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: Huntington Power Plant

Facility Owner: PacifiCorp Energy

Facility Location: Hwy 31 (6 miles northwest of Huntington)

Form Prepared By: CH2M HILL, 215 South State St, SLC, UT 84111

Outfall Number: 001 and 002

Receiving Water: Huntington Creek

What Are the Designated Uses of the Receiving Water (R317-2-6)?
Domestic Water Supply: 1C
Recreation: 2B - Secondary Contact
Aquatic Life: 3A - Cold Water Aquatic Life
Agricultural Water Supply: 4
Great Salt Lake: None

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

UPDES Permit Number (if applicable): UT0025607

Effluent Flow Reviewed: 0.3 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.

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)

☐ **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)

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.

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: *Antidegradation Review and Statement of Social, Environmental, and Economic Importance: Huntington Power Plant*

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.

See Attachment A

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

See Attachment A

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

See Attachment A

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

See Attachment A

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

See Attachment A

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.*

Parameters of Concern:

Rank	Pollutant	Ambient Concentration	Effluent Concentration
1	Total suspended solids	No data	30 mg/L (permit limit)
2	Total dissolved solids	236 mg/L	2,240 mg/L
3			
4			
5			

Pollutants Evaluated that are not Considered Parameters of Concern:

Pollutant	Ambient Concentration	Effluent Concentration	Justification
Oil and grease	No data	Non-detect	Not detected in historical monitoring
Iron and copper	No data	No data	No discharge of metals cleaning waste. Landfill drainage is segregated from outfall.
Chromium and zinc	No data	No data	Not present in cooling water treatment chemicals

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)

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: *Antidegradation Review and Statement of Social, Environmental, and Economic Importance: Huntington Power Plant*

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.

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

Alternative	Feasible	Reason Not Feasible/Affordable
Pollutant Trading	Yes	
Water Recycling/Reuse	Yes	
Land Application	No	Additional suitable land is not available near the plant
Connection to Other Facilities	No	No treatment capacity or suitable processes are available
Upgrade to Existing Facility	Yes	
Total Containment	Yes	
Improved O&M of Existing Systems	No	No existing treatment system; reuse pump station only
Seasonal or Controlled Discharge	No	Business requires year round operation
New Construction	Yes	
No Discharge	Yes	

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

Water reuse in the plant

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

☒ **Yes**

☐ **No**

If no, what were less degrading feasible alternative(s)? N/A

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.

N/A

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: ☐

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:_____

Signature:_____

Date:_____

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:_____

Signature:_____

Date:_____

Errata sheet for ADR Application Form
Huntington Power Plant

Response to Item E.3 – See Attachment A

Attachment A

Antidegradation Review and Statement of Social, Environmental, and Economic Importance: Huntington Power Plant

Prepared for

Utah Division of Water Quality on behalf of PacifiCorp Energy

July 2013

Prepared by

CH2MHILL.

215 South State Street, Suite 1000
Salt Lake City, Utah 84111

Attachment A

Antidegradation Review and Statement of Social, Environmental, and Economic Importance: Huntington Power Plant

Submitted to

Utah Division of Water Quality on behalf of PacifiCorp Energy

July 2013

CH2MHILL.

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Acronyms and Abbreviations

µg/L	microgram per liter
ADR	antidegradation review
C&D	construction and demolition
CFR	*Code of Federal Regulations*
CWA	Clean Water Act
EPA	U.S. Environmental Protection Agency
ft^3	cubic feet
HPP	Huntington Power Plant
kW	kilowatt
lb/d	pound per day
lb/yr	pound per year
LS	lump sum
mg/L	milligram per liter
mgd	million gallons per day
MW	megawatt
NAAQS	National Ambient Air Quality Standards
O&M	operation and maintenance
POC	parameter of concern
POTW	publicly owned treatment works
RO	reverse osmosis
SEEI	Social, Environmental, and Economic Importance
TDS	total dissolved solids
TRC	total residual chlorine
TSS	total suspended solids
TWF	toxic weighting factor
UAC	Utah Administrative Code
UDWQ	Utah Division of Water Quality
UPDES	Utah Pollutant Discharge Elimination System
ZLD	zero liquid discharge

1.0 Introduction and Purpose

PacifiCorp Energy (PacifiCorp) operates the Huntington Power Plant, located about 6 miles northwest of Huntington, Utah. The coal-fired power plant produces approximately 895 megawatts of electricity.

PacifiCorp has a Utah Pollution Discharge Elimination System (UPDES) permit to discharge to Huntington Creek from the Huntington Power Plant. UPDES Permit Number UT0025607 was issued to PacifiCorp in 2008 and expired in September (now administratively extended). PacifiCorp's application for reissuance was timely submitted in March 2011. PacifiCorp anticipates reissuance activity by the Utah Division of Water Quality (DWQ) in 2013.

In accordance with 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. It is considered one of the first steps in obtaining a new or revised UPDES permit. In this case, PacifiCorp does not anticipate such an increase for the upcoming permit reissuance. However, Huntington Creek is classified as a 1C water body, and DWQ requested that PacifiCorp prepare a Level II evaluation for use during the permitting process.

A Level II ADR review is intended to review the permitted discharge to ensure that the project is both economically and socially important to local and regional communities and that feasible treatment alternatives have been analyzed. This *Antidegradation Review and Statement of Social, Environmental, and Economic Importance: Huntington Power Plant* (Attachment A) is intended to supplement the information being provided by PacifiCorp in the Level II ADR application. Specifically, it identifies the parameters of concern (POCs) for the power plant wastewater effluent, identifies and analyzes feasible treatment alternatives, and provides a justification for the determination that the facility is socially and economically necessary.

2.0 Project Description

Site and Facility Description

The Huntington Power Plant is located in Emery County, about 6 miles northwest of Huntington, Utah. Coal is delivered to the plant by conveyor from the Deer Creek Mine. The plant consists of two coal-fired boilers that produce steam at a pressure of up to 2,400 psi. The steam is sent to a turbine generator to produce electricity. The spent steam is sent to a condenser, where cool water tubes convert the steam back into water. The water is returned to the boiler to be heated into steam and continue the steam generation cycle. Excess heat from the condensers is sent to cooling towers, which reject the heat to the atmosphere. Water for plant operations is obtained from Huntington Creek. An average annual water balance for the plant is presented in Appendix A.

The power plant operates the Huntington Research Farm to dispose of non-contact cooling water, boiler blowdown water, treated domestic wastewater and other process wastewaters described in 40 CFR Part 423.11 including cooling tower blowdown, low volume sources of wastewater and metal cleaning wastewaters. Wastewater is stored in a clay-lined evaporation pond throughout the year and is used to irrigate the Research Farm from April through November. Irrigation water is applied at a rate to minimize surface water runoff and infiltration to ground water. The irrigation system is operated based on the conditions in the ground water discharge permit, UGW150002.

The power plant also operates an active landfill for the disposal of RCRA-exempt combustion wastes, including fly ash, bottom ash, slaker grits, pyrites and scrubber sludge, and manages an older, closed landfill that was used for disposal of these same wastes. A permitted industrial landfill is operated on the top of the closed ash landfill. Collection systems have been installed to intercept leachate leaving both the new and old landfill areas. The collection systems were installed directly below the new landfill and in the drainage below the new and old landfills in the Duck Pond drainage. The flow from this drainage collection system is piped directly to the pump house sump.

The Duck Pond captures the storm water from the Duck Pond drainage. A collection system is located in West End Canyon to collect surface water and another collection system is located next to West End Canyon to collect water from several springs. The collection system from the West End Canyon and the springs joins the discharge pipe from the Duck Pond and gravity flows to the pump house sump. A third pipe flows to the pump house sump and contains water from the field drain located in the Research Farm.

The water from the pump house sump is currently pumped back to the facility for reuse in the plant systems. If a discharge is necessary, only water from the field drain and the drain containing the discharge from the Duck Pond, West End Canyon, and the springs can be discharged through Outfall 001. The last discharge from outfall 001 was prior to 2007.

