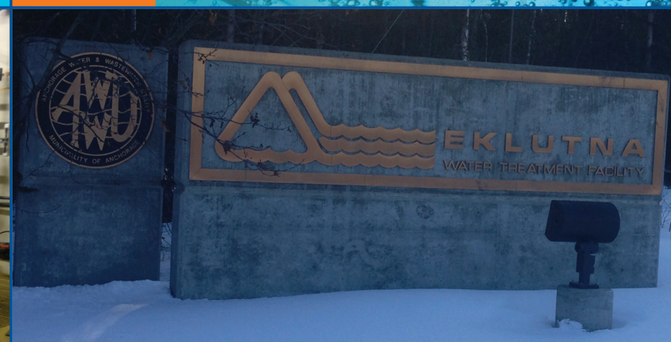
FINAL

Anchorage Water and Wastewater Utility



Eklutna Water Treatment Facility Plan

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CDM Smith

14432 SE Eastgate Way, Suite 100
Bellevue, Washington 98007
Mike Hyland, P.E., BCEE, PMP
Senior Project Manager
206-518-2297

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Section 1

Facility Plan Introduction and Format

1.1 Background and Previous Related Work

The Anchorage Water and Wastewater Utility (AWWU) provides potable water to most of the Municipality of Anchorage and adjacent areas including Eagle River and the Northern Communities. AWWU produces finished (potable) water at the Eklutna Water Treatment Facility (EWTF), from groundwater wells throughout the Anchorage Bowl, and occasionally at the Ship Creek Water Treatment facility (SCWTF). In approximately 2000, AWWU modified their operational strategy, making the EWTF the 'base load' treatment facility, which continues today.

The EWTF is located approximately 25 miles Northeast of downtown Anchorage and is the subject of this Facility Plan. The EWTF was originally constructed in the mid-1980s and has undergone significant upgrades in recent years including a programmatic SCADA upgrade and a recent filter-to-waste project. It is a conventional filtration plant providing potable finished water to customers immediately downstream of the facility.

1.2 Purpose of this Facility Plan

The purpose of this document is to provide AWWU with a comprehensive planning tool that identifies recommended capital improvements along for the most immediate planning horizon (approximately 10 years from 2018 through 2028) along with operational modifications and any supplemental evaluations/engineering efforts that may yield opportunities to enhance performance of the EWTF.

1.3 Format

This Facility Plan consists of the following sections:

- *Section 1 (this Section) – Facility Plan Introduction and Format*. This section introduces the Facility Plan and describes its organization along with some general background about the EWTF that is used throughout the remaining sections

- *Section 2 Non-Process Infrastructure*. This section describes evaluations undertaken as part of this Facility Plan related to facilities (i.e. non-process) infrastructure associated with the EWTF, including Architectural, Structural, Site/Civil, Electrical and Building Mechanical disciplines.

- *Section 3 Basis of Planning*. This section discusses fundamental attributes of a drinking water treatment facility (population and demand along with current and forthcoming regulations). Together, these form the basis on which all treatment processes are evaluated. A small subsection summarizing results of a dedicated water reliability study (performed as part of this Facility planning effort) has been included in the main body of this document with the full technical memorandum included as Appendix D.

- *Section 4 Process mechanical Infrastructure*. This section presents evaluation of each unit treatment process at the EWTF. In general, evaluations of the efficacy for a given treatment process use the assumptions presented in Section 3 as their basis.
- *Section 5 Facility-Wide Summary of Recommendations*. This section summarizes all recommendations developed in Sections 2 through 4 and then groups and prioritizes implementable projects in a framework that allows for capital planning over the next ten years.

1.4 Common Terminology

Following is a list of abbreviations and acronyms used throughout this Facility Plan

'	feet
"	inches
$	U.S. dollars
%	percent
µg/L	micrograms per liter
12-IBC	2012 International Building Code
12-IEBC	2012 International Existing Building Code
12-IFC	2012 International Fire Code
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADOL&WD	Alaska Department of Labor & Workforce Development
AEDC	Anchorage Economic Development Corporation
AHU	Air Handling Unit
AIC	Amps Interrupting Capacity
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ATS	Automatic Transfer Switch
AWWA	American Water Works Association
AWWU	Anchorage Water & Wastewater Utility
BCE	Business Case Evaluation
BHP	Brake Horsepower
Bin 1	lowest Bin Level
CCL	Contaminant Candidate List
CCR	Consumer Confidence Report
CFE	combined filter effluent
CFRs	Code of Federal Regulations
CIP	cast-in-place
CL1	Replace Existing On-Site Hypochlorite Generation System
CL2	Modify Bulk Salt Loading System
CML&C	Cement-Mortar Lined & Coated
CMU	concrete masonry units
Constr	Construction
CPE	Comprehensive Performance Evaluation
CPVC	chlorinated polyvinyl chloride

cVOC	Carcinogenic VOC
CW1	Clearwell Influent and Effluent Valves' Actuator Modifications
CW2	Clearwell Drain Valves
CW3	Clearwell Hypochlorite Injection Point Modifications
CW4	Final Effluent Weir Underdrain Valve Modifications
CW5	Clearwell & Effluent Vacuum Relief & vent Tube Cleaning
CWS	Community Water System
DBP	disinfection by-product
DBPR	disinfection by-product rule
DC	Direct Current
DCPM	Design and Construction Practices Manual
dia	diameter
DOC	dissolved organic carbon
e.g.	for example
EEWS	Emergency Eyewash Shower
EPA	Environmental Protection Agency
EPDM	ethylene propylene diene monomer
ERS	Energy Recovery Station
ESDC	Engineering Services during Construction
ETM	Eklutna Transmission Main
EWTF	Eklutna Water Treatment Facility
FBRR	Filter Backwash Recycle Rule
FC1	Remove ferric chloride equipment, piping, storage silos, and Electrical/I&C related items
FLC1	Flocculator Replacement
FL1	Replace Fluoride System with New Dry System
floc	flocculation
FLT1	Filter Assessment
FLT2	Filter Startup SOP Preparation
ft.	feet
ft3	cubic feet
gal	gallon
GC1	Chemical Piping Hazard Assessment
GC2	Install Emergency Eyewash Showers
Gilkes	Gilbert Gilkes & Gordon Ltd.
gpcd	gallons per capita per day
gph	gallons per hour
gpm	gallons per minute
GWUDI	groundwater under the direct influence of surface water
HAA5s	halo acetic acids
hp	Horsepower
HPS	High Pressure Sodium
I&C	Instrumentation & Control
I/O	input/output
IBC	International Building Code
ICC	International Code Council
ICR	Information Collection Rule

ID	Identifier
IDSE	Initial Distribution System Evaluation
IEBC	International Existing Building Code
IESWTR	Interim Enhanced Surface Water Treatment Rule
IFC	International Fire Code
IFE	individual filter effluent
IFGC	International Fuel Gas Code
IMC	International Mechanical Code
IOC	inorganic chemical
IRMA	inverted roof membrane assembly
K	thousand
kV	kilovolt
kVA	kilovolt ampere
Kw	kilowatt
lbs	pounds
LCR	Lead and Copper Rule
LED	light-emitting diode
LF	linear foot
LLC	limited liability company
LoF	likelihood of failure
LT1ESWTR	Long Term 1 Enhanced Surface Water Treatment Rule
LT2ESWTR	Long Term Stage 2 Enhanced Surface Water Treatment Rule
M	million
MASS	Municipality of Anchorage Standard Specifications
MCC	motor control center
MCL	Maximum Contaminant Level
MCLG	maximum contaminant level goals
MEA	Matanuska Electric Association
Mfg	Manufacturing entity
MFL	Million Fibers Per Liter
mg	milligrams
mg/L	milligrams per liter
MGD	million-gallons per day
mil	millimeter
min	minute
MLCP	mortar-lined cement pipe
MOA	Municipality of Anchorage
MRDL	maximum residual disinfectant level
MRDLG	maximum residual disinfectant level goal
MVB	pad-mounted distribution cabinet
N.I.C.	Not in Construction
N/A	not applicable
NaOCl	Sodium Hypochlorite
NEC	National Electrical Code
NFPA	National Fire Protection Association
No.	number

NTU	nephelometric turbidity unit
O&M	operations and maintenance
OEM	original equipment manufacturer
OSHA	Occupational Safety & Health Administration
OSHG	On-site Sodium Hypochlorite Generation
PACL	Polyaluminum Chloride
PC	Primary Coagulant (original 1986 facility)
PCCP	pre-stressed concrete cylinder pipe
pCi/L	picoCuries per liter
PCL1	Replace Two PCL Metering Pumps with Three New Pumps
PCL2	Add Bulk PCL Storage Tank
pH	potential of hydrogen
PLC	Programmable Logic Controller
PN	Public Notification
ppd	pounds per day
PSI	pounds per square inch
PVC	polyvinyl chloride
PWS	Public Water System
RM1	Replacement of Two Lagoon Decant Pumps
RM2	Mitigate Waste Washwater Backup into Sedimentation Basin
RPM	revolutions per minute
RTCR	Revised Total Coliform Rule
RW1	Raw Water Pipeline Seismic Restraints
RW2	Flash Mix Condition Assessment
RW3	Flash Mix Feed Water PRV Replacement
SA1	Remove soda ash equipment, piping, storage silos, and Electrical/I&C related items
SBD	Main Switchboard
SCADA	supervisory control and data acquisition
SCBA	self-contained breathing apparatus
SCWTF	Ship Creek Water Treatment Facility
SDWA	Federal Safe Drinking Water Act
Sed	Sediment
SED1	Wear Plates and Guide Rail Replacement
SED2	Collector Drives Replacement
SED3	Addition of Motorized Actuator to Basin Drain Valves
SOC	synthetic organic chemical
SOP	standard operating procedure
SUVA	specific ultraviolet absorbance
SWTR	Surface Water Treatment Rule
TBD	to be determined
TCR	Total Coliform Rule
THM	total trihalomethanes
TOC	total organic carbon
TON	Threshold Odor Number
TT	Treatment Technique
TTHM	total trihalomethane

UCMR	Unregulated Contaminant Monitoring Rule
UPC	Uniform Plumbing Code
UPS	Uninterruptible Power Supply
USC	United States Code
VOC	volatile organic chemical
WRF	Water Research Foundation
WWPS	Waste Washwater Pump Station
WWTP	Wastewater Treatment Plant
yrs	years

1.5 Area and Unit Process Designations

Figures 1-1 through 1-5 provide an overview of the entire EWTF and include basic terminology that is referenced throughout individual subsections of this Facility Plan:

The schematic below shows the spatial relationship between major structures and facilities on site

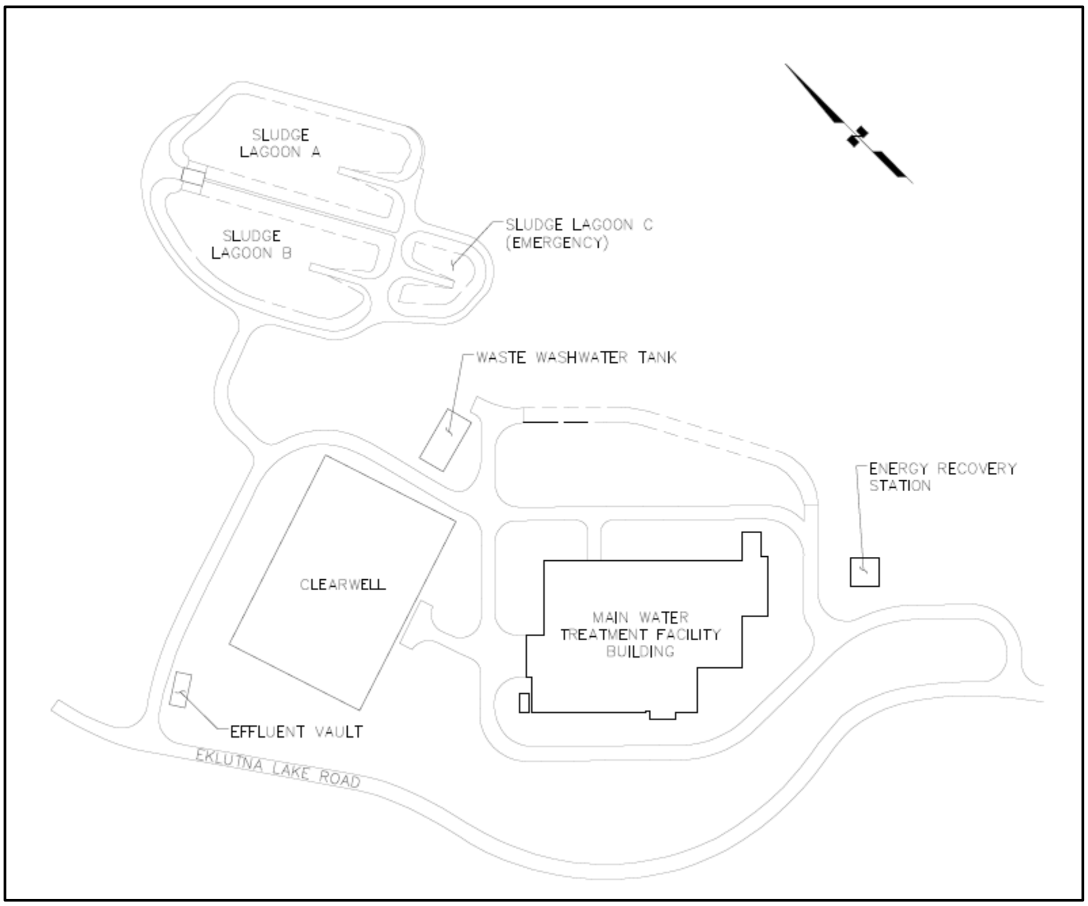

Figure 1-1
Site Plan

Figure 1-2 was adapted from the As-Built set and shows major facilities and unit processes on the upper level floor of the main EWTF

