatment of the blowdown would be required prior to discharge, resulting in greater costs.

As discussed in the responses to the Antidegradation Review Form, the concentrations of metals in ATI's discharges are well below the concentrations that would pose a risk of harm to the designated uses of the Great Salt Lake and have only an insignificant effect on the assimilative capacity of the lake. Further potential reductions in metals concentrations would not provide substantial environment benefits, and any such benefits would be outweighed by the very substantial additional economic, energy, and environmental costs of these alternative treatment technologies. Accordingly, these alternatives are not feasible.

2. Connection to Other Wastewater Treatment Facilities

The nearest municipality with a wastewater treatment facility of any size is over 30 miles away, which would require the construction of a connecting discharge pipe at a prohibitive financial cost and with the environmental degradation associated with construction of such an extensive conveyance. Also, it is not feasible to obtain the necessary rights of way to install a pipeline to connect to the municipal system.

An adjacent industrial facility (US Magnesium) discharges effluent to an array of evaporation basins. ATI has not inquired about the joint use of US Magnesium's discharge system due to system capacity limitations and ground water concerns.

Because ATI's discharge does not pose a threat to designated uses of the lake and does not significantly reduce the lake's assimilative capacity, the costs associated with discharging through a municipal treatment system or using the US Magnesium system far outweigh the environmental benefits.

3. Process Changes and Product and Raw Material Substitutions

During the conceptual design phase, the engineering team for ATI developed plans for a titanium manufacturing facility that used vacuum distillation to purify titanium sponge rather than the electrolytic recovery of magnesium. EPA exempted such facilities (vacuum distillation) from its BAT and NSPS standards for titanium manufacturing facilities because it determined that their wastewater discharges pose an insufficient threat of harm to warrant categorical regulation. *See* 40 CFR § 421.300; EPA, *Development Document for Effluent Limitations Guidelines for the Nonferrous Metals Manufacturing Point Source Category* (1989). EPA also acknowledged that the exempt design results in the least amount of wastewater generated from any of the standard titanium manufacturing processes. Nonetheless, even though ATI's facility is exempt from EPA's categorical standards, ATI's wastewater treatment system employs the same control technologies that EPA used to establish BAT and NSPS requirements for the more polluting titanium manufacturing processes.

There are two raw materials introduced into the ATI process to manufacture titanium sponge: magnesium and titanium tetrachloride ($TiCl_4$). There are no substitutes for these essential materials, which must be pure and free from impurities. Moreover, the resulting products--titanium and magnesium chloride--are environmentally benign.

4. Seasonal or Controlled Discharge Options to Minimize Discharging During Critical Water Quality Periods.

There are no critical water quality periods for the Great Salt Lake. Moreover, as discussed in the responses to the Antidegradation Review Form, ATI's wastewater does not pose a threat to designated uses even at the point of discharge before it is diluted by the lake. Therefore, seasonal or other controls on wastewater discharges would not result in any environmental benefit.

5. Pollutant Trading

The Utah Division of Water Quality's pollutant trading program is only applicable to salinity control in the Colorado River Basin, not the Great Salt Lake. Furthermore, ATI's discharges do not pose a threat to designated uses of the lake, and no other discharges to the lake sufficiently influence the quality of the lake in the vicinity of ATI's discharge to warrant trading.

6. Water Conservation

All the water used at the site is supplied from groundwater sources. Prior to use, groundwater must be pumped, transported, and treated. Because the cost of this is significant--up to $1 per 1000 gallons--it provides ATI with a strong financial incentive to conserve water.

ATI designed the facility to use as little water as feasible and to reuse and recycle it to the maximum extent practicable. For example, the scrubber water and equipment wash water comprise approximately 40% of the total effluent stream. Scrubber water is required for the fume scrubbers, which are required by ATI's air permit as Best Available Control Technology (BACT). The amount of scrubbing water is minimized by recycling the water in the control device. Wash water is used to rinse scale buildup on the inside of the production vessels. Mechanical removal methods are used to ensure all titanium product is removed from the equipment except for trace residuals that require some washing. The water used in the scrubbers and equipment washing is reused until the TDS concentration becomes too elevated. Non-contact cooling water is the other large component of the effluent stream. It is used in a "closed loop" circulation system that is designed to conserve water.

To enable used water to be held on-site for future reuse, a lined water storage basin was designed and installed to, among other things, hold water that can be reused when water demand fluctuations would otherwise result in the discharge of excess water. This system saves not only water, but also the energy and chemicals required to treat the groundwater that otherwise would be required.

7. Alternative Discharge Locations and Receiving Waters

Over three miles of effluent line are used to convey ATI's discharge to the Great Salt Lake. The outfall's location was selected to ensure minimal effects on lakeshore wetlands and to use a natural channel on the lake bed to minimize the shore area that ATI's effluent contacts. There are no other receiving waters in the area. The facility's location was selected for proximity to the neighboring magnesium production facility, thereby eliminating any adverse transportation effects associated with obtaining one of the primary raw materials for the production process. The cost of piping the wastewater to another lake outfall location or to another receiving water would not be justified by any environmental benefits. Indeed, the relatively high concentration of TDS in the wastewater discharge makes it much better suited to the highly saline Great Salt Lake than to a freshwater body of water.

8. Land Application

Utah land application regulations provide, "Use of industrial wastewaters (not containing human pathogens) shall be considered for approval by the Board based on a case-specific analysis of human health and environmental concerns." R317-1-5.1. Although the allowable uses of industrial water are not specifically defined, the analogous uses allowed for municipal wastewater effluent where human exposure is unlikely are:

- Irrigation of farms
- Irrigation of food crops that does not contact the edible portion
- Irrigation of animal feed crops
- Impoundments
- Cooling water
- Soil compaction and dust suppression in construction areas

See R317-3-11.5.

ATI's wastewater contains high concentrations of TDS, which makes it unsuitable for any of these uses without substantial treatment to remove TDS. Because of the high capital and O&M costs of such treatment, as well as the absence of a consistent and reliable year-round use for the water nearby, land application is not feasible or reasonable.

Land application using impoundments for evaporation is evaluated in paragraph 9, below.

9. Evaporation

The average annual evaporation rate at ATI's facility is 48 inches. However, evaporation is negligible for approximately 4 months of the year because of freezing weather conditions. A solar pond dedicated to the evaporation of effluent discharged at a rate of 500 gpm on an annual basis would require a pond of approximately 200 acres. This could be reduced to a 6-month capacity of 100 acres.

The estimated cost for a lined pond is $100,000 per acre, which would be $10,000,000 for a 100-acre pond. This cost makes a lined wastewater evaporation pond infeasible, particularly given that ATI's discharge does not pose a risk to the designated uses of the Great Salt Lake and uses only an insignificant portion of the lake's assimilative capacity in the immediate vicinity of ATI's outfall.

10. Improved Operation and Maintenance of the Existing Treatment System

ATI's treatment facility is a new, state-of-the-art, world-class design that is optimally operated and maintained through a program of continuous improvement. Control of the quantity and type of chemicals can result in insoluble metal removal efficiency of 90% *(UN – 2003 pg10)*. Because the optimal pH for precipitation depends both on the metal to be removed and on the counter ion used (hydroxide, carbonate, or sulfide), the best treatment chemicals have been determined through site evaluation and improvements specific to the existing equipment and

influent parameters. These techniques and ongoing studies will provide more consistent treatment results that will correspond to the lower end of the concentration range published for chemical precipitation treatment systems (*i.e.*, 1 mg/l).

11. Other Alternatives

ATI is not aware of any other potentially feasible alternatives to its discharge.