The field drain and Duck Pond inlet are sampled semi-annually, but there is no routine sampling of the pump station discharge. Analyses are conducted for TDS and TDS constituents, i.e., sodium, calcium, sulfate, and chloride, but not metals.

3.0 Identification of the Parameters of Concern

As per Utah Administrative Code (UAC) R317-2.3.5, both Level I and Level II anti-degradation reviews (ADRs) are to be conducted on a "parameter-by-parameter basis." An important component of the ADR process is for the applicant and the Utah Division of Water Quality (UDWQ) to agree on the parameters of concern (POCs) for a wastewater discharge. The following technical memorandum provides a list of the parameters that were considered as potential POCs for the Huntington Power Plant and the screening process that was used to select the POCs for the Huntington Power Plant ADR analysis.

3.1.1 Selection of Potential POCs

Section 4.0 of the *Utah Antidegradation Reviews: Implementation Guidance, Version 1.1* (dated May 2012) (*ADR Implementation Guidance*) provides six considerations that should be addressed when an applicant is considering what pollutants to consider as potential POCs. The primary source of pollutants that must be considered is the list of priority pollutants provided in the EPA Form 2C – Application for Permit to Discharge Wastewater. Based on the nature of operations at power plants such as Huntington Power Plant, the facility has the potential to discharge priority pollutants in its effluent. The metals and priority pollutants limited by the Steam Electric Power Generating point source category (40 CFR 423) include chromium, copper, iron, zinc, and constituents in cooling water treatment chemicals. These four metals are associated with cooling tower blow down and metals cleaning activities and have been included in the list of potential POCs to be considered for the Huntington Power Plant ADR analysis. However, cooling tower blowdown and other process wastewater sources are collected and used for irrigation, and are not discharged to the UPDES outfalls. Drainage from the landfill areas is collected and reused in the power plant. In addition to using the list of priority pollutants, the *ADR Implementation Guidance* also recommends that the following factors be considered when selecting pollutants to screen as potential POCs:

1. *Are there any parameters in the effluent or expected to be in the effluent that exceed ambient concentrations in the receiving water?* Ambient water quality data for the Huntington Creek upstream of Huntington Power Plant that was collected within the past 10 years was reviewed. However, Outfall 001 has not discharged during the last 5 years and comparison of the effluent quality to the ambient water quality was not possible. Data for two sources contributing to Outfall 001, field drain and West End Canyon drain, were reviewed to provide an estimate of the outfall effluent quality.
2. *Is the parameter/pollutant already included in an existing UPDES permit?* The existing Huntington Power Plant UPDES permit contains limits for the following parameters:
    a. *Outfall 001 (Field Drain and West End Canyon Drain)* – pH, oil & grease, total suspended solids (TSS), and total dissolved solids (TDS).

b. *Outfall 002 (sanitary wastewater package plant)* -- pH, total residual chlorine (TRC), oil & grease, total suspended solids (TSS), and influent and effluent total dissolved solids (TDS).

The last discharge from Outfall 001 was prior to 2007, and no discharge is anticipated under routine future operations. Outfall 002 is an internal outfall from the sanitary package plant, and effluent from the package plant is spray irrigated onto farm fields at the site. Because the outfall does not discharge to surface water, Outfall 002 is not included in the ADR.

3. *Are parameter concentrations and/or loads exceeding or projected to exceed the current permitted load or design basis?* Wastewater effluent from the Huntington Power Plant is not expected to exceed the current permit limits. No increases in plant capacity are planned for the permit duration.

4. *Are there any parameters that are considered to be important by UDWQ or the general public? For instance, nutrients or bioaccumulative compounds?* To PacifiCorp's knowledge, there are no parameters/pollutants that have been identified as "important" through public comment or other public input forums for discharges to Huntington Creek. TDS is a POC under the Colorado River Salinity Control Forum.

5. *Are there any parameters in the effluent that are known to potentially degrade the beneficial uses of the receiving water?* Yes, there are several parameters potentially in the HPP effluent discharge that have the potential to degrade the existing beneficial uses of Huntington Creek, including TSS and TDS. Although HPP expects to continue spray irrigation of plant effluent and not have a routine discharge from Outfall 001, these parameters have been included for consideration as potential POCs because they are current limits for Outfall 001.

6. *Is the receiving water listed as impaired for any parameters?* A TMDL for Huntington Creek below Highway 10 was approved by the U.S. Environmental Protection Agency on August 4, 2004. This TMDL addresses impairment due to total dissolved solids. A site specific criterion (SSC) of 4,800 mg/L was assigned to Huntington Creek downstream of Highway 10 due to unalterable conditions. Huntington Creek and its tributaries upstream of Highway 10 retained the 1,200 mg/L State of Utah water quality standard for TDS as described in R317-2. The segment of Huntington Creek below Highway 10 to the confluence with Cottonwood Creek was listed as impaired for selenium in the 2010 Integrated Report.

Based on the above-referenced considerations, the following list of preliminary parameters/pollutants was established as potential POCs for further consideration in the Huntington Power Plant ADR analysis:

1) Total Residual Chlorine
2) Total Suspended Solids
3) Totals Dissolved Solids
4) Iron
5) Chromium
6) Zinc

7) Copper
8) Selenium
9) Oil & Grease

3.1.2 Selection of Final POCs for ADR Analysis

The criteria listed in Section 3.1 of the *ADR Implementation Guidance* are used to screen the large number of potential parameters/pollutants that may be present in the facility's wastewater effluent to develop a preliminary list of potential POCs that must be considered for the Huntington Power Plant ADR analysis. To select the final POCs to be incorporated into the Huntington Power Plant ADR analysis from the list of potential parameters listed above, Section 4.0 of the *ADR Implementation Guidance* indicates that "only parameters in the discharge effluent that exceed, or potentially exceed, ambient concentrations [in the receiving water body] should be considered". However, recent effluent quality data are not available for comparison to the ambient water quality data for locations upstream of Huntington Power Plant.

Table 3-1 below provides a summary of the preliminary list of POCs that were considered and whether or not each potential POC was selected as a final POC for the Huntington Power Plant ADR analysis. The final POCs identified in Table 3-1 will be used to aid in the selection of effluent treatment and discharge alternatives that will be analyzed in detail in the final ADR analysis. In addition, the POCs will also be used by UDWQ as a factor in evaluating the potential effects on Huntington Creek from the discharge and in their renewal of the UPDES permit for the facility.

TRC is listed as a potential POC in Section 3.1.1, because TRC is a permit parameter for Outfall 002. However, Outfall 002 is an internal outfall, and the effluent is spray irrigated onto farm fields at the site and does not discharge to surface water. Outfall 002 is not included in the ADR. No sources of TRC enter the pump house, and TRC is not evaluated further as a POC.

TABLE 3-1
Summary of Final POCs for the Huntington Power Plant ADR Analysis
PacifiCorp Huntington Power Plant

Potential POC Being Considered	Huntington Creek above HPP Diversion (average concentrations 2002 – 2008)	Huntington Power Plant Outfall 001 Effluent Concentration	Final Parameter of Concern (Yes/No)	Rationale
1. Total Suspended Solids	8 mg/L[1]	No data[5]	**Yes**	Current permit limit
2. Total Dissolved Solids	236 mg/L	2240 mg/L[6]	**Yes**	Current permit limit. Field drain and seep TDS concentrations exceed receiving stream water quality.
3. Oil & Grease	No data[2]	No data[5]	No	Not detected by historical effluent monitoring.
4. pH	7.8 – 8.7	6.4 – 7.5[6]	No	Field drain and seep water quality within pH range of receiving stream
5. Iron, Dissolved	Non-detect[3]	No data[5]	No	No discharge of metals cleaning waste (40 CFR 423)
6. Chromium, Dissolved	4.8 µg/L[4]	No data[5]	No	Not present in cooling water treatment chemicals (40 CFR 423)
7. Zinc, Dissolved	Non-detect[3]	No data[5]	No	Not present in cooling water treatment chemicals (40 CFR 423)
8. Copper, Dissolved	Non-detect[3]	No data[5]	No	No discharge of metals cleaning waste (40 CFR 423)
9. Selenium, Dissolved	Non-detect[3]	No data[5]	No	Metals-bearing wastewater sources do not discharge to this outfall. Outfall discharges to an unimpaired stream segment.