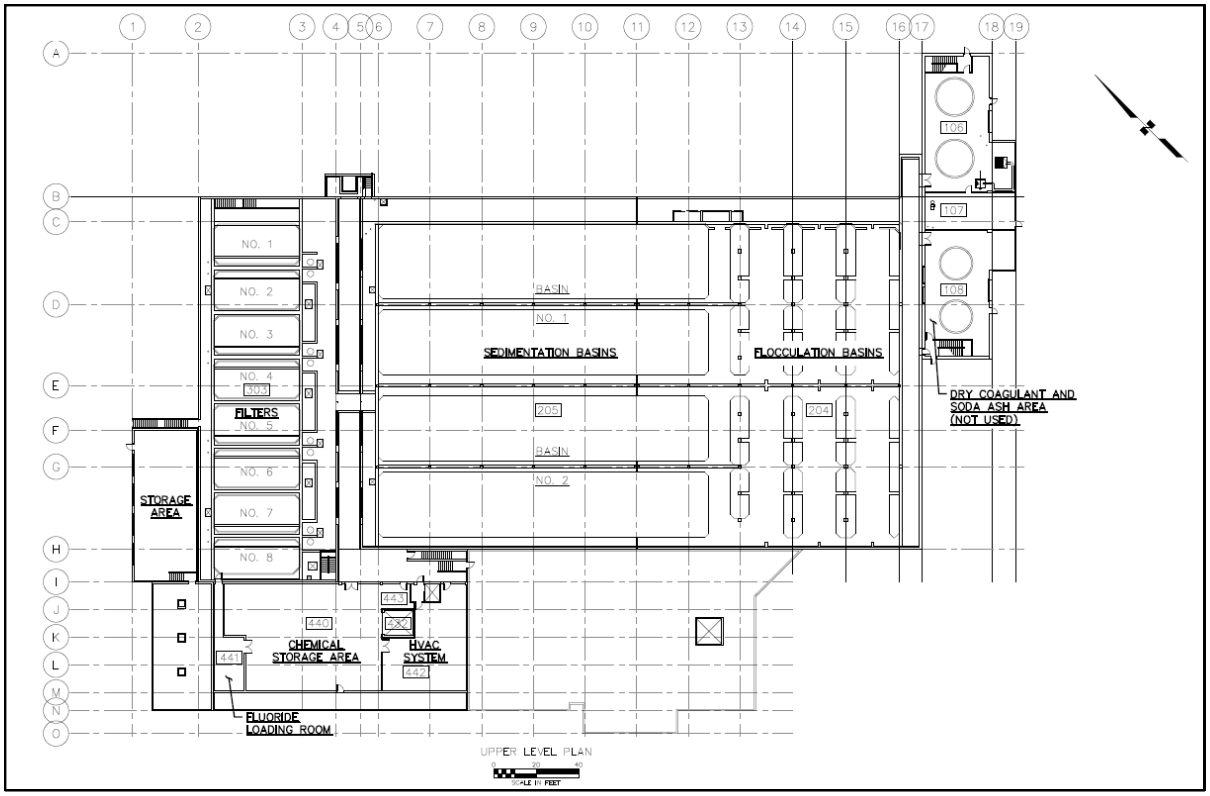

Figure 1-2
Upper Level Floor Plan.

Figure 1-3 was adapted from the As-Built set and shows major facilities and unit processes on the lower level floor of the main EWTF

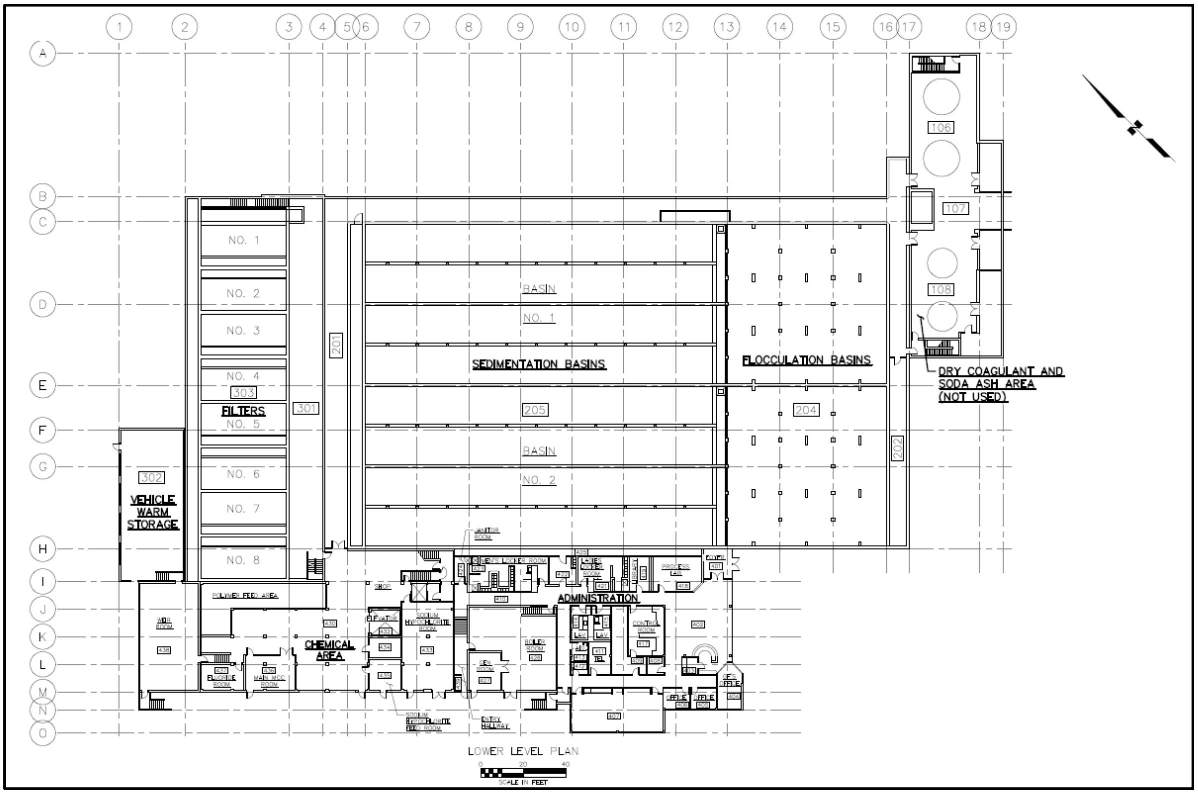

Figure 1-3
Lower Level Floor Plan

The schematic below shows the relationship of all major unit processes at the EWTF in order of the treatment process, starting with raw water transmission to the plant through the Energy Recovery Station (ERS) and concluding with finished water in the clearwell

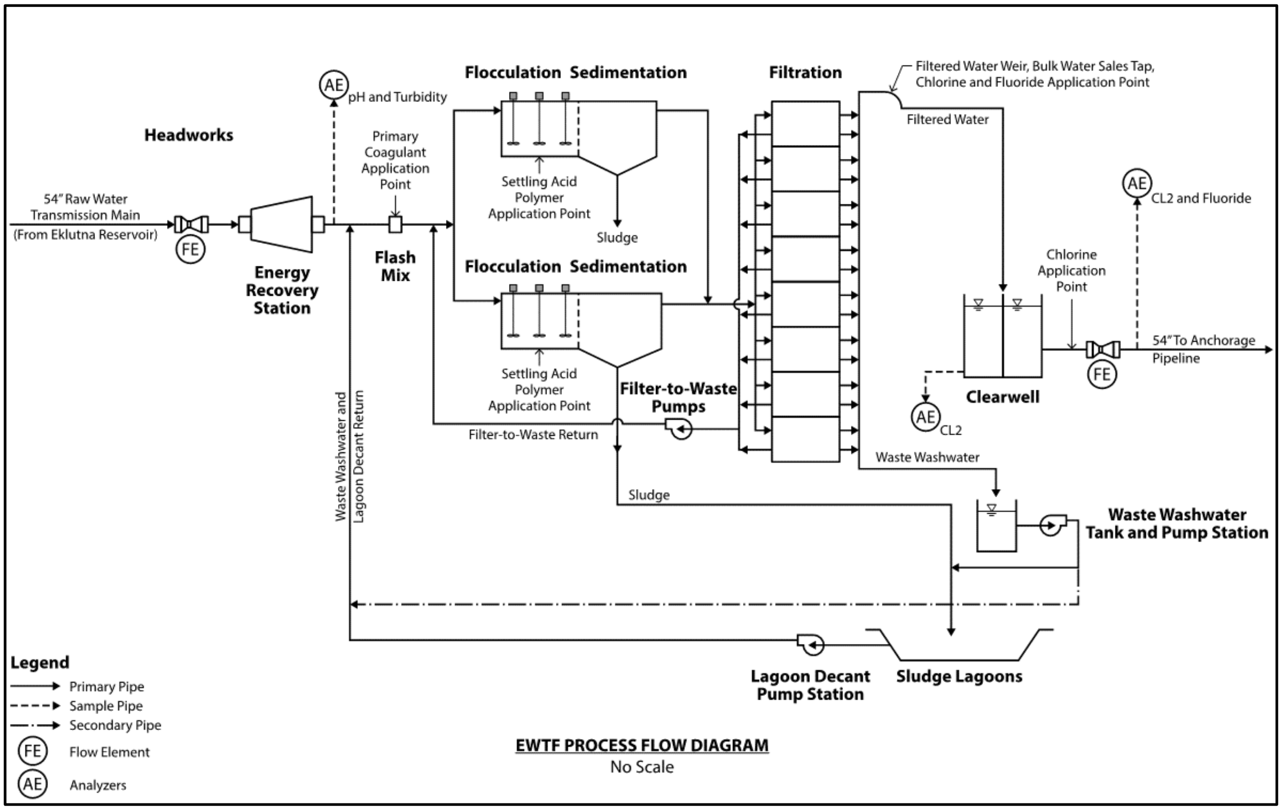

Figure 1-4
Process Flow Diagram.

This partial plan has been annotated to show the approximate location of each major chemical system in use (or abandoned) at the EWTF, which are referenced throughout this Facility Plan

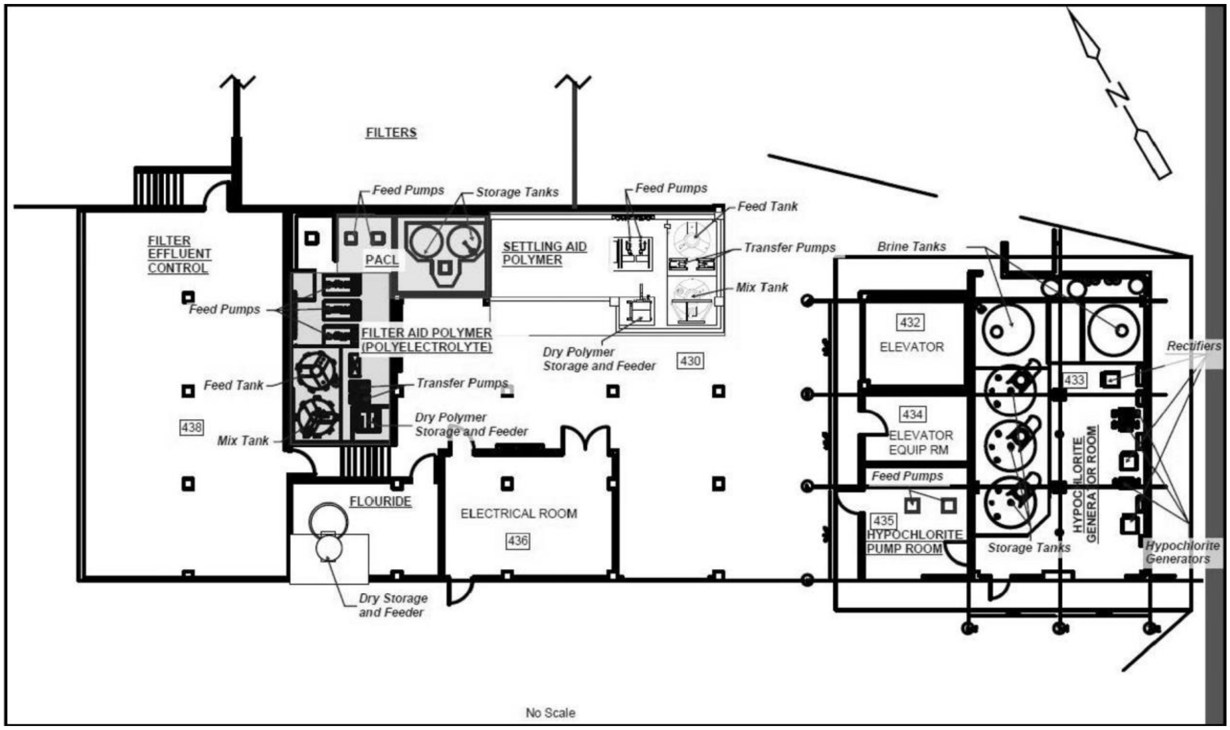

Figure 1-5
Existing Chemical System Locations.

Section 2

Non-Process Infrastructure

2.1 Overview

The Eklutna Water Treatment Facility (EWTF) and its accessory structures, facilities and other non-process infrastructure were reviewed primarily for issues that are currently out of code compliance, are not functioning as intended, or present opportunities to improve the safety or environment for AWWU staff and visitors. Generally, a code review was conducted for each discipline along with one or more site visits from licensed engineers and architects in the state of Alaska to evaluate the condition of existing infrastructure and its viability to continue serving AWWU's needs over the capital planning horizon of at least ten years. For each discipline, a discussion is provided for each of the following areas:

- Applicable codes - the codes in effect at the time of this writing or recommended for use by each discipline lead are documented
- Existing Facilities and Infrastructure – a brief description of major facilities (i.e. non-process) infrastructure is provided
- Asset Management Planning Considerations – a formal Asset Management Plan is being developed as part of this Facility Planning effort; as such, outputs from the Asset Management Plan for each discipline (where applicable) are documented in the Facility Plan
- Assessment – a separate discussion is provided for each major area or facility/infrastructure item for which additional engineering efforts, an operational modification, or a capital improvement is recommended
- Alternatives Evaluation – if applicable, alternatives to be considered associated with any recommendations are described for consideration by AWWU
- Summary of Recommendations – a brief tabular summary of the final recommendations of this Facility Plan are provided for each discipline along with pertinent information such as a derivation of planning level project costs, relative need for the project, etc.
- Special Considerations for Implementation – if applicable, any potential special considerations that could impact the eventual design and/or construction of a given recommended alternative are documented

The balance of this section follows the above framework for each of the following disciplines:

- Section 2.2 – Architectural
- Section 2.3 – Structural

- Section 2.4 – Site/Civil
- Section 2.5 – Electrical
- Section 2.6 – Building mechanical

2.2 Architectural

The EWTF has performed very well architecturally and aesthetically over the past 30 years with minimal degradation. General wear and tear on finishes and hardware is expected over this duration, and certain items are nearing the end of their life cycle. Various exterior upgrades have been performed recently, including a complete re-roofing of the main facility which extends and protects the building from exposure to harsh elements.

2.2.1 Applicable Codes

The existing architectural systems were reviewed against the following codes and standards:

- 2012 International Building Code (12-IBC)
- 2012 International Existing Building Code (12-IEBC)
- 2012 International Fire Code (12-IFC)
- 2009 ICC A117.1 Accessible and Usable Buildings and Facilities
- 2012 Municipality of Anchorage Title 23 Local Amendments
- Occupational Safety & Health Administration (OSHA)
- American Society of Mechanical Engineers (ASME) A17.1 – Safety Code for Elevators and Escalators

2.2.2 Existing Facilities and Infrastructure

The original facility/infrastructure was constructed in 1986 and has performed very well over the past 30 years. General wear is visible throughout the facility as would be expected; however, the facility has withstood the past three decades very well. The facility has undergone various interior mechanical and electrical improvements over the years. For example, in the early 2000s, the EWTF and the Energy Recovery Station (ERS) buildings were provided with new, 60-mil EPDM roof coverings.

2.2.3 Asset Management Planning Considerations

The Asset Management Planning undertaken as part of this Facility Planning effort does not identify individual architectural components as assets.

2.2.4 Assessment

The items below were noted during a general walk through of the facility, review of the record drawings, and direct meetings with AWWU staff. A full code assessment as it relates to the current building code was not conducted, which is typical for this level of facility planning. All occupancies and rated wall separations are based on original construction documents. No change in occupancy or building additions have modified the original design, which could have altered the code requirements as originally reviewed and permitted with the Authority Having Jurisdiction (e.g. MOA). Buildings are not required to be upgraded to each new code cycle; however, life safety items (e.g., egress and protection of the egress path) were reviewed in accordance with current codes.

Exterior Building Elements

Exterior Wall Panels

The exterior finish of all the buildings located on the main EWTF campus consist of pre-formed insulated metal wall panels. These panels all appear to be performing well with minor dents at the grade elevations of some of the buildings; however, no punctures were noted in the exterior skin. One common item on the exterior skin of the panels that was noticed throughout were irregular discoloration patches (Figure 2-1). The cause of these discolored patches is unknown, but they are very noticeable and distract from the building aesthetics. The discolored patches were all noted as being within arm reach from the walking surface, indicating that at some time these areas received a touch-up coating. Patches were not a close color match and field observation noted the patch left a chalky residue that disappeared when wiped with a wet cloth. It is recommended that all EWTF campus buildings' pre-formed insulated metal wall panels be cleaned per panel manufacturer recommendations.

Figure 2-1
Typical Exterior Panel Discoloration

The Intake Structure and Portal buildings (located near Eklutna Lake) are constructed of concrete walls and roof, which appear to be in excellent condition.

Figure 2-2
WWPS Existing Roof

Roof Assemblies

The roof assembly types of the buildings located on the main EWTF campus vary. All the buildings' original roof construction consisted of an inverted roof membrane assembly (IRMA), in which the roofing membrane is located below layers of roofing insulation and concrete pavers. The IRMA roofs located on the EWTF and ERS buildings were replaced in the early 2000s with a 60-mil EPDM membrane. This new EPDM roof is performing well without any signs of wear. However, the roof assemblies of the Waste Washwater Pump Station (WWPS) (Figure 2-2), Effluent Vault Building (Figure 2-3), and Lagoon Pump Station retain their existing IRMA roofs and are showing extreme signs of deterioration. Moss and tree sprouts were noticed growing on these roofs, which could cause further damage to the membrane. It is recommended that these three structures

Figure 2-3
Effluent Vault Existing Roof

be provided with new EPDM roof assemblies similar to the rest of the EWTF to extend the life of these buildings.

Roof Access

Roof access to the main portion of the EWTF is via a stairway adjacent to the southwest corner of the sedimentation basins. This access places the occupant on the roof above the operations area. From there, ladders are available to traverse the various roof levels including above the chemical storage, equipment storage, filters, and sediment/flocculation basins. The roofs of the primary coagulant towers (see Figure 2-4) and the ERS building (Figure 2-5) are accessed by interior ladders and roof access hatches. There is a separate roof hatch for each north and south tower of the structures. Both these roof hatches along with the roof access hatch of the ERS building place personnel in the corner of the roof plane, within a foot of the roof parapet. Not only is this a safety concern, current building codes do not allow roof access openings to be located within 10 feet of the roof edge without guard protection.[1] If roof access openings are located within 10 feet of the roof edge, they must be protected with guardrails measuring 42 inches in height and extending not less than 30 inches beyond the edge of the access opening. To comply with current building codes and increase roof access safety, it is recommended that guardrails be installed at all three roof access openings associated with each of the two primary coagulant towers and the ERS building.

Figure 2-4
Primary Coagulant Tower Roof Access

Figure 2-5
ERS Roof Access

Stair Guardrails and Handrails

Handrails at the exterior stairs have a single guardrail/handrail located at a height of 34 inches above tread nosing. Current codes require a 42-inch high guardrail and that a separate handrail be installed where the walking surface is located more than 30 inches above grade. These railings were installed per the building code at the time of construction, and therefore are not a violation nor recommended to be upgraded.

Interior Building Elements

The interior building elements have performed very well given the age of the facility. Elements and finishes that experience more use are subject to degradation over time, and this is observed at the EWTF. The elements that have seen the highest level of degradation over the years are interior doors and finishes.

Doors

The door schedule in the main EWTF building record drawings indicates 62 doors that have listed fire ratings from 20-minute to 90-minute. These rated doors are designed per building codes to function properly and have properly working door hardware to maintain their listed ratings. Furthermore, rated doors are not allowed to be blocked or held open with manual devices (e.g.,

[1] 12-IBC, Section 1013.7 Roof access.

floor wedge or door stop) unless held open by a mechanical device (e.g., a magnetic hold open tied into a fire alarm system), which would automatically close the door when needed to maintain the required rating separation. The following table is a general list of doors, their deficiencies, and recommendations:

Table 2-1: EWTF Door Schedule with Recommendations

Record Drawing Door/Location	Recommendation	Number of Doors
1-S1C (Figure 2-6), 1-S2A, Pair 101A, Pair 105A, 105E (Figure 2-7), 106A, 108A, Pair 204A, 430I, 435A, 438A	Replace door, frame, and hardware due to binding, rusting, inoperability, and/or infiltration.	11
Pair 201A, 430B, 410C, 430C, 433B, Pair 440A, Pair 442A	Replace inoperable door hardware and adjust for proper operation.	7
Pair 105C, 105D, 430G, 430H	Replace hardware with panic door hardware and provide proper smoke gasketing. Panic hardware is required on electrical room doors with equipment rated 1,200 amperes or more, and those over 6 feet wide that contains overcurrent devices, switching devices or control devices.[2]	4
1-S2C, 4S2A, 430A, 3-S1A, Pair 440B, 444A	Replace/provide smoke gasketing.	6
Operations Area	Remove manual door stops to allow doors to function as rated openings. Corridor doors are 20-minute rated doors and have manual door stops allowing the doors to be held open. These doors are part of the rated corridor opening and are required to be automatic closing doors that are not manually held open.	20 (approximately)

Figure 2-6
Door 1-S1C

Figure 2-7
Door 105E

It is recommended that the discrepancies noted above for the listed doors be brought into compliance with current building code.

Interior Floor/Ceiling Finishes

Interior finishes of the facility have performed well over the years; however, in the operations area, certain materials are showing wear. The carpet and rubber base has recently been replaced in the conference room, along with the remaining administrative areas. The rooms with vinyl flooring are performing well; however, the rubber base in these rooms is cracking and showing extreme wear and should be replaced. The ceiling tiles appear to be performing well; however, there were a few locations noted as having damaged and/or stained ceiling tiles, which should be replaced. Stained ceiling

[2] 12-IBC, Section 1008.1.10 Panic and fire exit hardware.

tiles were noticed in the main lobby/reception area, in the conference room, and above the corridor drinking fountains. It was also noticed that the gypsum board ceiling in the plan room (adjacent to the operator's laboratory) had peeling paint in the northeast corner of the room. Further investigation should be conducted to ensure that there is no water leaking from above, and the gypsum board should then be repaired and repainted to match existing. It is recommended that all the original carpet/rubber bases, rubber bases at vinyl flooring locations, and damaged/stained ceiling tiles be replaced.

Stair Guardrails and Handrails

The interior guardrails and handrails throughout the EWTF are in good condition. The guardrails meet the current building code height of 42 inches above the walking surface, and they are in compliance with the opening limitations whether the rail is on a public or non-public route. In general, handrails are also in compliance regarding height above stair nosing. The exception to this is handrail extensions at the top and bottom of the stair run, which were installed in accordance with the building codes at the time of construction. Current codes require longer extensions at the top and bottom of each stair run. Although the handrails do not meet current codes, it is recommended that the existing handrails remain as currently installed as they do not present a safety issue. The majority of the existing handrail extensions vary between six to eight inches beyond the top or bottom riser. Current building codes require a horizontal extension of 12 inches beyond the top riser and a depth of one tread beyond the bottom riser.

Filter Basin Railing Access

Existing guardrails currently located around the eight filter basins do not allow full perimeter maintenance access of each individual basin. Guardrails currently encompass the perimeter of basins 1, 2-3, 4-5, 6-7, and 8. Since the railings around the perimeter of basins 2-3, 4-5, and 6-7 are continuous with no gate between (Figure 2-8), AWWU staff is required to climb over the top of the railing onto a walkway between the basins while tied off to a safety cable that runs parallel above the walkway. To provide a safer and more-efficient means of filter basin access, the utility has requested that guardrails be added on both sides of the walkway between basins 2-3, 4-5, and 6-7 so each filter basin is encompassed with its own guardrail. In addition, to provide access to the bottom of each filter, aluminum ladders are to be provided on the west side of each filter basin. An existing gate is located on the west side of each basin guardrail, and aluminum ladders are to be located at each gate for access into the bottom of the basin (similar in style to the ladders that currently exist in the sedimentation basins) with bottom elevation slightly above the operating surface.

Figure 2-8
Typical Filter Basin Guardrail

Interior Rated Wall Penetrations

Record drawings indicate various walls throughout the facility as being either one-hour occupancy separation walls, one-hour fire walls for separation of fire areas, or two-hour shaft enclosures (Figures 2-9 and 2-10). Rating integrity is to be maintained at all instances, including through penetrations of conduit or piping. Various upgrades at the EWTF required the penetration of these walls with conduit or piping, and they have not been properly firestopped in accordance with the building code.[3] It is recommended that all penetrations through rated wall assemblies be protected by an approved penetration firestop system installed and tested in accordance with current building code.