1. Average of reported values for 7 samples and estimated half of the reporting limit (0.5 x 5 mg/L) for 10 samples.
2. No ambient data within the last 10 years.
3. Results reported as non-detect, and no reporting limit was provided.
4. Average of reported values for 5 samples and estimated half of the reporting limit (0.5 x 2 µg/L) for 1 sample.
5. No effluent data within the last 5 years.
6. Average of field drain and West End Canyon data from 2nd quarter 2007 to 2nd quarter 2012.

4.0 Alternatives Analysis

PacifiCorp has submitted a request to renew the UPDES permit for the Huntington Power Plant. The existing UPDES permit includes two discharge points, Outfalls 001 and 002. Sources to Outfall 001 include the field drain and West End Canyon drain. PacifiCorp has not discharged from Outfall 001 since before 2007, but wants to retain the permitted outfall to allow operating flexibility. Outfall 002 is an internal outfall for the sanitary package plant effluent, which is combined with process wastewater sources and used for irrigation at the Research Farm.

The intent of this section is to evaluate whether there are any reasonable nondegrading or less degrading alternatives when compared with the discharge alternative for handling of process wastewater from the Huntington Power Plant. The section provides an initial screening of potential alternatives based on their feasibility followed by a detailed screening of those alternatives deemed feasible based on their total financial costs, pollution/POC reduction, and performance based on several criteria, including reliability, operability, maintainability, sustainability, and adaptability to future regulatory changes. The analysis is followed by identification of PacifiCorp's preferred treatment alternative and the justification for selection of that treatment alternative.

4.1 Initial Screening of Alternatives

The requirements found in UAC R317-2-3.5 stipulate the following alternatives should be considered, evaluated, and implemented to the extent feasible:

a) Innovative or alternative treatment options

b) More effective treatment options or higher treatment levels

c) Connection to other wastewater treatment facilities

d) Process changes or product or raw material substitution

e) Seasonal or controlled discharge options to minimize discharging during critical water quality periods

f) Pollutant trading

g) Water conservation

h) Water recycle and reuse

i) Alternative discharge locations or alternative receiving water bodies

j) Land application

k) Total containment

l) Improved operation and maintenance (O&M) of existing treatment systems

m) Other appropriate alternatives

Section 5.2 of the Implementation Guidance indicates that the feasibility of all treatment alternatives should be examined before the alternatives are included for further consideration as part of the ADR analysis. Based on this requirement, many of the alternatives listed in UAC R317-2-3.5 can be excluded from further consideration as part of this ADR analysis based on their impracticality or inability to be implemented at the Huntington Power Plant. Following are treatment alternatives from the above list that are excluded from further consideration and the justifications for exclusion:

- **Alternative B – Higher treatment levels**: Ion exchange and reverse osmosis are demonstrated treatment processes for removing TDS from effluent. However, these processes concentrate the salt ions into a reverse osmosis membrane reject stream or an ion exchange resin regeneration brine, and do not reduce the mass of TDS requiring discharge to surface or disposal by other methods. Due the cost and complexity of managing reject and regeneration wastes, higher level treatment processes were not considered further.

- **Alternative C—Connection to other wastewater treatment facilities:** The Castle Valley Special Service District operates a sanitary wastewater treatment facility near Huntington, UT, which is the only wastewater treatment works facility located in proximity to the Huntington Power Plant. The District's treatment system does not have the capacity or the treatment technology to effectively handle the wastewater flow.

- **Alternative D—Process changes or product or raw material substitution:** The Huntington Power Plant is a coal-fired power-generating facility that uses a water cooled condenser. An air cooled condenser is an alternative cooling process that allows a power plant to use less water. The feasibility of converting the existing steam circuit to an air cooled condenser is unknown, and would reduce the plant's net power production. The sources connected to Outfall 001 are associated with the overall site development and are not directly affected by the power generation process. Based on technical uncertainties and the site layout, process changes are not a feasible alternative.

  Product and Raw Material Substitution: There are limited to no options available for product and raw material substitutions. The use of alternative fuels, i.e., oil or natural gas, in place of coal to produce electricity is impractical due to the site location and age of the facility. These alternatives fuels will not improve the discharge water quality and may reduce the discharge water quality.

- **Alternative E—Seasonal or controlled discharge options:** In order to meet electricity demands, particularly during peak-use periods, the Huntington Power Plant must have flexibility in its operating parameters. To effectively operate under current scenarios, a discharge of process wastewater from the facility must occur. It is not feasible to limit operating times of the facility since this operational flexibility would essentially be eliminated.

- **Alternative G—Water conservation:** The primary uses of water at the facility are makeup water for the boilers and cooling towers. Blow down from these systems is necessary to maintain the steam and cooling water quality required by the plant

equipment. Recycling the blow down streams may be technically feasible, but would require TDS removal from the water circuits through a more concentrated, i.e., higher TDS, blow down from the water recovery treatment process.

- **Alternative I—Use of alternative discharge locations or alternative receiving water bodies:** The only receiving water body in proximity to the Huntington Power Plant is Huntington Creek.

- **Alternative J—Land application:** The Huntington Power Plant uses land application to dispose of cooling tower blowdown, process wastewater and treated sanitary wastewater. The existing Research Farm cannot accept additional flow and will someday need to cease operation to protect groundwater from elevated TDS. The facility is located in a relatively narrow canyon and property suitable for an additional effluent storage pond and additional sprays fields is not available.

- **Alternative L—Improved operation and maintenance of existing treatment systems:** Not applicable, because Outfall 001 does not have a treatment system.

After excluding these treatment alternatives deemed infeasible from further consideration, the following alternatives listed in UAC R317-2-3.5 are being carried forward for further analysis as part of this ADR:

- **Baseline Alternative for Comparison Purposes (hereafter referred to as Alternative 1):** The existing water reuse pump house is the baseline alternative for comparison and evaluation of feasible treatment alternatives.

- **Alternative A – Alternative treatment option (hereafter referred to as Alternative 2):** Granular media filtration combined with pollutant trading, or salinity offset credits, (Alternative 3 below) is carried forward for evaluation as an alternative to the existing water reuse system.

- **Alternative F—Pollutant trading (hereafter referred to as Alternative 3):** The discharge is located within the Colorado River basin, and is subject to the Colorado River Basin Salinity Control Forum's policies for TDS. The Forum policy allows permitting authorities to allow industrial sources of salinity to conduct or finance salinity offset projects. Purchasing salinity offsets is a potential alternative to reduce the TDS discharge from the facility.

- **Alternative K—Total containment (hereafter referred to as Alternative 4):** Options for total containment include an evaporation pond, deep well injection, and thermal evaporation using a mechanical concentrator and crystallizer. However, the construction of holding or evaporation ponds or other containment structures would requires about 100 acres of suitable, undeveloped land to operate effectively. Based on the rugged topography surrounding the plant site and limited undeveloped areas with moderate slopes, total containment using evaporation ponds is not considered for the Huntington Power Plant.

  Total containment using deep well injection is used at some locations to dispose of effluent streams. However, the geology and hydrogeology is not well known at the depth and area of interest for the Huntington Power Plant site, and the risks associated with

siting and drilling a successful well are high. The cost of installing an injection well is difficult to determine, but an estimate for drilling the injection well and associated monitoring well is $600,000 or more. Well completion and injection pumps would increase the capital cost to over $1 million. Total containment using an injection well is not considered for the Huntington Power Plant.

A mechanical concentrator and crystallizer treatment system is being carried forward for evaluation as an alternative to the proposed dechlorination system.