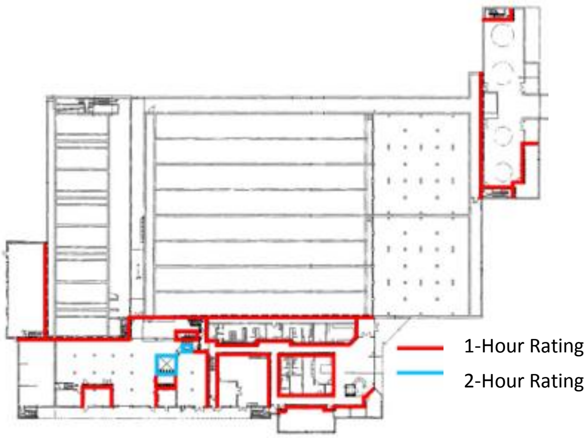

Figure 2-9
EWTF Lower Level

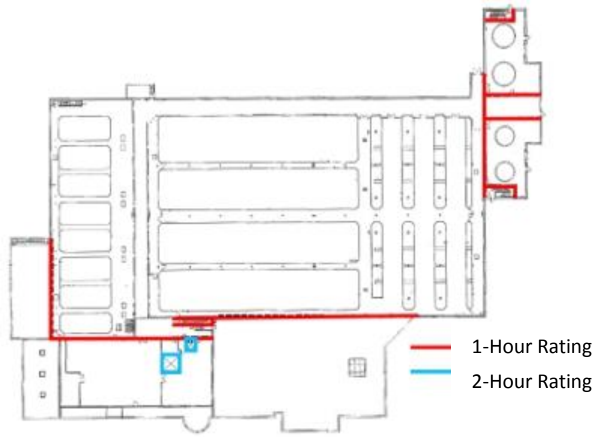

Figure 2-10
EWTF Upper Level

Intake Structure Access

The existing service elevator (Figure 2-11) provides personnel access from the utility level (approximately 16 feet below grade) to the bottom of the intake vault shaft (approximately 115 feet below utility level). It appears to be the original construction elevator, which has remained as the permanent service elevator. A manufacturer nameplate indicates this elevator as an Alimak AB Passenger and Goods Hoist, model Scando Mini 2/10, No. 763, manufactured in 1986. The elevator is listed with a maximum load of 500 pounds or two passengers. A current elevator inspection certificate could not be located. A sticker was noted indicating "Code Data Plate as required by A17.1-2004" and further referenced "For this unit use Code Edition A17.1-1981". The current compliance of this elevator was not assessed as part of this Facility Plan and should be verified by others or with the state elevator inspector for compliance in accordance with ASME A17.1 – Safety Code for Elevators and Escalators. In addition to

Figure 2-11
Intake Structure Elevator

[3] 12-IBC, Section 714 Penetrations.

the current elevator, ladder access exists to the bottom of the vault shaft and appears to comply with OSHA for maximum ladder runs with intermediate platforms and cages.

Another access ladder to the bottom sump level is located at the bottom of the vault shaft at the lower landing level (approximately 115 feet below utility level). This lower landing is protected by a guardrail with a gate access to the ladder. The ladder extends 16 feet to the bottom sump level. Access from the lower landing grating to the top rung of this ladder is not safe as the ladder does not have adequate side extensions for personnel to grasp while traversing between the landing and the ladder rungs. The vault bottom's environment is also higher in humidity, which causes the rungs to be slippery. It is recommended that extensions be added to both sides of the ladder that extend a minimum of 42 inches above the adjacent grading, and slip-resistant abrasive material be provided on each ladder rung for foot traction.

Figure 2-12
Sump Access Ladder

2.2.5 Alternatives Evaluations

No alternatives were evaluated for the items listed above.

2.2.6 Summary of Recommendations

Below is a summary of the recommended architectural upgrades described above. Table 2-2 summarizes additional detail with respect to the architectural recommendations that is used in the summary of plant-wide recommendations included in Section 5. For Architectural recommendations that include capital improvements, an initial construction cost was developed, which is then used to derive an approximate design cost, engineering services during construction (ESDC) cost and soft costs (e.g. permitting, AWWU labor, etc.) using assumed percentages of 12%, 6% and 20% respectively. The sum of these parameters is shown as a Total 'Project' Planning Cost.

- ARCH 1 - Exterior Wall Panels – Clean the exterior wall panels of the chalky patches that are visible around the perimeter of all the structures located on the main Eklutna facility campus.
- ARCH 2 - Roof Assemblies – Replace the existing IRMA roof assemblies on the following buildings:
  - WWTP (Area = 21 feet x 37 feet).
  - Effluent Vault Building (Area = 9 feet x 27 feet).
  - Lagoon Pump Station Building (Area = 23 feet x 38 feet).
- ARCH 3 - Roof Access – Provide guardrails at ERS building roof access and (2) roof access locations on the primary coagulant towers. Guardrails shall extend vertically 42 inches above roof level and extend beyond each side of the roof hatch opening not less than 30 inches.

- ARCH 4 - Interior Doors – Upgrades to existing doors consist of either full replacement, modifying door hardware, or providing/replacing smoke gasketing at rated doors.
  - 11 doors: Recommend full replacement including door, frame, and hardware.
  - 7 doors: Recommend upgrading existing door hardware for proper operation.
  - 4 doors: Recommend replacing existing hardware with panic/fire exit hardware.
  - 6 doors: Recommend replacing/providing new smoke gasketing.
  - 20 doors (approximately): Recommend removal of manual door stops to allow doors to function as rated openings.
- ARCH 5 - Interior Finishes – Recommend the following:
  - Replace all remaining original carpet (including rubber base) with new.
  - Replace rubber base in rooms with existing vinyl flooring.
  - Replace damaged and stained acoustical ceiling tiles.
  - Repair damage to gypsum board ceiling in plans room.
- ARCH 6 - Filter Basin Guardrails – Modify existing guardrails around filter basins to provide gate access to walkway between basins 2-3, 4-5, and 6-7 at both ends of the walkway and include ladders at each location.
- ARCH 7 - Rated Wall Penetrations – Provide protection of all wall penetrations in rated wall assemblies with approved firestop system.
- ARCH 8 - Intake Structure Ladder Access– Provide ladder rail extensions on both sides of existing ladder at lower level of vault shaft. Provide slip-resistant abrasive material on all rungs to increase foot traction.

Table 2-2: Architectural – Summary of Recommendations and Planning Level Costs

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
ARCH1	Clean Exterior Wall Panels	Aesthetics and decreased long-term wear	Low	Low	$5,000	$7,000
ARCH2	Roof Replacements	Improved building service life	Medium	Low	$80,000	$110,000
ARCH3	Roof Access - Add Guardrails	Worker safety/code compliance	High	Low	$15,000	$21,000
ARCH4	Door Hardware Improvements	Worker safety/code compliance	Medium	Low	$60,000	$83,000

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
ARCH5	Replace Interior Finishes	Improved worker comfort/ safety and aesthetics	Low	Low	$10,000	$14,000
ARCH6	Filter Basin Guardrails / Ladders	Worker safety/code compliance	High	Low	$65,000	$90,000
ARCH7	Rated Wall Penetrations	Worker safety/code compliance	High	Low	$10,000	$14,000
ARCH8	Intake Structure Ladder Access	Worker safety/code compliance	Medium	Low	$15,000	$21,000

Because the total project cost derived for planning purposes is below $500k, Recommendations ARCH 1 through ARCH8 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

2.2.7 Special Considerations for Implementation

None of the recommended items listed above will cause disruption to daily activities during implementation and thus no special considerations are noted.

2.3 Structural

This section addresses buildings on the site and structures containing treated and untreated water, and water in the process of treatment. It does not include the water pipelines upstream or downstream from the facility.

No seismic review or analysis (ASCE 41) has been performed for the EWTF as part of this facility planning scope.

2.3.1 Applicable Codes

The existing structures were reviewed based on the following codes and standards:

- IBC 2012, International Code Council, "International Building Code"
- IEBC 2012, International Code Council, "International Existing Buildings Code"
- ASCE 7-10, American Society of Civil Engineers, "Minimum Design Loads for Buildings and other Structures"

2.3.2 Existing Facilities and Infrastructure

On May 4, 2016, David Stierwalt, PE, with Reid Middleton walked the facility to visually assess the quality of the existing structure. The following section describes the construction of each of the 14 buildings:

Energy Recovery Station (ERS)

The ERS is a tall concrete and CMU structure. The 1986 drawings note this building as “N.I.C.” or “BY OTHERS”. Additional construction drawings were identified and reviewed as part of this facility planning effort. A 10-ton bridge crane is positioned over the pumps for pump extraction.

Utilidor from ERS to Headworks

The utilidor is a 10’ tall x 17’ wide concrete box with 12” thick walls, a 13” thick concrete floor and a 14” thick lid. The entire utilidor slopes down from the East to the West. See Sheet 1S-1 of the 1986 drawings. A 1” expansion joint separates the utilidor from both the ERS and the Headworks buildings.

Primary Coagulant & Soda Ash Storage (Headworks)

The storage area is a two-story concrete and CMU structure. The north side and the south side contain two tall tanks each that are floor supported and extend through the second floor without support. These tanks are abandoned and unused. See S-11 and 1S-1 through 1S-9 of the 1986 drawings. This area is located between Grids 17-19. The roof structure consists of 16” deep Precast Double Tees with a 2.5” concrete topping. The roof is a flat structural slab at the low roof between towers. The walls and floor are cast-in-place concrete. The silo bases are rock anchored into underlying bedrock (see Section A-A on 1S-3).

Flocculation Basins

The flocculation (floc) basins are a two-story concrete structure. See S-11, 2S-1, 2S-5, 2S-8, and 2S-12 in the 1986 drawings. This area is located between Grids 13-17. The roof structure consists of 24” and 16” deep Precast Double Tees with a 2.5” concrete topping.

Sediment Basins

The sedimentation basins are a two-story concrete structure. See S-11, 2S-2-3, 2S-6-7, 2S-9-10, and 2S-14 in the 1986 drawings. This area is located between Grids 4-13. The roof structure consists of 24” and 16” deep Precast Double Tees with a 2.5” concrete topping. The basins, walls & 2nd floor consist of cast-in-place (CIP) concrete; the 2nd floor walls consist of concrete masonry units (CMU). This area includes the hallway (Service Gallery located between B-C and 4-5) between the Filter & Sedimentation basins and on north side of floc/sed basins. The main floor level, located between Grid 4-5, is precast/prestressed hollow plank.

On the Main Level, North side, in the 12” CIP concrete floor, cracks were pressure grouted in a 2015 wastewater renovation (See 6/2S-14 in the 1986 drawings).

Filters

The filters are a two-story concrete structure. See S-11 and 3S-1 through 3S-12 in the 1986 drawings. This area is located between Grids 2-4. The roof structure consists of 32” deep Precast Double Tees with a 2.5” concrete topping.

Chemical Storage

The storage area is a two-story concrete structure. See S-11 and 4S-1 through 4S-22 in the 1986 drawings. The roof structure consists of 24” deep Precast Double Tees with a 2.5” concrete topping.

Operations Area

The operations area is a two-story concrete structure. See S-11 and 4S-1 through 4S-22 in the 1986 drawings. The roof structure consists of 24" and 16" deep Precast Double Tees with a 2.5" concrete topping.

Clearwell Building

The clearwell area is a tall one-story concrete structure that is buried. The 1986 drawings indicate this structure as "N.I.C." Additional construction drawings were identified and reviewed as part of this facility planning effort.

Effluent Vault

The effluent vault is a concrete below grade structure. The portion above grade is CMU walls with a concrete CIP roof. See 6S-1 through 6S-3 of the 1986 drawings.

Waste Washwater Building

The wastewater building is a two-story structure. See Sheets 5S-1 through 5S-2 of the 1986 drawings. This building consists of a concrete CIP vault below grade with CMU walled structure above grade with a sloped CIP concrete roof.

Sludge Lagoon Building

The lagoon building is a two-story structure. See Sheets 7S-1 through 7S-3 of the 1986 drawings. This structure consists of a concrete CIP vault below grade with CMU walled structure above grade with a sloped CIP concrete roof.

Intake Structure & Generator Shed

The intake structure is a deep concrete shaft near Eklutna Lake. The generator shed is a newer one-story CMU structure with a concrete on metal deck roof. The 1986 drawings indicate this structure as "N.I.C." Additional construction drawings were identified and reviewed as part of this facility planning effort.

Portal

The portal is a concrete building, above and below grade where the intake pipe transitions in size and material. The 1986 drawings note this building as "N.I.C." Additional construction drawings were identified and reviewed as part of this facility planning effort.

2.3.3 Asset Management Planning Considerations

The Asset Management Planning undertaken as part of this Facility Planning effort does not identify individual structural components as assets.

2.3.4 Assessment

The following section describes the identified deficiencies of each of the 14 buildings:

Energy Recovery Station (ERS)

- Basement – corridor to utilidor, multiple small wall cracks – efflorescing on interior; wet concrete at base of wall indicating water/moisture seepage

- 2nd Floor; Nozzle Y has a 15' section of unsupported pipe

Utilidor from ERS to Headworks

- Asphalt over utilidor is badly cracked and needs replacement
- Underside of concrete roof is wet, multiple locations
- Sealant at both ends is leaking

Primary Coagulant & Soda Ash Storage (Headworks)

- Leaking at west wall of headworks tank (near doors on both sides)
- Wastewater recycle project cut hole in top of headworks and reinforced floor – no cracking indicated at time of project (2015)
- Roof spalling at precast connection; approximate location C.5/17.5 (Soda Ash Room)

Flocculation Basins

- Minor cracking at roof seams
- Floor cracked at negative moment zones over CIP concrete beams
- A site visit to investigate a reportedly leaking riser box at the floc basin inlet was conducted in April 2017 – the concrete inside the riser box is in excellent condition without signs of cracking therefore only seal replacement is recommended at this time

Sediment Basins

- Minor cracking at roof seams
- The expansion joint between the two halves is enlarging from the floor to the roof, which indicates slight settlement.
- Main Level, South side, CIP concrete, floor cracks remaining (see 8/2S-14 of 1986 drawings)
- Hallway (Service Gallery) between Filter & Sed Basins - multiple wall cracks, moderate efflorescence; crack lengths approximated and written in black sharpie for estimate in 2015

Filters

- No identified deficiencies.

Chemical Storage

- Exposed rebar at floor to wall joint (back corner of recent wastewater upgrade, lower level)
- Chlorine Feed – door jambs are heavily corroded at bases

Operations Area

- Floor crack under tile in lobby

Clearwell Building

- No identified deficiencies.
- Only the exterior soil was observed. No interior investigation was done.

Effluent Vault

- Handrail base plates encroach on stair clear width
- Stair stringer flanges cut by water piping

Waste Washwater Building

- Existing roof has substantial organic growth (growing trees)

Sludge Lagoon Building

- No identified deficiencies.

Intake Structure & Generator Shed

- Heavy efflorescence over bottom of structure – indicates moisture movement from exterior to interior
- Efflorescence is so thick it is filling up sump at base

Portal

- No identified deficiencies.

2.3.5 Alternatives Evaluations

No alternatives were identified or evaluated structurally.

2.3.6 Summary of Recommendations

Below is a summary of the recommended structural upgrades to address the items noted above. Table 2-3 summarizes additional detail with respect to the structural recommendations that is used in the summary of plant-wide recommendations included in Section 5. For Structural recommendations that include capital improvements, an initial construction cost was developed, which is then used to derive an approximate design cost, engineering services during construction (ESDC) cost and soft costs (e.g. permitting, AWWU labor, etc.) using assumed percentages of 12%, 6% and 20% respectively. The sum of these parameters is shown as a Total 'Project' Planning Cost.

STRUCT-1, Utilidor Repair

- Scope of recommended improvements:
  - Seal cracks in utilidor lid & walls between Headworks & ERS
  - Replace sealant at each end
  - Repair asphalt and provide drainage

Figure 2-13
Cracked Pavement over Utilidor

STRUCT-2, Cracks in Headworks Tank

- Scope of recommended improvements:
  - Seal cracks in Headworks tank

STRUCT-3, Cracks in Floc/Sed Basin Floors

- Scope of recommended improvements:
  - Repair cracks in Floc/Sed Basin second floor slabs
  - Repair seals around floc basin influent channel

STRUCT-4, Cracks in Service Gallery Walls

- Scope of recommended improvements:
  - Repair cracks in Service Gallery walls

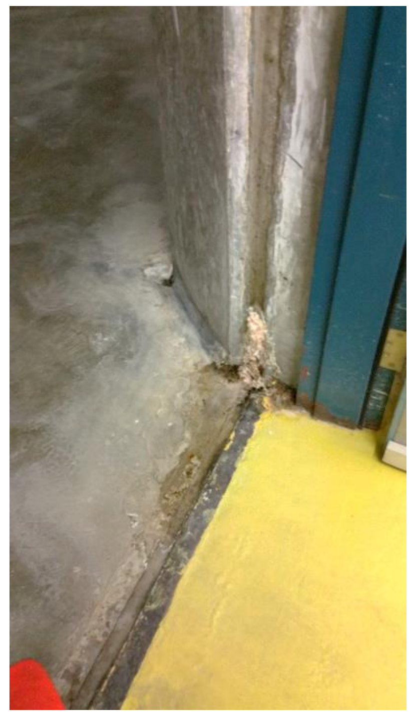

Figure 2-14
Door Seal Leaks

Figure 2-15a
Floor Cracks

Figure 2-15b
Leaking joint near riser box/floc basin transition

Figure 2-16
Wall Cracks

Figure 2-17
Exposed Rebar

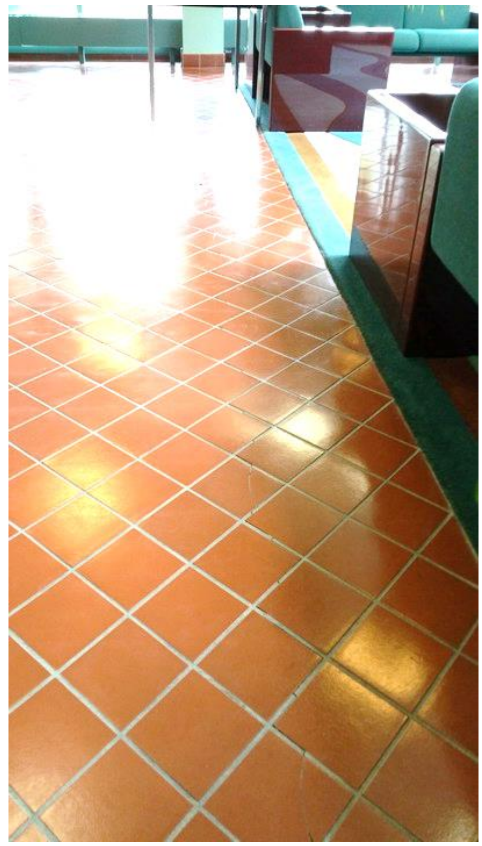

Figure 2-18
Lobby Floor Crack

Figure 2-19
Stair Modifications

STRUCT-5, Chemical Storage Rebar

- Scope of recommended improvements:
    - Coat and protect exposed rebar in Chemical Storage

STRUCT-6, Repair Lobby Floor Crack

- Scope of recommended improvements:
    - Repair floor crack in Lobby

STRUCT-7, Effluent Vault Stair Repair

- Scope of recommended improvements:
  - Stair repairs in Effluent Vault (handrail bases & stringer cut)

STRUCT-8, Intake Structure Calcium Build-up

- Scope of recommended improvements:
  - Remove calcium build-up from base of intake structure

Figure 2-20
Calcium Build-up at Sump

Figure 2-21
Calcium Weeping through Walls

Table 2-3: Structural – Summary of Recommendations and Planning Level Costs

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
STRUCT1	Utilidor Repair	Mitigate Concrete Degradation	Medium	Medium	$150,000	$207,000
STRUCT2	Repair Headworks Tank Cracks	Mitigate Concrete Degradation	Medium	Medium	$150,000	$207,000

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
STRUCT3	Floc/Sed Basin Floor Cracks and Riser Box Seal	Avoid premature Rebar Failure and seal observed leaking joint	Low	Low	$150,000	$207,000
STRUCT4	Service Gallery Wall Cracks	Avoid premature Reba Failure	Low	Low	$50,000	$69,000
STRUCT5	Coat/Protect Chemical Storage Rebar	Avoid premature Reba Failure	Low	Low	$2,500	$3,000
STRUCT6	Repair Lobby Major Floor Crack	Worker/Visitor Safety	Low	Low	$20,000	$28,000
STRUCT7	Effluent Vault Stair Repair	Clear Egress/Worker Safety	Low	Low	$15,000	$21,000
STRUCT8	Remove Intake Structure Calcium Build-Up	Avoid Future/Potential Equipment Disruption	Low	Low	$40,000	$55,000

Because the total project costs derived for planning purposes are below $500k, Recommendations STRUCT1 through STRUCT8 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

2.3.7 Special Considerations for Implementation

None of the recommended items listed above will cause disruption to daily activities during implementation and thus no special considerations are noted.

2.4 Site/Civil

2.4.1 Applicable Codes

Codes that apply to the site/civil infrastructure evaluation discussed in this section include the following:

- Municipality of Anchorage Standard Specifications (MASS) requirements for civil and water pipeline work.
- AWWU Design and Construction Practices Manual (DCPM) requirements for water pipelines.
- Occupational Safety and Health Administration (OSHA) codes that relate to worker safety including confined space entry and tunnel work.

2.4.2 Existing Facilities and Infrastructure

Lake Diversion Tunnel (RW-038)

The 8,620 LF (linear foot) Lake Diversion Tunnel is constructed with 8,458 LF of 72-inch diameter pre-stressed concrete cylinder pipe (PCCP). The 72-inch PCCP pipe contains 119 LF of pipe with welded joints and 8,339 LF of pipe with double gasketed joints. The remainder of the Lake Diversion Tunnel pipe was built with welded steel pipe that was installed upstream of the meters at each valve shaft and includes 82 LF of 54-inch pipe at the Intake Valve Shaft and 80 LF of 54-inch pipe at the Portal Valve Shaft.

Most of the Lake Diversion Tunnel is about 200 feet below the ground surface. A tunneling machine was used to construct the 9.5-foot diameter tunnel in the existing gravel soils. As the tunneling work progressed, a steel beam and wood structure was built to support the tunnel walls. After the tunnel was built, the PCCP pipe was installed by sliplining (insertion process) it into place from the lower end of the tunnel. Cement grout was used to fill the annular space between the PCCP and the tunnel walls to help secure the PCCP water pipe. Joints in the PCCP pipe were covered with hand-applied mortar on the inside and outside of the connections.

Complications during construction led to a portion of the PCCP becoming collapsed. A 16-foot long by 60-inch diameter steel repair section was built between station 89+97 and 90+13 to cover the collapsed area. This repair is located 470 feet downstream from the Intake Valve Shaft (station 94+81).

Access for Inspection

The Lake Diversion Tunnel can be drained to perform an inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the Lake Diversion Tunnel. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Access to inspect the Lake Diversion Tunnel would be via hatches that are located at each end of the tunnel; one is in the Intake Valve Shaft structure and the other is in the Portal Valve Shaft structure. The hatches provide a 24-inch diameter access into the pipe.

A gate valve in the Intake Valve Shaft structure controls the water flow into the Lake Diversion Tunnel pipeline. Two butterfly valves in the Lake Diversion Tunnel raw water pipe are also located in the Intake Valve Shaft and the Portal Valve Shaft. When man-entry work is performed, both the gate valve and the butterfly valve in the Intake Valve Shaft must be closed.

Corrosion Monitoring Stations

Twelve corrosion monitoring stations are located periodically along the Lake Diversion Tunnel. They are used to measure the potential corrosion activity in the soil that is outside of the steel tunnel liner. They do not provide corrosion readings for the PCCP pipe. Two of the stations are located in the Intake Valve Shaft and Portal Valve Shaft (one in each valve shaft). Readings can be taken from the wall-mounted boxes in these two structures. The remaining ten corrosion monitoring stations are positioned along the 72-inch PCCP pipe. Readings from the stations inside the pipe can only be taken by dewatering the pipe and walking to each station.

In the O&M Manual, Section 302000 contains information about the monitoring stations in the tunnel. The 10 corrosion monitoring stations are used to measure the potential corrosion activity on the soil side of the steel tunnel liner. They consist of high purity zinc reference electrodes extending approximately 6 inches into the soil outside of the tunnel, with test connections terminated on the interior of the tunnel.

The O&M Manual describes the testing procedure for the diversion tunnel corrosion monitoring stations. A DC voltmeter is set at a 1-volt to 2-volt range and used to measure the voltage between the zinc electrode and the adjacent 3-inch diameter pipe coupling that is connected to the steel tunnel wall. Measurements taken are to be compared to previous readings to identify changes which may be indicative of corrosion activity. According to the O&M Manual, changes in potential measurements exceeding a 10 percent difference from previous readings could indicate possible corrosion activity.

Initial potential measurements were taken during the week of August 24, 1987. These are the only known previous readings taken from the corrosion stations inside the tunnel. The results are shown below:

Station No.	Potential Measurement (Volts)
94+47	0.575
89+94	0.636
78+45	0.863
69+92	0.270
59+91	0.917
48+47	0.927
39+90	0.884
29+89	0.587
19+88	0.236
10+13	0.417

The O&M Manual recommended that the electrode test stations in the Lake Diversion Tunnel be checked and tested periodically. No regularly scheduled sequence for this testing work was required.

P-4 Raw Water Transmission Pipeline (RW-039)

Description

The P-4 Raw Water Transmission pipeline was installed using the traditional trench excavating and backfill method. The 32,253 LF mortar lined and coated steel pipeline (MLCP or CML&C steel) contains 16,199 LF of 54-inch diameter pipe and 16,148 LF of 60-inch diameter pipe. The pipe joints are welded and covered with mortar/grout in the field. The MLCP is constructed with a steel core that is wrapped on the outside with wire reinforcement. Cement mortar covers both the inside and the outside of the steel.

In 2016, AWWU staff cleared and graded the access road along the P-4 pipeline. The entire pipeline route can now be traveled with a 4-wheel drive vehicle.

Access for Inspection

The P-4 Raw Water Transmission pipeline can be drained to perform an internal inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the pipe. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Approximately 23,000 feet (70%) of the P-4 raw water pipe that is located along the creek bottom will not drain by gravity into the Energy Recovery Station. To drain this portion of the P-4 pipe, a blow off valve must be opened. The blow off valve is located approximately 4,400 feet upstream of the Energy Recovery Station at the low point of the P-4 pipeline.