As mentioned previously, these four alternatives will be analyzed and compared in detail in Section 4.2 based on several criteria, including the following:

- Construction and O&M costs
- Ability to minimize degradation and increase pollutant reduction
- Several performance criteria, including reliability, maintainability, operability, sustainability, and adaptability

4.2 Detailed Analysis of Feasible Alternatives

4.2.1 Alternative 1 – Existing Water Reuse System

Alternative 1 – Water Reuse

Huntington Power Plant currently reuses water from Outfall 001 and other sources. The reuse pump house collects drainage below the new and old landfills, in the West End Canyon and springs near the Duck Pond inflow, and the field drain at the Research Farm.

Water from the pump house sump is pumped back to the power plant for reuse in the plant systems. A discharge from the outfall may be necessary during a short-term outage of the mist eliminator system or other activities that use this water. Water reuse would resume after the outage is over and normal plant operations resume. If a discharge is required, the potential contributing sources include the field drain and the drain containing discharge from the Duck Pond, West End Canyon, and area springs. These sources are primarily storm water runoff and groundwater discharges, and will vary based on the season and recent precipitation. TDS is the primary constituent of the water entering the pump house sump, and the concentration will vary based on the season and precipitation. The Duck Pond was not designed as a treatment process and provides only flow dampening before entering the pump house sump. Maintaining the Outfall 001 discharge permit is necessary to accommodate unplanned outages of the mist eliminator system and to manage higher intermittent flow caused by intense precipitation or other unusual weather events.

Alternative 1—Expected Pollutant Removals

Table 4-1 presents the estimated POC removal by water reuse.

TABLE 4-1
Estimated Pollutant Removal by Alternative 1 – Water Reuse
PacifiCorp Huntington Power Plant

Parameter	Influent (mg/L)	Influent (lb/d)	Effluent (mg/L)	Effluent (lb/d)	Removal (lb/yr)	Removal

TABLE 4-1
Estimated Pollutant Removal by Alternative 1 – Water Reuse
PacifiCorp Huntington Power Plant

Parameter	Influent (mg/L)	Influent (lb/d)	Effluent (mg/L)	Effluent (lb/d)	Removal (lb/yr)	Removal
TSS	30	75	0	0	27,397	100%
TDS	2,240	5,604	0	0	2,045,635	100%

NOTES:
lb/d = pound per day
lb/yr = pound per year
mg/L = milligram per liter
Mass loads are based on a flow of 300,000 gallons per day.

Alternative 1—Cost Analysis

The primary cost of the water reuse system is electricity to operate the pumps and pump maintenance. The estimated annualized cost of power and routine pump maintenance is approximately $11,300/year.

4.2.2 Alternative 2 – Filtration and Salinity Offset Credits

Alternative 2—Treatment Process

Although TSS has not been detected in the Outfall 001 effluent, TSS is a permitted parameter. Granular media filters are commonly used to remove TSS from wastewater. To address TDS in the effluent, salinity offset credits would be purchased. A pressure filter system includes the following equipment:

- Influent pumps
- Granular media filters
- Backwash holding tank

The filtration system would be installed for the sources connected to Outfall 001. A skid-mounted filter system with integral controls is possible, and would need to be installed in a building to provide freeze protection.

Alternative 2—Expected Pollutant Removals

Table 4-2 presents the estimated POC removal provided by effluent filtration and salinity offset credits.

TABLE 4-2
Estimated Pollutant Removal by Alternative 2—Filtration and Salinity Offset Credits
PacifiCorp Huntington Power Plant

Parameter	Influent (mg/L)	Influent (lb/d)	Effluent (mg/L)	Effluent (lb/d)	Removal (lb/yr)	Removal
TSS	30	75	10	25	18,265	67%
TDS	2,240	5,604	799	1,999	1,315,964	64%

NOTES:
lb/d = pound per day
lb/yr = pound per year
mg/L = milligram per liter
Mass loads are based on a flow of 300,000 gallons per day.

Granular media filtration is commonly used in municipal and industrial wastewater treatment systems and is effective for achieving TSS removal and meeting effluent limits. However, filtration will not remove additional POCs, and, therefore, TDS is addressed using salinity offset credits. With proper maintenance and operator training, the reliability of a filtration system is high.

Alternative 2—Cost Analysis

The estimated total installed cost for an effluent filtration system and salinity credits for five years is $1,404,000. The cost estimate worksheet is presented in the Appendix. Table 4-3 presents the estimated annual O&M costs and annualized capital cost for the filtration and salinity credit alternative.

TABLE 4-3
Total Annualized Cost for Alternative 2—Filtration and Salinity Offset Credits
PacifiCorp Huntington Power Plant

Item	Quantity	Cost
Labor	730 hours/year	$36,500
Laboratory analysis	LS	$2,600
Electricity	15 kW	$6,600
Maintenance	3% of equipment cost	$7,800
Annual Total O&M Cost		**$53,500**
Annual Salinity Credit Cost		**$32,900**
Cost of capital	$1,240,000 at 7% over 20 years	$117,050
Total Annualized Cost		**$203,450**

NOTES:
kW = kilowatt
LS = lump sum

4.2.3 Alternative 3: Salinity Offset Credits

Funding salinity offset projects is allowed under the permitting policy of the Colorado River Salinity Control Forum. The Forum's permitting policy indicates that salinity offset projects can be used in cases where it is not practical to: (i) prevent the discharge of all salt from proposed new construction; (ii) reduce the salt loading to the Colorado River to less than one ton per day; or (iii) when the proposed discharge exceeds the 500 mg/L TDS definition of "fresh water" for the receiving stream. Salinity offsets would be based on the TDS mass exceeding one ton per day based on the TDS of all UPDES outfalls for the facility. Using average TDS data for the Field Drain and West End Canyon Drain and a flow of 0.3 mgd, a credit of 1.8 ton per day is needed to meet the one ton per day criterion.

Alternative 3—Expected Pollutant Removals

Salinity offset credits will not change the effluent quality discharged by the Huntington Power Plant, but will reduce the salt discharge within the Huntington Creek basin. The proposed salinity offset is 1.8 ton per day, or 658 tons per year.

Alternative 3—Cost Analysis

DWQ staff indicated that the 2012 cost of salinity offset credits is $50/ton. Salinity offsets must be purchased for the entire five year UPDES permit duration at the beginning of the permit term. The cost of 1.8 ton per day salinity credit for five years is $164,500.

4.2.4 Alternative 4: Total Containment

Total containment can be provided using a system consisting of reverse osmosis (RO) to concentrate the wastewater and evaporative crystallization of the RO concentrate. This process is a zero liquid discharge (ZLD) system; water is recovered for reuse, and salt is dried. The RO permeate and condensate from the evaporator crystallizer can be returned to the process. Salt cake is disposed of in an offsite landfill.

The following processes are included in the ZLD system:

- Influent pumps
- Granular media pressure filters
- Reverse osmosis system
- Chemical feed systems
- Membrane clean-in-place systems
- Mechanical recompression brine crystallizer
- Salt cake filter press
- Brine equalization tank

The cost estimate in Appendix A presents the size or capacity of major equipment.

Alternative 4—Expected Pollutant Removals

Table 4-4 presents the estimated POC removal provided by a ZLD system.

TABLE 4-4
Estimated Pollutant Removal for Alternative 4—Zero Liquid Discharge
PacifiCorp Huntington Power Plant

Parameter	Influent (mg/L)	Influent (lb/d)	Removal (lb/yr)	Removal
TSS	30	75	27,397	100%
TDS	2240	5,604	2,045,635	100%

NOTES:
lb/d = pound per day
lb/yr = pound per year
mg/L = milligram per liter
Mass loads are based on a flow of 300,000 gallons per day.

A ZLD system provides the highest level of treatment and eliminates the liquid discharge from the facility. However, a ZLD system is a complex treatment system and has significantly higher capital and operating costs than other treatment options. In addition, the ZLD system requires a significant amount of power and steam to run, which creates a parasitic load on the facility's power generation. The ZLD unit processes are reliable, and the processes are currently used at other electric generating facilities for cooling tower blowdown. Zero liquid discharge systems are typically used when no surface water bodies are available to accept an effluent discharge.