Access to inspect the inside of P-4 would be via 17 hatches that are located along the pipeline; one is in the Portal Valve Shaft structure, one is in the Energy Recovery Station structure and 15 underground hatches are spaced out along the P-4 pipe. The hatches provide a 24-inch diameter access into the pipe. Digging an excavation approximately 13 feet deep would be required to reach the 15 hatches that are spaced out along the pipeline. The locations of the buried access hatches are marked on the surface with two vertical 6-inch diameter marker pipes.

Corrosion Test Stations

Standard two-wire corrosion test stations are installed at approximately 1,500-foot intervals along the P-4 pipeline. A total of 22 test stations are connected to the pipe. Test station readings have been recorded by AWWU staff a total of seven times for the years 1990, 1992, 1998, 2000, 2002, 2004 and 2006. No readings have been taken since 2006.

The Eklutna WTF O&M Manual recommends a two-year interval to measure and record potential at the corrosion test stations along the P-4 Raw Water Transmission pipeline. The Manual also recommends that at least twice a year the pipeline should be inspected for minor leaks by walking the pipeline route during dry weather and looking for water emitting from the ground or wet spots above the pipe.

Clearwell Underdrain Piping (CLW-B2-006)

The clearwell underdrain piping consists of a network of perforated pipes that collect groundwater from the soil that is under and around the clearwell structures. The perforated pipes eventually drain all the collected groundwater into a buried concrete structure called the "clearwell vault." The vault is located on the west side of the clearwells. The water that is collected in the vault flows over a "V" notch weir and then flows through a pipe and eventually discharges onto the ground surface and existing creek channel that is located downhill and to the west of the clearwells.

Fencing and Gates

The treatment plant site is surrounded and kept secure with a chain link fence that is provided with barbed wire at the top. Gates are located at each of the two access roads into the site. AWWU staff maintain an access path along the fence line. The path was brushed-out in 2016.

Parking and Roads

Roads through the site are predominately covered with asphalt. All the parking areas near the buildings are paved with asphalt. Gravel covered roads exist around the sludge lagoons.

2.4.3 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No site/civil were found to have a *moderate*, *major* or *catastrophic* risk rating level. The risk matrix shown in Table 2-4 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 2-4: Site/Civil – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Parking/Roads	Asphalt surface w/concrete curb gutter	3	2	2	2	3	3	2	2
Fencing/Gates	Chainlink fence w/barbwire, auto gates	3	2	2	2	3	3	2	2
Street Lights		1	2	2	2	3	3	2	1
Landscaping	Grass, trees, shrubs, wild growth areas	1	2	2	2	3	3	2	1
Grounddowns/Drainage		1	2	2	2	3	3	2	1
Storm water system	Surface drainage, culverts, piping	3	2	2	2	3	3	2	2

2.4.4 Assessment

Lake Diversion Tunnel and P-4 Transmission Pipeline Condition Assessment Program

On September 26, 2016, a meeting was held at AWWU's engineering office to discuss and select a plan for assessing the condition of the raw water pipeline. Details regarding the proposed detailed condition assessment are provided in Appendix C.

Clearwell Underdrain Piping Assessment Program

It is recommended that the clearwell vault be inspected periodically to confirm that it is continuing to function properly. Methods described in the EWTF O&M manual should be followed.

Fencing

The entire perimeter fence was inspected on May 3, 2016 and was found to be damaged in five separate locations. A total of approximately 120 feet of fence is in need of repair. The damage had been caused mostly from large trees that had fallen and partially collapsed the fence.

Parking and Roads

The paved roads and parking areas were inspected on May 3, 2016. Generally, they are in good condition except for an area near the maintenance garage entrance and nearby parking stalls and the roads around the lagoons. Near the garage, an area of asphalt that is approximately 150 feet by 75 feet was cracked and partially heaved and needs removal and replacement. The separated joint in the storm pipe in this area should be repaired before the asphalt is replaced. The asphalt covered single land roads (2,000 LF) that access and surround the lagoons is deteriorating and vegetation and brush is growing through the surface. The asphalt should be removed and the remaining subgrade patched with leveling course (D-1) gravel.

Figure 2-22 depicts the extent of improvements described by site/civil recommendations.

Figure 2-22
Extent of Site/Civil Upgrades

2.4.5 Alternatives Evaluation

No alternatives were identified or evaluated as part of the site/civil evaluation.

2.4.6 Summary of Recommendations

Table 2-5 summarizes additional detail with respect to the site/civil recommendations that is used in the summary of plant-wide recommendations included in Section 5. For site/civil recommendations that include capital improvements, an initial construction cost was developed, which is then used to derive an approximate design cost, engineering services during construction (ESDC) cost and soft costs (e.g. permitting, AWWU labor, etc.) using assumed percentages of 12%, 6% and 20% respectively. The sum of these parameters is shown as a Total 'Project' Planning Cost.

Table 2-5: Site/Civil – Summary of Recommendations and Planning Level Costs

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
CIVIL1	Lake Diversion Condition Assessment	Mitigate concrete degradation	High	High	N/A - Engineering Effort Only	
CIVIL2	P-4 Transmission Pipeline Condition Assessment	Mitigate concrete degradation	High	High	N/A - Engineering Effort Only	
CIVIL3	Clearwell Underdrain Piping Assessment Program	Avoid premature rebar failure	Low	Low	N/A - Engineering Effort Only	
CIVIL4	Repair Perimeter Fence	Safety/Security	Low	Low	$7,500	$10,000
CIVIL5	Repair Cracking and Heaving Asphalt	Personnel/Visitor Safety	Low	Low	$40,000	$55,000
CIVIL6	Repair Lagoon Roads	Personnel/Visitor Safety and Long-Term Maintenance	Low	Low	$15,000	$21,000

Because the total project cost derived for planning purposes is below $500k, Recommendations CIVIL1 through CIVIL6 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

2.4.7 Special Considerations for Implementation

None of the recommended capital improvements listed above will cause disruption to daily activities during implementation and thus no special considerations are noted. Refer to Appendix C for planning and staging constraints associated with manned entry for the proposed tunnel condition assessment.

2.5 Electrical

2.5.1 Applicable Codes

The existing electrical systems were reviewed based on the following codes and standards:

- 2012 IBC
- 2012 IFC
- 2104 NFPA 70 (NEC)
- 2013 NFPA 72

2.5.2 Existing Facilities and Infrastructure

For the main facility, Energy Recovery Station (ERS) and outbuildings, the electrical service, distribution, lighting, fire alarm and public address equipment are mostly original from the mid-1980s construction. The plant–wide SCADA infrastructure and standby generation system were more recently replaced in 2003 and 2016 respectively. Much of the electrical distribution equipment (panelboards, Motor Control Centers (MCCs), dry-type transformers, etc.) are manufactured by Square D (now Schneider Electric). The equipment is near the end of the manufacturer's recommended useful life. Replacement parts are available, however, due to the age of the equipment, many items are not readily available and have long delivery times. This could result in significant operational down-time for the facility's critical equipment.

The intake and portal building's electrical service, distribution and lighting equipment are mostly original from the mid-1980s construction. The equipment is near the end of the manufacturer's recommended useful life.

2.5.3 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Switchgear serving the EWTF was found to be a *moderate* risk item. No electrical assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Table 2-6 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 2-6: Electrical – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultatio	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Building Electrical	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical	Exterior Lighting	3	2	2	2	3	3	2	2
Building Electrical	Service Entrance	4	2	2	2	3	3	2	2
Building Electrical	Panelboards	3	2	2	2	3	3	2	2
Building Electrical	Transfer Switches	3	2	2	2	3	3	2	2
Building Electrical	Interior Lighting	2	2	2	2	3	3	2	2
Building Electrical	Panelboards	2	2	2	2	3	3	2	2
Building Electrical	Panelboards	2	2	2	2	3	3	2	2
Building Electrical - Effluent Vault	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical - Effluent Vault	Motor Control Centers	3	2	2	2	3	3	2	2
Building Electrical - Effluent Vault	Panelboards	3	2	2	2	3	3	2	2
Building Electrical - Lagoon Pump Station	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical - Lagoon Pump Station	Exterior Lighting	3	2	2	2	3	3	2	2
Building Electrical - Lagoon Pump Station	Motor Control Centers	3	2	2	2	3	3	2	2
Building Electrical - Lagoon Pump Station	Panelboards	3	2	2	2	3	3	2	2
Building Electrical - Operations Area	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical - Operations Area	Service Entrance	4	2	2	2	3	3	2	2
Building Electrical - Operations Area	Switchboards	3	2	2	2	3	3	2	2
Building Electrical - Operations Area	Panelboards	3	2	2	2	3	3	2	2
Building Electrical - Operations Area	Motor Control Centers	3	2	2	2	3	3	2	2
Building Electrical - Operations Area	Standby Power Generator	1	2	2	2	3	3	2	1
Building Electrical - Operations Area	Automatic Transfer Switches	1	2	2	2	3	3	2	1
Building Electrical	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical	Motor Control Centers	3	2	2	2	3	3	2	2
Building Electrical	Panelboards	3	2	2	2	3	3	2	2
Building Electrical	Dry Type Transformer	3	2	2	2	3	3	2	2
Builiding Electrical - Energy Recovery	Interior Lighting	3	2	2	2	3	3	2	2
Builiding Electrical - Energy Recovery	Exterior Lighting	3	2	2	2	3	3	2	2
Builiding Electrical - Energy Recovery	Motor Control Center	3	2	2	2	3	3	2	2
Builiding Electrical - Energy Recovery	Panelboards	3	2	2	2	3	3	2	2
Builiding Electrical - Energy Recovery	Switchgear	3	2	3	2	4	3	3	3
Builiding Electrical - Energy Recovery	Dry Type Transformer	3	2	2	2	3	3	2	2

2.5.4 Assessment

Electrical Service

The EWTF has one standby source in addition to the utility service. The utility service from Matanuska Electric Association (MEA) consists of a single, medium voltage (12.47kV, 3-Phase) underground feeder serving a pad-mounted distribution cabinet ('MVB') located on the Southwest corner of the main building. This service cabinet supplies an adjacent pad-mounted, 1,000kVA transformer stepping down the medium voltage to a 480/277 volt, 3-phase, facility voltage. A 1,200-ampere rated, 480 volt, 3-Phase, 4-wire service feeder is routed below grade along the South side of the building and enters the Main Switchboard (SBD) in the South Electrical Room. The main facility is also supplied by the ERS hydro-turbine which provides power to the medium voltage service through another pad-mounted, 1,000kVA transformer (Figure 2-23). The transformer steps up from 4.16 kV to the higher utility voltage of 12.47kV (3-phase). The ERS supplies the entire facility load on a regular basis and generates excess capacity. The excess capacity is used by the utility to supply other loads on the MEA system.

The portal building has a manual connection for a portable standby generator in addition to the utility service. The utility service from Matanuska Electric Association (MEA) consists of a pole mounted transformer stepping down the medium voltage to the 240/120 volt, 1-phase facility voltage. The 200-ampere rated meter and main service equipment appears to have been installed as a construction temporary on the utility service pole and never relocated to the building for the final installation (Figure 2-24).

The intake structure has a manual generator connection and portable genset located adjacent to the building. A pad-mounted utility (MEA) service transformer supplies the structure, stepping down the medium voltage to 240/120 volt, 1-phase at the facility.

Figure 2-23
Medium Voltage Service Transformer

Figure 2-24
Portal Building Service Equipment

Service Switchgear

In the main treatment facility, the South Electrical room houses the 480-volt main switchboard 'SBD' and standby generator Automatic Transfer Switch (ATS). The SBD is a Square D POWER STYLE switchboard rated at 1200 amperes, 480 Volts, 3-phase with a 65,000-ampere short circuit interrupting rating (65K AIC). The SBD consists of three sections, the incoming service section with CT compartment, main service disconnect and electronic power meter (metering the entire service, monitored by SCADA) and the distribution section (Figure 2-25) for the facility MCC feeders. A new (2016 construction) ASCO 7000 SERIES Power Transfer and Bypass ATS has been added to the end of the line-up (Figure 2-26).

Figure 2-25
480 Volt Main Switchboard 'SDB'

Figure 2-26
New Automatic Transfer Switch

Standby Generator

A new (2016 construction) diesel-fired standby generator was recently installed at the main treatment facility building. The generator is a Marathon Electric Model number MTU BV1600 DS400, 400kW, 1800 RPM, 277/480 Volts, 3-Phase unit. The generator is connected back to the 'SBD' bus via a 600-ampere circuit breaker and 1000 ampere rated ATS (Figure 2-26).

In case the utility service loses power, the ATS will automatically transfer the facility to the standby generator source. The standby system will carry the priority loads for the main treatment facility and shutdown once the ATS transfers back to the restored utility source.

Distribution and Motor Control Centers (MCCs)

Power is distributed throughout the facility from the main switchboard (SBD) at 480 volts, 3-phase to MCCs and panelboards. In the main facility, the North and South electrical rooms house the majority of the MCCs. The North electrical room contains MCC-A and E while the South electrical room houses MCC-B and F. The outbuilding MCCs include MCC-C in the Lagoon Pump Station building, MCC-D in the Waste Washwater Pump Station and MCC-G in the Effluent Vault building.

The 480 volt, 3-phase panelboards are located throughout the plant and supply loads (mainly lighting and special receptacles) not served by the MCCs. Loads requiring 120/208 volt, 3-phase are provided using step down dry-type transformers connected to distribution panelboards.

The existing MCCs are all original from the mid-1980s construction. The equipment is vulnerable to prolonged outage due to age and lack of readily available replacement components. Further, the facility-wide SCADA upgrade in 2003 provided for a non-standard, discrete, hardwired interface (Figure 2.28) between the existing MCC controls and the PLC based SCADA system. As a result, the existing MCC equipment is not capable of communicating with SCADA using modern protocols and this results in less functionality information available to system.

A programmatic upgrade of the existing MCCs to Intelligent MCCs with individual starters, drives, and feeder circuit breakers interconnected using a fieldbus network (e.g., DeviceNet) and networked to the Plant SCADA System would provide additional functionality and device parameters available for adjustment, status, monitoring, and trending through the Plant SCADA System.

Intelligent MCCs would allow additional data to be monitored, collected, and trended enabling better proactive/predictive maintenance of starters and drives as well as mechanically driven process equipment as well as provide a better understand of the nature of motor starter and drive issues remotely for operators and maintenance technicians.

Much of the cost of procuring, implementing, and configuring the Intelligent MCCs would be offset by the simplified wiring required between the MCC starters, drives, and power monitors and Plant SCADA System. All devices within an Intelligent MCCs will be communicate to the Plant SCADA system though a single network cable instead of multiple hard-wires for each starter and drive resulting in significantly reduced installation cost for conduit and wire.

Replacing the existing MCCs with Intelligent MCCs is recommended whenever an existing MCC is replaced because it is approaching the end of its expected service life or requires significantly modification because of plant process modifications.

Figure 2-27
MCC-E Motor Control Center

Figure 2-28
SCADA Interface Cabinet

Lighting

This section briefly describes the existing lighting for the facility. The only code compliance issue that was noted is the inadequacy (in spacing and location) of the existing emergency lighting to meet current codes. The recommendations are limited to energy conservation and maintenance items.

Interior Lighting

The majority of the spaces within the main facility and outbuildings use linear fluorescent fixtures and appear to be mostly original from the mid-1980s construction. The fixtures use T12 40W lamps with magnetic ballasts which are both less efficient than modern fixtures of the same type. These fixtures are controlled by local switches at the entry/exits to the spaces. Lighting in the Flocculation Basins, Sedimentation Basins and Filtration areas use High Pressure Sodium (HPS) fixtures (Figure 2.29). These fixtures are controlled by lighting contactors and pushbutton stations located at common entry/exit points. Emergency lighting consists mainly of self-contained battery backup units and incandescent exit signs located to facilitate egress from the building. As indicated in the first part of this section, the emergency lighting appears inadequate in some areas to meet current codes.

Exterior Lighting

The majority of building mounted exterior lighting uses HPS type fixtures. The facility roadway and site lighting is provided by pole mounted HPS “cobra head” type fixtures with mast arms (Figure 2.30). All fixtures appear to be from the original mid-1980s construction.

Modern LED replacements to linear fluorescents and HPS fixtures are commonly used in treatment facilities today. This fixture type provides a higher efficiency than the existing and offers a significant (2-3 times) increase in the operational lifetime of the equipment.

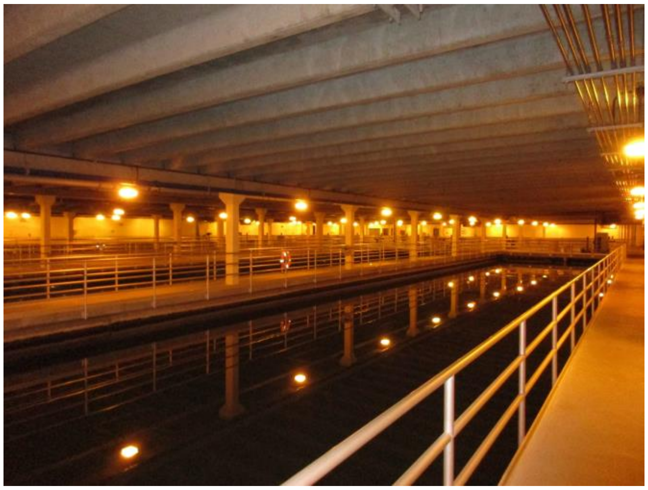

Figure 2-29
Floc and Sedimentation Basins

Figure 2-30
Pole Mtd Fixture

Plant-Wide Communications Network

The existing network within the EWTF consists of a patch work of installed networks serving industrial control, administration and site security/public address IP applications and connected into a single undifferentiated network. Each network using numerous different communications protocols. The existing system lacks the network security and efficiency of a network with virtual or physical separation between the application types. The most important being the industrial control network upgrade to meet modern standards of security for facilities with a critical mission requirement. It is recommended that a new plant-wide network be provided with secure separation between the three distinct network types: industrial control, administration and camera/access/public address applications. The network design that is currently being developed for other AWWU facilities would define this standard.

Fire Alarm System

The fire alarm system consists of a non-addressable control panel, initiating and annunciating devices covering six zones throughout the main facility building. The control panel is manufactured by Kidde Fire Systems (Figure2.31) and appears to be original from the mid-1980s construction. The system is near the end of the manufacturer's recommended useful life and is not compliant with current codes with regards to panel type, device spacing and functionality.

Figure 2-31
Fire Alarm Control Panel

Public Address System

The public address/paging system consists of a connection to the telephone system, page control unit, power supply(s) and paging speakers located throughout the facility. The system headend components (Figure 2.32) are manufactured by Valcom and appear to be original from the mid-1980s construction. The system is near the end of the manufacturer's recommended useful life. The facility staff have indicated that the system is not functioning properly and has been an ongoing maintenance issue. The public address system functionality and expandability will be greatly enhanced with the installation of a plant-wide communications network using a dedicated segment for security and public address

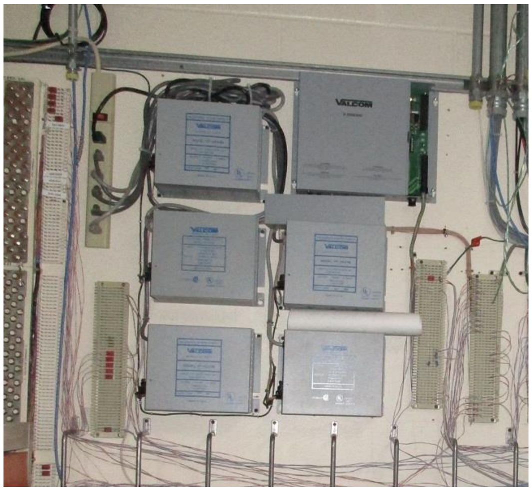

Figure 2-32
Public Address Head-End Equipment

Figure 2-33
Public Address Horn Speaker

Additional CCTV Coverage

The CCTV cameras are in designated areas in the Main Facility and outbuildings to provide required site security and process monitoring. The cameras are IP based and utilize the existing Ethernet network to communicate with the Main Facility's control room. The cameras are monitored and controlled by facility personnel using software on local PCs. The camera system functionality and expandability will be greatly enhanced with the installation of a plant-wide communications network using a dedicated segment for cameras and public address. Initial discussions with AWWU staff indicated a potential need for additional coverage at certain locations (e.g. floc/sed and filter basin areas); however, this additional CCTV coverage was already being implemented at the time of this writing.

Uninterruptible Power Supplies

There are several distributed uninterrupted power supply (UPS) units through the facility. These stand-alone units do not have a central monitoring capability. After power outages, there have been instances of UPSs not charged for carrying through the outage. Some units have been replaced in the main building, but other areas/buildings are still served by distributed stand-alone UPSs.

Based on AWWU staff experience with unreliability and lack of status monitoring capability of the small portable plug-in (consumer off the shelf) style UPSs serving critical loads such as vendor control panels, a "stationary type" (e.g., Liebert UPS presently installed in the Administration Building), should be installed in each remote building and hard-wired UPS circuits be wired to the existing UPS loads. The “stationary UPSs” would be installed in the electrical room serving each building, where space and clearance requirements allow.

Larger industrial/commercial type stationary UPSs are more reliable and provide the ability for remote monitoring than the existing stand-alone plug-in consumer type UPSs.

Providing control panels with UPS power from a more reliable source would improve operator ability to focus on water process by reducing the potential for the need to address problems with UPSs when process equipment is needed during a power outage.

Replacing the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs is recommended.

2.5.5 Alternatives Evaluation

No alternatives were identified or evaluated for the Electrical upgrades identified above. Typical alternatives would include manufacturer make and model preferences that would be more thoroughly evaluated and determined during design.

2.5.6 Summary of Recommendations

Below is a summary of the recommended electrical upgrades described above. Table 2-7 summarizes additional detail with respect to the electrical recommendations that is used in the summary of plant-wide recommendations included in Section 5. For Electrical recommendations that include capital improvements, an initial construction cost was developed, which is then used to derive an approximate design cost, engineering services during construction (ESDC) cost and soft costs (e.g. permitting, AWWU labor, etc.) using assumed percentages of 12%, 6% and 20% respectively. The sum of these parameters is shown as a Total ‘Project’ Planning Cost.

Scope of recommended improvements for the main EWTF:

- Full replacement of the medium voltage (above 600 volt) equipment (switch cabinet, transformers, feeders) and 480-volt service feeder is recommended at this time. It is preferable from a maintenance standpoint and more typical for the serving utility (MEA) to own and maintain all of the medium voltage system. The only exception may be the 4.16 kV feeder from the step-up transformer to the ERS power equipment.
- Full replacement of the 480-volt service switchgear (SBD) is recommended at this time.
- Due to the recent new installation (2016) of the standby generator system, no capital improvements to that system are recommended at this time.
- Full replacement of the plant-wide communications network is recommended at this time
- Full replacement of the MCCs with modern equipment using standard SCADA communications protocols is recommended to be programmed over a multiple year replacement duration.
- Replacement of the existing interior and exterior lighting with LED fixtures is recommended at this time.

- Full replacement of the fire detection and alarm system is recommended at this time.
- Full replacement of the public address/paging system is recommended at this time.

Scope of recommended improvements for the portal building:

- full replacement of the power service and distribution equipment is recommended at this time. It is further recommended that a permanent standby generation system be installed to support this facility.

Scope of recommended improvements for the intake structure:

- full replacement of the power service and distribution equipment is recommended at this time. It is further recommended that a permanent standby generation system be installed to support this facility.

Table 2-7: Electrical – Summary of Recommendations and Planning Level Costs

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
ELEC1	Plant Primary Service Upgrade	Increased power reliability/resiliency	Medium	High	$2,000,000	$2,760,000
ELEC2	Intake Facility Service Upgrade	Increased power reliability/resiliency	Medium	High	$350,000	$483,000
ELEC3	Portal Facility Service Upgrade	Increased power reliability/resiliency	Medium	High	$250,000	$345,000
ELEC4	Plant MCC Distribution Upgrades	Additional functionality; enhanced monitoring capabilities	Low	Medium	$2,000,000	$2,760,000
ELEC5	Plant Light Fixtures Upgrade	Increased efficiency	Low	Low	$225,000	$311,000
ELEC6	Plant Fire Alarm System	Worker/Visitor Safety	Medium	Low	$200,000	$276,000
ELEC7	Plant Public Address System	Worker/Visitor Safety	Medium	Low	$100,000	$138,000
ELEC8	Additional CCTV Coverage	Worker Safety, enhanced monitoring	Medium	Low	$20,000	$28,000
ELEC9	Uninterruptible Power Supply Upgrades	Improved monitoring, maintenance, reliability	Medium	Low	$250,000	$345,000
ELEC10	Exterior Lighting Upgrades & Cabinet Controls	Worker/Visitor Safety	Medium	Low	$80,000	$110,000
NET1	Plant-Wide Common Network Upgrades	Additional functionality; enhanced monitoring capabilities	High	High	$1,500,000	$2,100,000

Implementation of the above recommendations would alleviate the 'moderate risk' item (switchgear) noted in the Asset Management Plan for Site Electrical to the extent practical.

Because the total project costs derived for planning purposes exceed $500k, Recommendations ELEC1 and ELEC 4 are subject to a Business Case Evaluation (BCE)-1 per AWWU's draft BCE guidance document dated August 2016. Because the total project costs derived are less than $500k, recommendations ELEC2, ELEC3 and ELEC5 through ELEC10 are subject to a BCE-0. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan

2.5.7 Special Considerations for Implementation

Replacement of existing MCCs with Intelligent MCCs would likely be justified when the MCCs need to be replaced because they are approaching their end of life or need to be replaced or significantly modified to support new process equipment. The plant-wide network and communication upgrade would benefit a number of related Electrical upgrades (all but the primary service upgrades) and therefore should be sequenced to occur before any large expenditures associated with intelligent MCCs, public address systems, etc. Coordination with MEA should be initiated prior to implementation of primary service upgrades to efficiently stage and sequence this work.

2.6 Building Mechanical (Heating, Ventilation, and Plumbing)

2.6.1 Applicable Codes

The existing building mechanical systems were reviewed based on the following codes and standards:

- 2012 IBC
- 2012 IFC
- 2012 IMC
- 2012 UPC
- 2012 International Fuel Gas Code (IFGC)

2.6.2 Existing Facilities and Infrastructure

The main building is heated with a combination of systems. A pair of gas fired boilers provides heat to a hydronic system serving unit heaters and convectors and air handler coils via water to glycol heat exchangers. Some process areas of the main plant building such as the energy recovery station, primary coagulant and soda ash storage area, floc/sed basins and filters are heated and ventilated using individual gas-fired unit heaters and duct heaters. Additionally, a snowmelt system for the service entrance at the lower level is served using a water to glycol heat exchanger.