Alternative 4—Cost Analysis

The estimated total installed cost for a ZLD system is $16,980,000. The cost estimate worksheet is presented in the Appendix. Table 4-5 presents the estimated annual O&M costs and annualized capital cost for this alternative.

TABLE 4-5
Total Annualized Cost for Alternative 4—Zero Liquid Discharge
PacifiCorp Huntington Power Plant

Item	Quantity	Cost
Labor	8,760 hours/year	$438,000
Laboratory analysis	LS	$25,000
Electricity	350 kW	$153,300
Maintenance	3% of equipment cost	$115,700
Chemicals	LS	$30,700
Solids disposal	657 tons/year	$49,300
Annual Total O&M Cost		**$812,000**
Cost of capital	$16,980,000 at 7% over 20 years	$1,602,800
Total Annualized Cost		**$2,414,800**

NOTES:
LS = lump sum
MW = megawatt

4.3 Cost of Achieving Effluent Reduction

The POCs selected for the ADR evaluation are TSS and TDS, and neither pollutant has an established toxic weighting factor (TWF). Therefore, the treatment effectiveness was evaluated based on the total mass removal for TSS and TDS. Table 4-6 presents a summary of the cost effectiveness evaluation for the four treatment alternatives described.

Conceptual level unit process sizing and equipment selection was completed to support preparation of order-of-magnitude cost estimates for each treatment alternative. The cost estimates presented in Section 4.2 are considered Class 5 estimates as defined by the Association for the Advancement of Cost Engineering, with actual costs not more than 100 percent or less than 50 percent of the estimated total value. Actual project costs will depend on the selected project scope, actual labor and material costs, competitive market conditions, actual site conditions, productivity, schedule, and other variables. As a result, the costs for these treatment alternatives will vary from the estimates prepared, within the stated accuracy range.

TABLE 4-6
Summary of Cost Effectiveness of Treatment Alternatives
PacifiCorp Huntington Power Plant

Item	Alt 1- Water Reuse	Alt 2 – Filters + Salinity Offsets	Alt 3 – Salinity Offsets	Alt 4 - ZLD
Capital cost	$0	$1,240,000	$0	$16,980,000
O&M ($/year)	$11,300	$86,400	$32,900	$812,000
Total annualized cost ($/year)	$11,300	$203,450	$32,900	$2,414,800
Incremental annualized cost ($/year)	$11,300	$192,150	$21,600	$2,403,500
Removal (lb/yr)	2073032	1333900	1315635	2073032
Incremental removal (lb/yr)	2073032	<739132>	<757397>	0
Cost effectiveness ($/lb removed)	0.006	0.15	0.025	1.16

NOTES:
Incremental annualized cost and incremental removal are a comparison to the water reuse alternative.

Table 4-6 presents the estimated cost-effectiveness for each of the treatment technologies reviewed in this report for removal of TSS and TDS. By this analysis, the existing water reuse system has the lowest annualized cost and is the most cost effective based on the cost per pound of pollutant removed. The pollutant removal cost effectiveness of the other alternatives is higher by a factor of 4 to 193.

As demonstrated, the potential benefit of Alternatives 2 and 3 is less than the water reuse alternative. A ZLD system achieves the same pollutant reduction as the water reuse alternative, but has a significantly higher capital and operating costs. The water reuse alternative more than meets the State's guidance for cost-effective treatment and is the recommended treatment approach for the Huntington Power Plant based on costs considerations.

4.4 Performance Criteria Analysis

Table 4-7 presents a comparison of the four treatment alternatives based on a series of performance criteria. These criteria were equally weighted to determine the overall performance of each alternative.

TABLE 4-7
Comparison of Alternatives Using Performance Criteria
PacifiCorp Huntington Power Plant

Performance Criterion	Alt 1 – Water Reuse	Alt 2 – Filters + Salinity Offsets	Alt 3 – Salinity Offsets	Alt 4 - ZLD
Reliability	High	Medium	Medium	High
Maintainability	High	High	High	Low
Operability	High	Medium	High	Low
Sustainability	High	Medium	High	Low
Adaptability	High	Low	Low	High
Overall Performance	**High**	**Medium**	**Medium/High**	**Low/Medium**

NOTES:
High = more favorable
Low = less favorable

The reliability for the water reuse and ZLD alternative will be high with proper O&M practices. The reliability of salinity offsets is rated medium, because the availability and cost of salinity offsets for the next permit cycle, i.e., after 2017, is unknown. The maintainability and operability of the water reuse system is considered more favorable because the alternative includes the least equipment and requires the lowest amount of operator attention. A ZLD system will have the most equipment and involve the most complex unit processes and is rated low (less attractive) for maintainability and operability.

Water reuse is a simple system with low power usage and is rated more favorably for sustainability. The ZLD system has high chemical and energy usage, and is rated low for sustainability. ZLD will also require a larger site footprint and generate solids requiring offsite disposal. Although the ZLD does reduce water usage, the significant energy use by the ZLD process determined the low rating.

As for adaptability to future regulatory changes, filtration and salinity offset credits will require additional treatment processes to address POCs beyond TSS and TDS, and are rated low for adaptability to future permit conditions. A ZLD system eliminates the wastewater discharge entirely and would not be affected by future limits or regulatory changes, resulting in the highest rating of the four alternatives for adaptability.

4.5 Preferred Treatment Alternative

Based on the preceding analysis, PacifiCorp's preferred alternative remains Alternative 1, the water reuse system that is the current process at the Huntington Power Plant. Alternative 1 is also the least degrading alternative with no discharge of pollutants, which is the same as ZLD.

Alternative 1 is the least degrading feasible alternative, and the cost analysis provided demonstrates that it is also the lowest cost alternative. As shown in Table 4-7, the total annualized costs for Alternative 1 was calculated to be $11,300 per year, while the total

annualized costs for Alternative 2 is $203,450 per year, for Alternative 3 is $32,900 per year, and for Alternative 4 is $2,414,800 per year. Further, the calculated cost effectiveness for Alternative 1 is $0.006 per pound of pollutant removed, which is lower than the alternatives by a factor of 4 or more. Alternative 1 also provides greater pollutant removal than Alternatives 2 and 3, and removal equal to the ZLD alternative at a significantly lower cost.

Based on the comparison of the four treatment alternatives against the performance criteria, Alternative 1, the water reuse system, is rated as more favorable than the three other alternatives in overall performance—particularly in reliability, maintainability, operability, and sustainability. Given that Alternative 1 is the most cost-effective alternative and that Alternative 1 outperforms the other alternatives based on the performance criteria and pollutant removal, Alternative 1 (water reuse) is the recommended treatment alternative for the Huntington Power Plant.

5.0 Statement of Social, Environmental, and Economic Importance

The requirement for applicants to complete a Statement of Social, Environmental, and Economic Importance (SEEI) originates in the *Code of Federal Regulations*, Chapter 40, Part 131.12(a)(2) [40 CFR 40.131.12(a)(2)]. It requires applicants to demonstrate that allowing lower water quality is necessary to accommodate social or economic development in the area in which the waters to be degraded are located. In UAC R317-2-3.5(c)(4), the State of Utah defines the minimum information that an applicant must provide to demonstrate that degradation is necessary, which includes the following:

- Impacts on employment
- Increases in production
- Improved community tax base
- Impacts on housing
- Correction of an environmental or public health problem

In addition, the Implementation Guidance further clarifies these minimum considerations as well as further considerations that should be included in an applicant's SEEI analysis, including the following:

- Effects on public and social services, including the identification of public or social services that would be provided to the community or required of the community in the affected area as well as effects on health/nursing care, police/fire protection, infrastructure, housing, and public education
- Effects on public health and safety, including any health and safety services that will be provided or required in the affected areas as well as identification of potential project benefits that will enhance food or drinking water quality, control disease vectors, or improve air quality, industrial hygiene, occupational health, and public safety
- Effects on quality of life of residents of affected area, including educational, cultural, and recreational opportunities, daily life experience (in regards to dust, noise, traffic, etc.), and aesthetics (views cape)
- Effects on employment and tax revenues in the affected areas
- Effects on tourism, including the creation or enhancement of tourist attractions or impacts resulting from elimination or reduction of existing tourist attractions
- The pros and cons of preserving assimilative capacity for future industry and development in the affected areas (which is to include the approval/disapproval of local communities for the proposed project)

The purpose of this section is to provide an SEEI that addresses the requirements provided in state and federal regulations as well as the recommendations provided in the ADR

Implementation Guidance in an effort to demonstrate that potential degradation of Huntington Creek from the Huntington Power Plant operations is necessary to accommodate economic and social development.

5.1 Description of Affected Communities

The Huntington Power Plant is located in Emery County, Utah approximately six miles northwest of Huntington, Utah. According to the U.S. Census Bureau 2010 census data, the total population of Huntington was 2,129 residents (www.city-data.com/city/Huntington-Utah.html). The 2009 median household income was $39,228. In August 2012, the unemployment rate within incorporated areas of Huntington was 7.5 percent (www.city-data.com/city/Huntington-Utah.html).

Huntington was established near Huntington Creek, which continues to supply irrigation water to the community. Agriculture and mining have been a large part of Huntington's history and the local economy continues to reflect the trends of these industries.

5.2 Effects on Community Resources from Huntington Power Plant

The Huntington Power Plant plays a significant role in the Emery County economy. PacifiCorp has approximately 160 direct employees and 134 contractor and vendor staff working at the Huntington Power Plant. The payroll for PacifiCorp staff is about $12.2 million per year (PacifiCorp, 2012). The wages paid by the utility services sector are significantly higher than Utah average wages (Perlich, Hogue, and Downen, 2010). In addition to direct employment, a power plant has an estimated total employment impact of 7.6 to 1 (Perlich, Hogue, and Downen, 2010). During calendar year 2011, the power plant had purchases of approximately $20,700,000, excluding coal, and paid approximately $1,200,000 in sales tax and $6,200,000 in property taxes (PacifiCorp, 2012).

The Huntington Power Plant has operated for almost 40 years and is an established part of Emery County. Continued operation of the power plant is not expected to require additional community services, increase the workforce and place additional infrastructure and education demands on the community, or consume assimilative capacity in Huntington Creek that is needed for other projects. Continued operation of the plant is not expected to impact existing area tourism activities.

6.0 References

Perlich, Pamela S., Hogue, Michael T., and Downen, John C., *The Structure and Economic Impact of Utah's Coal Industry*, Bureau of Economic and Business Research, University of Utah, May 2010.

Huntington, Utah, (UT84528) Profile, www.city-data.com/city/Huntington-Utah.html, Accessed January 2, 2013.

PacifiCorp, Campbell, James, *email communication*, July 17, 2012.

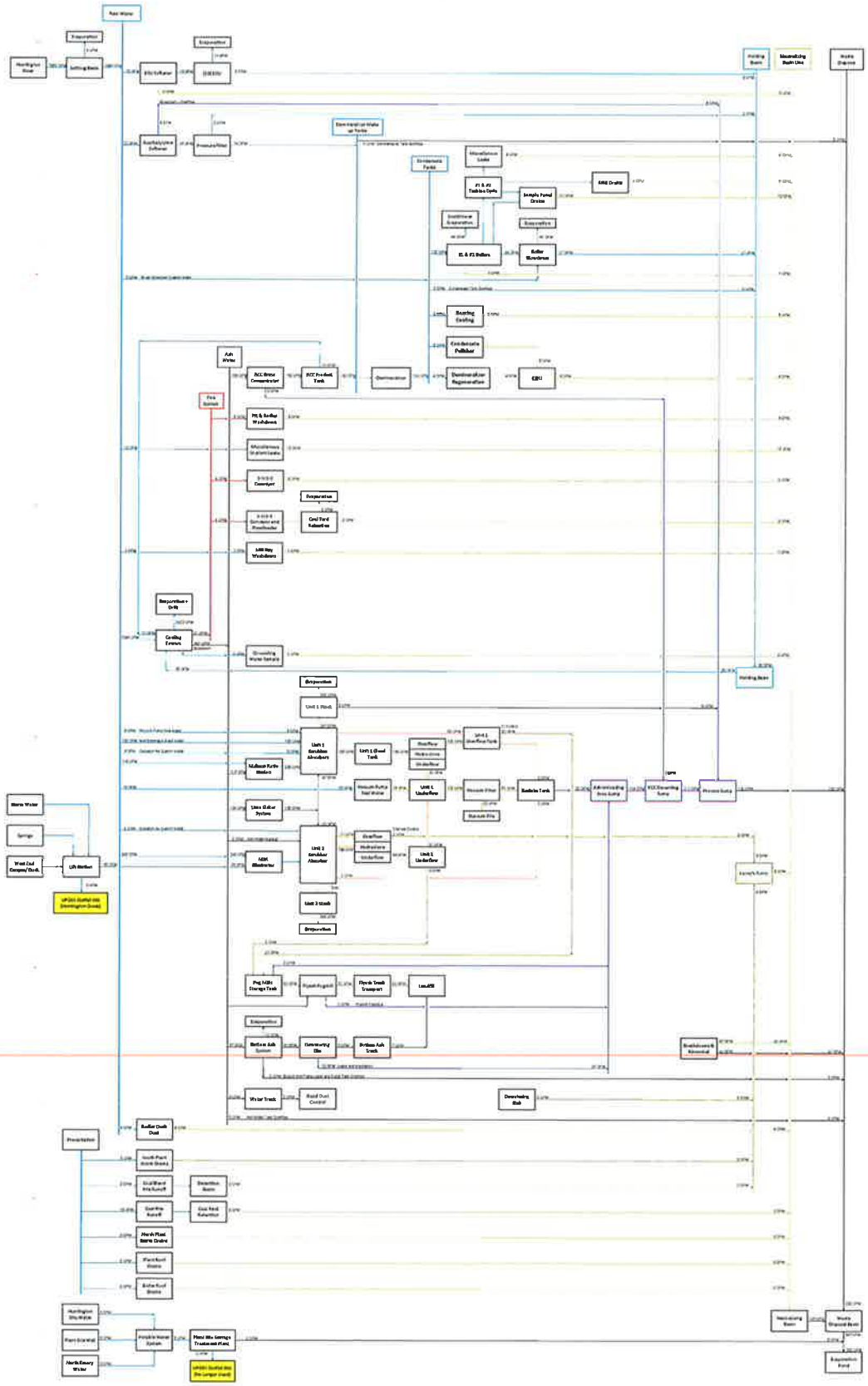
U.S. Environmental Protection Agency (EPA). 2000. *Cost-Effectiveness Analysis of Proposed Effluent Limitations Guidelines and Standards for the Metal Products and Machinery Industry*. EPA-821-B-00-007. Washington, D.C.

APPENDIX A

Average Annual Plant Water Balance

Huntington Plant Water Balance

Average Annual Volume Flows



PacifiCorp Huntington Plant Drawing Number L-22113 P3-27A Rev 0 June 28, 2013

APPENDIX B

Cost Worksheets for Treatment Alternatives

Order-of-magnitude Level Construction Cost Estimate
PacifiCorp Huntington Plant Inplant Reuse

Item	Design Criteria	Quantity	Basis	Cost per Unit	Estimated Cost
Reuse Pump	150 gpm, 7.5 hp	2	Prior experience	$15,000	30,000
Total Equipment Cost (TEC)					$30,000
Freight and Taxes		10%	of TEC		3,000
Equipment Delivery Adjustment: Schedule		0%	of TEC		0
Equipment Delivery Adjustment: Locatior		0%	of TEC		0
Purchased Equipment Cost - Delivered (PEC-D)					$33,000
Equipment Installation (a)		30%	of PEC-D		10,000
Piping		20%	of PEC-D		7,000
Heat Tracing and Insulatior		5%	of PEC-D		2,000
Instrumentation and Controls		15%	of PEC-D		5,000
Electrical		18%	of PEC-D		6,000
Buildings		0%	of PEC-D		0
Yard Improvements (b)		5%	of PEC-D		2,000
Service Facilities (c)		5%	of PEC-D		2,000
Subtotal					$67,000
Other Direct Costs:					
Pump station sump					10,000
Total Direct Costs (TDC)					$77,000
Engineering (d)	excludes geotech and speciality services	10%	of TDC		8,000
Other Indirect Costs (e)		10%	of PEC-D		3,000
Total Direct + Indirect Costs (TD+I)					$88,000
Contractor's Fee		10%	of TD+I		10,000
Contingency (f)		25%	of TD+I		20,000
Total Construction Cost (TCC)					$118,000
Bond/Insurance		2%	of TCC		$2,000
Owners Costs		10%	of TCC		$10,000
Pilot Testing		LS			$0
Services During Construction		6%	of TCC		6,000
O&M Manual/Startup Plar		3%	of TCC		4,000
Startup Expenses (g)		2%	of TCC		2,000
Escalation	no escalation included	0.0%			0
Total Estimated Cost (h)					**$142,000**
Annualized Cost of Capital	7% over 20 years				$13,404

(a) Includes costs for labor, foundations, supports, platforms, construction expenses, and other factor directly related to the erection of purchased equipment
(b) Includes fencing, grading, roads, sidewalks, and similar items.
(c) Includes required improvements to steam, water, compressed air, waste disposal, fire protection, anc other plant services.
(d) Engineering costs include process design, detailed design, basic specifications/data sheets
(e) Includes temporary construction and operations, construction tools and rental, home office personn in field, field payroll, travel and living expenses, taxes and insurance, startup materials and labor and overhead.
(f) Does not include scope contingency
(g) Includes preparation of startup plan and O&M plan, and startup of facilities. Analytical costs ar not included.
(h) This cost estimate has been prepared for guidance in project evaluation and implementation an was based on information available at the time that the estimate was prepared. Final costs for th project, and the project's resulting feasibility will depend on actual labor and material costs competitive market conditions, actual site conditions, final project scope, implementation schedule and other variable factors. As a result, the final project cost will vary from the estimate preparec Because of these factors, project feasibility, benefit/cost ratios, risks, and funding needs must b carefully reviewed before making specific financial decisions or establishing project budgets in order to help ensure proper project evaluation and adequate funding

Note: Factors from Plant Design and Economics for Chemical Engineers, Fourth Edition, M.S.Peters

Annual O&M Costs

		Quantity		Unit Rate	Total
Labor	2 hr/wk	104	hr/yr	$50 per hr	5,200
Laboratory analysis		1		LS	2,600
Electricity		6	kW	$0.05 per kWhr	2,600
Maintenance	3% of total equipment costs	$30,000		3%	900
					0
Total					$11,300

Order-of-magnitude Level Construction Cost Estimate
PacifiCorp Huntington Plant Salinity Offset Credits

Item	Design Criteria	Quantity	Basis	Cost per Unit	Estimated Cost
None					0
Total Equipment Cost (TEC)					$0
Freight and Taxes		10%	of TEC		0
Equipment Delivery Adjustment: Schedule		0%	of TEC		0
Equipment Delivery Adjustment: Location		0%	of TEC		0
Purchased Equipment Cost - Delivered (PEC-D)					$0
Equipment Installation (a)		30%	of PEC-D		0
Piping		20%	of PEC-D		0
Heat Tracing and Insulation		5%	of PEC-D		0
Instrumentation and Controls		15%	of PEC-D		0
Electrical		18%	of PEC-D		0
Buildings		0%	of PEC-D		0
Yard Improvements (b)		5%	of PEC-D		0
Service Facilities (c)		5%	of PEC-D		0
Subtotal					$0
Other Direct Costs:					0
Total Direct Costs (TDC)					$0
Engineering (d)	excludes geotech and speciality services	10%	of TDC		0
Other Indirect Costs (e)		10%	of PEC-D		0
Total Direct + Indirect Costs (TD+I)					$0
Contractor's Fee		10%	of TD+I		0
Contingency (f)		25%	of TD+I		0
Total Construction Cost (TCC)					$0
Bond/Insurance		2%	of TCC		$0
Owners Costs		10%	of TCC		$0
Pilot Testing		LS			$0
Services During Construction		6%	of TCC		0
O&M Manual/Startup Plan		3%	of TCC		0
Startup Expenses (g)		2%	of TCC		0
Escalation	no escalation included	0.0%			0
Total Estimated Cost (h)					$0
Annualized Cost of Capital	7% over 5 years (Existing pump station, no new capital investment required)				$40,119

(a) Includes costs for labor, foundations, supports, platforms, construction expenses, and other factors directly related to the erection of purchased equipment.
(b) Includes fencing, grading, roads, sidewalks, and similar items.
(c) Includes required improvements to steam, water, compressed air, waste disposal, fire protection, and other plant services.
(d) Engineering costs include process design, detailed design, basic specifications/data sheets.
(e) Includes temporary construction and operations, construction tools and rental, home office personnel in field, field payroll, travel and living expenses, taxes and insurance, startup materials and labor, and overhead.
(f) Does not include scope contingency.
(g) Includes preparation of startup plan and O&M plan, and startup of facilities. Analytical costs are not included.
(h) This cost estimate has been prepared for guidance in project evaluation and implementation and was based on information available at the time that the estimate was prepared. Final costs for the project, and the project's resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other variable factors. As a result, the final project cost will vary from the estimate prepared. Because of these factors, project feasibility, benefit/cost ratios, risks, and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets in order to help ensure proper project evaluation and adequate funding.

Note: Factors from Plant Design and Economics for Chemical Engineers , Fourth Edition, M.S.Peters

Annual O&M Costs

		Quantity		Unit Rate	Total
Labor			hr/yr	$50 per hr	0
Laboratory analysis				LS	0
Electricity			kW	$0.05 per kWhr	0
Maintenance	3% of total equipment costs	$0		3%	0
Chemicals			lb/d	$0.50 per lb	0
Total					$0

Salinity Offset Credit	Flow (mgd)	TDS	TDS Mass (lb/d)
Effluent (estimated)	0.3	2240	5604
Effluent (permit)	0.3	799	1999
		Delta	3605
		Delta >1 tpd	1.80 tpd
		5 yr cost	$164,496

Order-of-magnitude Level Construction Cost Estimate
PacifiCorp Huntington Plant Granular Media Filters

Item	Design Criteria	Quantity	Basis	Cost per Unit	Estimated Cost
Influent pumps	210 gpm x 75 ft TDH, VFDs	2	Prior experience	$25,000	50,000
Media Filter Vessels	4-ft diam CS vessels	4	Prior experience	$40,000	160,000
Filter Backwash Holding Tank	25000 gals CS API 650	1	Prior experience	$2.00 per gallon	50,000
Total Equipment Cost (TEC)					$260,000
Freight and Taxes		10%	of TEC		26,000
Equipment Delivery Adjustment: Schedule		0%	of TEC		0
Equipment Delivery Adjustment: Location		0%	of TEC		0
Purchased Equipment Cost - Delivered (PEC-D)					$286,000
Equipment Installation (a)		30%	of PEC-D		86,000
Piping		20%	of PEC-D		57,000
Heat Tracing and Insulation		5%	of PEC-D		14,000
Instrumentation and Controls		15%	of PEC-D		43,000
Electrical		18%	of PEC-D		51,000
Buildings		0%	of PEC-D		0
Yard Improvements (b)		5%	of PEC-D		14,000
Service Facilities (c)		5%	of PEC-D		14,000
Subtotal					$565,000
Other Direct Costs:					
Filter Building	30 ft x 30 ft Pre-Egr Building	900	Prior Experience	$100 per sq ft	90,000
Total Direct Costs (TDC)					$655,000
Engineering (d)	excludes geotech and speciality services	10%	of TDC		66,000
Other Indirect Costs (e)		10%	of PEC-D		29,000
Total Direct + Indirect Costs (TD+I)					$750,000
Contractor's Fee		10%	of TD+I		80,000
Contingency (f)		25%	of TD+I		190,000
Total Construction Cost (TCC)					$1,020,000
Bond/Insurance		2%	of TCC		$20,000
Owners Costs		10%	of TCC		$100,000
Pilot Testing	assume not required	LS			$0
Services During Construction		6%	of TCC		60,000
O&M Manual/Startup Plan		2%	of TCC		20,000
Startup Expenses (g)		2%	of TCC		20,000
Escalation	no escalation included	0.0%			0
Total Estimated Cost (h)					**$1,240,000**
Annualized Cost of Capital	7% over 20 years				$117,047

(a) Includes costs for labor, foundations, supports, platforms, construction expenses, and other factors directly related to the erection of purchased equipment.
(b) Includes fencing, grading, roads, sidewalks, and similar items.
(c) Includes required improvements to steam, water, compressed air, waste disposal, fire protection, and other plant services.
(d) Engineering costs include process design, detailed design, basic specifications/data sheets.
(e) Includes temporary construction and operations, construction tools and rental, home office personnel in field, field payroll, travel and living expenses, taxes and insurance, startup materials and labor, and overhead.
(f) Does not include scope contingency.
(g) Includes preparation of startup plan and O&M plan, and startup of facilities. Analytical costs are not included.
(h) This cost estimate has been prepared for guidance in project evaluation and implementation and was based on information available at the time that the estimate was prepared. Final costs for the project, and the project's resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other variable factors. As a result, the final project cost will vary from the estimate prepared. Because of these factors, project feasibility, benefit/cost ratios, risks, and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets in order to help ensure proper project evaluation and adequate funding.

Note: Factors from Plant Design and Economics for Chemical Engineers , Fourth Edition, M.S.Peters

Annual O&M Costs

		Quantity		Unit Rate	Total
Labor	2 hr/d, 7 d/wk	730	hr/yr	$50 per hr	36,500
Laboratory analysis		1		LS	2,600
Electricity		15	kW	$0.05 per kWhr	6,600
Maintenance	3% of total equipment costs	260000		3%	7,800
Total					$53,500

Salinity Offset Credit	Flow (mgd)	TDS	TDS Mass (lb/d)
Effluent (estimated)	0.3	2240	5604
Effluent (permit)	0.3	799	1999
		Delta	3605
		Delta >1 tpd	1.80 tpd
		5 yr cost	$164,496

Order-of-magnitude Level Construction Cost Estimate
PacifiCorp Huntington Plant Zero Liquid Discharge (RO/Brine Crystalizer)

Item	Design Criteria	Quantity	Basis	Cost per Unit	Estimated Cost
Influent pumps	210 gpm x 75 ft TDH, VFDs	2	Prior experience	$25,000	50,000
RO Feed Tank	12000 gals CS API 650	1	Prior experience	$2.50 per gallon	30,000
RO Feed Pumps	105 gpm @350 psi, 40 hp	3	Prior experience	$500 per hp	60,000
Media Filter Vessels	4-ft diam CS vessels	4	Prior experience	$40,000	160,000
Filter Backwash Holding Tank	25000 gals CS API 650	1	Prior experience	$2.00 per gallon	50,000
RO Cartridge Filter Skid	FRP housing, 3 @ 50%	1	Prior experience	$30,000	30,000
RO Skid	210 gpm skid, 6x3 array	2	Prior experience	$400,000	800,000
RO Acid Feed System	1000 gal tank w/ pump skid	1	Prior experience	$30,000	30,000
RO Anti-scale Feed	vendor package	1	Prior experience	$25,000	25,000
CIP System	vendor package	1	Prior experience	$50,000	50,000
Brine Crystallizer	12 gpm avg, 3.5% TDS feed	1	Prior experience	$2,000,000	2,000,000
Brine Diversion Tank	Rubber lined carbon steel, 200,000 gal	1	Prior experience	$1.50 per gallon	300,000
Soda Ash Feed System	20 ton silo and feed system	1	prior experience	$150,000	150,000
Distillate Storage Tank	Stainless steel, 25,000 gals	1	prior experience	$4.00 per gallon	100,000
Reuse Water Pumps	200 gpm @ 60 psi, 10 hp	2	prior experience	$1000 per hp	20,000
Total Equipment Cost (TEC)					$3,855,000
Freight and Taxes		10%	of TEC		386,000
Equipment Delivery Adjustment: Schedule		0%	of TEC		0
Equipment Delivery Adjustment: Location		0%	of TEC		0
Purchased Equipment Cost - Delivered (PEC-D)					$4,241,000
Equipment Installation (a)		30%	of PEC-D		1,272,000
Piping		20%	of PEC-D		848,000
Heat Tracing and Insulation		5%	of PEC-D		212,000
Instrumentation and Controls		15%	of PEC-D		636,000
Electrical		18%	of PEC-D		763,000
Buildings		0%	of PEC-D		0
Yard Improvements (b)		5%	of PEC-D		212,000
Service Facilities (c)		5%	of PEC-D		212,000
Subtotal					$8,396,000
Other Direct Costs:					
Membrane Building	70 ft x 50 ft Pre-Egr Building	3500	Prior Experience	$100 per sq ft	350,000
Total Direct Costs (TDC)					$8,746,000
Engineering (d)	excludes geotech and speciality services	10%	of TDC		875,000
Other Indirect Costs (e)		10%	of PEC-D		424,000
Total Direct + Indirect Costs (TD+I)					$10,045,000
Contractor's Fee		10%	of TD+I		1,000,000
Contingency (f)		25%	of TD+I		2,510,000
Total Construction Cost (TCC)					$13,555,000
Bond/Insurance		2%	of TCC		$270,000
Owners Costs		10%	of TCC		$1,360,000
Pilot Testing		LS			$500,000
Services During Construction		6%	of TCC		750,000
O&M Manual/Startup Plan		2%	of TCC		270,000
Startup Expenses (g)		2%	of TCC		270,000
Escalation	no escalation included	0.0%			0
Total Estimated Cost (h)					**$16,980,000**
Annualized Cost of Capital	7% over 20 years				$1,602,792

(a) Includes costs for labor, foundations, supports, platforms, construction expenses, and other factors directly related to the erection of purchased equipment.
(b) Includes fencing, grading, roads, sidewalks, and similar items.
(c) Includes required improvements to steam, water, compressed air, waste disposal, fire protection, and other plant services.
(d) Engineering costs include process design, detailed design, basic specifications/data sheets.
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Note: Factors from Plant Design and Economics for Chemical Engineers, Fourth Edition, M.S.Peters

Annual O&M Costs

		Quantity	Unit Rate	Total
Labor	24 hr/d, 7 d/wk	8760 hr/yr	$50 per hr	438,000
Laboratory analysis		1	LS	25,000
Electricity		350 kW	$0.05 per kWhr	153,300
Maintenance	3% of total equipment costs	3855000	3%	115,700
Citric Acid	membrane cleaning	5 ton/yr	$2500 per ton	12,500
Scale inhibitor	2.5 ppm dose	6 lb/d	$2.20 per lb	5,000
Sodium EDTA	membrane cleaning	3 ton/yr	$1250 per ton	3,800
Sulfuric acid	20 ppm dose	50 lb/d	$0.08 per lb	1,400
Sodium hydroxide	membrane cleaning	4 ton/yr	$800 per ton	3,200
Antifoam	20 ppm dose	6 lb/d	$2.20 per lb	4,800
Solids disposal	85% solids cake from crystalizer	1.8 ton/day	$75 per ton	49,300
Total				$812,000
RO membrane replacement	5 yr replacement cycle	90	500	$45,000