Outbuildings, such as the intake tunnel including the washwater pump station, lagoon pump station and effluent vault are heated and ventilated using electric resistance heat. The tunnel intake shaft and tunnel portal vault are also heated and ventilated using electric resistance heat.

Water systems, particularly hot water, domestic water and utility water have been attacked by the aggressive water, causing numerous leaks. Patches and pipe sections have been replaced, but leaks are still occurring. The domestic hot water in the admin/operating area has been replace with PEX piping.

2.6.3 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No building mechanical assets were found to have a *moderate, major* or *catastrophic* risk rating level. The risk matrix shown in Table 2-8 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 2-8: Building Mechanical – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Building Mechanical	Air Handling Units	3	2	2	2	3	3	2	2
Building Heat & Vent	Exhaust fans	2	2	2	2	3	3	2	2
Building HVAC	Boiler	2	2	2	2	3	5	3	2
Building HVAC	Boiler	2	2	2	2	3	5	3	2
Building HVAC	Air Handler	3	2	3	2	2	3	2	2
Building HVAC	Air Handler	3	2	3	2	2	3	2	2
Building HVAC	Air Handler	3	2	3	2	2	3	2	2
Building HVAC	AC System	1	2	2	2	3	3	2	1
Building HVAC	Miscellaneous exhaust fans	2	2	2	2	3	3	2	2
Building HVAC		2	2	2	2	3	3	2	2
Building HVAC - Energy Recovery	Heaters & Fans	2	2	2	2	3	3	2	2
Building Services	Water Heater	1	2	2	2	3	3	2	1
Building Mechanical - Effluent Vault	HVAC System (fans and heaters)	2	2	2	2	3	3	2	2
Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	3	2	2	2	3	3	2	2
Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	3	2	2	2	3	3	2	2

2.6.4 Assessment

The building mechanical equipment in this facility is generally original to the late 1980s construction and is still serviceable and operating, although some pieces of equipment have been recently replaced. Most building mechanical equipment is expected to last between 25 and 30 years. Because the original Eklutna WTF equipment is nearing this age range, it is prudent to budget for equipment replacement in the coming years.

In particular, gas fired equipment using air heat exchangers such as unit heaters and duct furnaces are susceptible to cracking of the heat exchangers, leading to flue gasses entering the occupied spaces. AWWU has replaced unit heaters in the floc/sed basin area recently, but a number of gas-fired heater are still original. Three gas-fired unit heaters in the ERS should be replaced, as they are original to the plant construction. Additionally, hydronic unit heaters in the truck bay have been problematic with issues occurring with controls and motors.

The boilers are the units originally installed in 1987 and are regularly inspected and maintained. The scotch marine fire-tube style boilers are susceptible to cracking and leaks at the tube sheets but inspections have not yet revealed any problems in that area. However, repairs have recently been necessary to the burner controls.

The snowmelt system at the lower level at the entries to the disinfection chemical area is no longer operational, creating a safety hazard for personnel delivering disinfection chemicals.

The fluoride ventilation system equipment is inadequate to properly contain the contamination, drawing air from the room rather than directly at the source. The configuration of the exhaust fans creates a negative pressure with respect to the hopper. The resulting airflow pattern in the room with the two wall mounted exhaust fans draws fluoride dust from room and exhausts it across the breathing zone of workers.

Domestic water, utility water and domestic hot water systems are in need of replacement due to corrosion. The extent of the work required is in the lower level chemical feed and process area (south of Grid H), lower level mechanical room, upper level process area (south of Grid H) and the operations area. ROM estimates of pipe sizes and lengths are as follows: 4-inch – 500 linear feet, 3-inch – 70 LF, 2-1/2-inch – 65 LF, 2-inch – 240 LF, 1-1/2-inch and smaller – 675 LF. Piping runs in process and mechanical areas are generally overhead exposed, and in the operations area, are generally above dropped ceiling and in piping chases.

2.6.5 Alternatives Evaluations

Two of the duct furnaces, 1-AHU-1 and 1-AHU-2 (see Figure 2-1) serving the primary coagulant and soda ash storage area are original to the plant construction and should be replaced to reduce the chance of cracked heat exchangers and introduction of flue gasses into the plant. The same style units are available with somewhat increased thermal efficiency and the equipment can be replaced essentially in-kind. The three gas fired unit heaters in the ERS should also be replaced as they are approaching end of life. Due to issues with control and motor failures on hydronic unit heaters AWWU has requested that the two-unit heater in the truck bay (3-UH-2 and 3-UH-3) be replaced as well.

The boilers (see Figure 2-2) are approaching the end of their useful life, and the manufacture indicates that while repair parts for burner controls are still available, it is likely that will relatively soon not be the case. There is also a chance that tube-sheet leaks will start occurring due to age which would require major repair or replacement on short notice. Newer boilers have significantly higher thermal efficiency than the existing boilers, and replacement using higher efficiency units would save energy costs over continuing to operate the existing boilers.

Replacement of the snowmelt system would restore the failed system and the safety aspect that such a system provides. Extension of area covered by the system from the base of the stairs to the upper level to the westernmost overhead door would also reduce the potential for both personnel slip and fall incidents and the possibility of a vehicle sliding into and damaging the building.

The fluoride system recommended for replacement should include an upgraded ventilation system, replacing the exhaust fans and incorporating direct duct connections to the bag load station and other points of fluoride transfer in order to keep the dust contained within the bag load station and out of the room.

Water piping systems are deteriorated and should be replaced with piping materials resistant to corrosion. The existing piping systems are constructed of a combination of copper, galvanized steel and some recently installed PEX piping. Corrosion resistant piping materials are available, such as Aquatherm's PPR (polypropylene random) piping system, which is available in the sizes used in the plant. It is a rigid piping system suitable for both cold and hot water systems and is also available with a faser composite layer to resist thermal expansion and flexibility normally seen with other plastic piping material. PPR is joined using a heat fusion joint that produces leak-free joints.

2.6.6 Summary of Recommendations

Below is a summary of the recommended building mechanical upgrades described above. Table 2-9 summarizes additional detail with respect to the building mechanical recommendations that is used in the summary of plant-wide recommendations included in Section 5. For Building Mechanical recommendations that include capital improvements, an initial construction cost was developed, which is then used to derive an approximate design cost, engineering services during construction (ESDC) cost and soft costs (e.g. permitting, AWWU labor, etc.) using assumed percentages of 12%, 6% and 20% respectively. The sum of these parameters is shown as a Total 'Project' Planning Cost.

The scope of the recommended building mechanical upgrades include:

- Replace duct furnaces 1-AHU-1 and 1-AHU-2 with similar units and replace three gas fired unit heaters in the ERS upper and lower levels. Also replace two hydronic unit heaters and associated controls in the truck bay.
- Replace existing Cleaver Brooks Scotch Marine fire-tube Boilers with new Cleaver Brooks condensing boilers (Model CFC-E-700-2000-125hw) with new stacks, including seismic anchoring, and startup services. Reconnect to existing heating water supply and heating water return piping. Provide condensate drain piping for each boiler to floor drain, including in-line condensate neutralization unit.
- Replace the snowmelt system along the south edge of the lower level of the treatment building, extending it from the base of the exterior stairs to the upper level to just west of the westernmost overhead door. Snowmelt area to extend 8'6" south of the building for a length of approximately 93 feet for a total area of approximately 790 square feet. Remove the existing pavement, install insulation, PEX tubing, and replace the pavement with concrete. Install a new heat exchanger to heat glycol solution using heating water from the boiler system and new duplex pumps to circulate the glycol solution through the underslab tubing. Provide a snow sensor near the southern edge of the slab and controls for the system to maintain a snow-free area ratio of at least 50% at all times.
- Replace the fluoride ventilation system in conjunction with the upgrade to the fluoride system (see Section 4.12 of this Facility Plan). The ventilation system should be designed to collect dust at points of generation (bag load station and transfer to the mix tank) and duct it directly to outside.
- Replace the water piping as noted above with non-corrosive polypropylene plastic piping.

Table 2-9: Building Mechanical – Summary of Recommendations and Planning Level Costs

ID	Description	Rationale	Relative Need	Complexity	Construction Cost ($)	Total 'Project' Planning Cost
HV1	Boiler Replacement	Higher efficiency, increased reliability	Medium	Medium	$400,000	$552,000
HV2	Duct Furnace Fan & Heaters Replacement	Worker safety, age of equipment	Medium	Low	$60,000	$83,000
HV3	Loading Area Snowmelt System	Enhanced worker safety; replaces failed system	Low	Low	$25,000	$35,000
HV4	Fluoride Ventilation System Upgrade	Worker safety/code compliance	High	High	N/A/ - included with new fluoride system recommendation (Section 4.12)	
HV5	Domestic Water Piping Replacement	Worker safety/code compliance	High	High	$80,000	$110,000

Because the total project cost derived for planning purposes exceed $500k, Recommendation HV1 is subject to a Business Case Evaluation (BCE)-1 per AWWU's draft BCE guidance document dated August 2016. Because the total project costs derived are less than $500k, Recommendations HV2 through HV5 are subject to a BCE-0. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

2.6.7 Special Considerations for Implementation

None of the recommended items listed above will cause disruption to daily activities during implementation and thus no special considerations are noted.

Figure 2-34
Duct heater 1-AHJ-1

Figure 2-35
Boiler 4-HWB-1 and 4-HBW-2

Section 3

Basis of Planning

3.1 Overview

This section first discusses the two most fundamental Basis of Planning drivers that influence the efficacy and adequacy of any major drinking water facility such as the EWTF:

1. Population and Demand Projections (i.e. how much water demand is there currently and how adequate is that supply likely to be moving forward over the planning horizon)

2. Current and Forthcoming Regulations (i.e. what level of treatment must be achieved both now and at the end of the panning horizon for current and projected demands)

In addition to the above, AWWU also evaluated the long-term reliability of the water supply as part of this Facility Planning effort to document any potential concerns regarding how climate change will impact the long-term viability of the EWTF source water. This section concludes with a summary of the findings of that water reliability study.

3.2 Population and Demand Projections

The following section addresses updates to both the population projections presented in the 2012 Water Master Plan, and demands for potable water expected to be created by AWWU Water Utility customers over the range of the planning horizon.

3.2.1 Planning Horizon

The long-term planning horizon assumed for this plan is 30 years, which is a period between the years 2016 and 2046.

3.2.2 Population Planning

The following paragraphs address updates to projected population data for Anchorage.

Source Data

AWWU's operational records and its 2012 Water Master Plan served as primary references for this review of population and demands for potable water within the AWWU Water Utility Service Area. The 2012 Water Master Plan drew on projected population data reported within the nine references listed below. The authors/originators of these nine references were contacted to determine whether updated versions had been published since 2012. In all cases the population data referenced for the 2012 Water Master Plan was still the most current and relevant data for these population data sources.

1. **Anchorage 2020 Anchorage Bowl Comprehensive Plan**
   Planning Department – Municipality of Anchorage
   February 2001

2. **Anchorage Housing Market Analysis**
   McDowell Group, ECONorthwest
   March 2012

3. **Anchorage Housing Market Analysis**
   Appendix C: Anchorage Forecast for Housing Demand 2010 to 2030
   ECONorthwest
   February 2012

4. **Chugiak-Eagle River Comprehensive Plan Update**
   Planning Department – Municipality of Anchorage
   December 2006
   (Previous Updates in 1993, 2006)

5. **Turnagain Arm Comprehensive Plan**
   Planning Department – Municipality of Anchorage
   December 2009

6. **Crow Creek Neighborhood Land Use Plan**
   Agnew Beck Consulting, LLC
   April 2006

7. **Economic and Demographic Projections for Alaska and Greater Anchorage 2010–2035**
   Scott Goldsmith, HDR
   December 2009
   (Previous Updates in 1987,1997)

8. **Hillside District Plan**
   Planning Department – Municipality of Anchorage, MWH
   April 2010

9. **Girdwood Area Plan**
   Planning Department – Municipality of Anchorage
   February 1995
   (Update Underway Currently)

New and Updated Sources Obtained for This Study

A search was also conducted to find alternative sources for Anchorage population data not utilized in the 2012 Water Master Plan. The following reports were located and reviewed as part of this study:

1. **Alaska Population Projections 2012 to 2042**
   Alaska Department of Labor & Workforce Development (ADOL&WD)
   April 2014

2. **Alaska Population Projections 2015 to 2045**
   (ADOL&WD)
   April 2016

3. **2015 3-Year Economic Outlook**
   McDowell Group
   Anchorage Economic Development Corporation (AEDC)
   2015

Population Projection Comparisons

Figure 3-1 presents estimates of future Anchorage population for the periods reported by the individual data sources up to year 2045. Sources of data for these estimates were:

1. AWWU's 2012 Water Master Plan

2. AEDC's 3-Year Economic Outlook including 2010 to 2015 population data

3. ADOL&WD Alaska Population Projections 2012 to 2045

Figure 3-2 presents the same data but is limited to a time interval of 2010 to 2019.

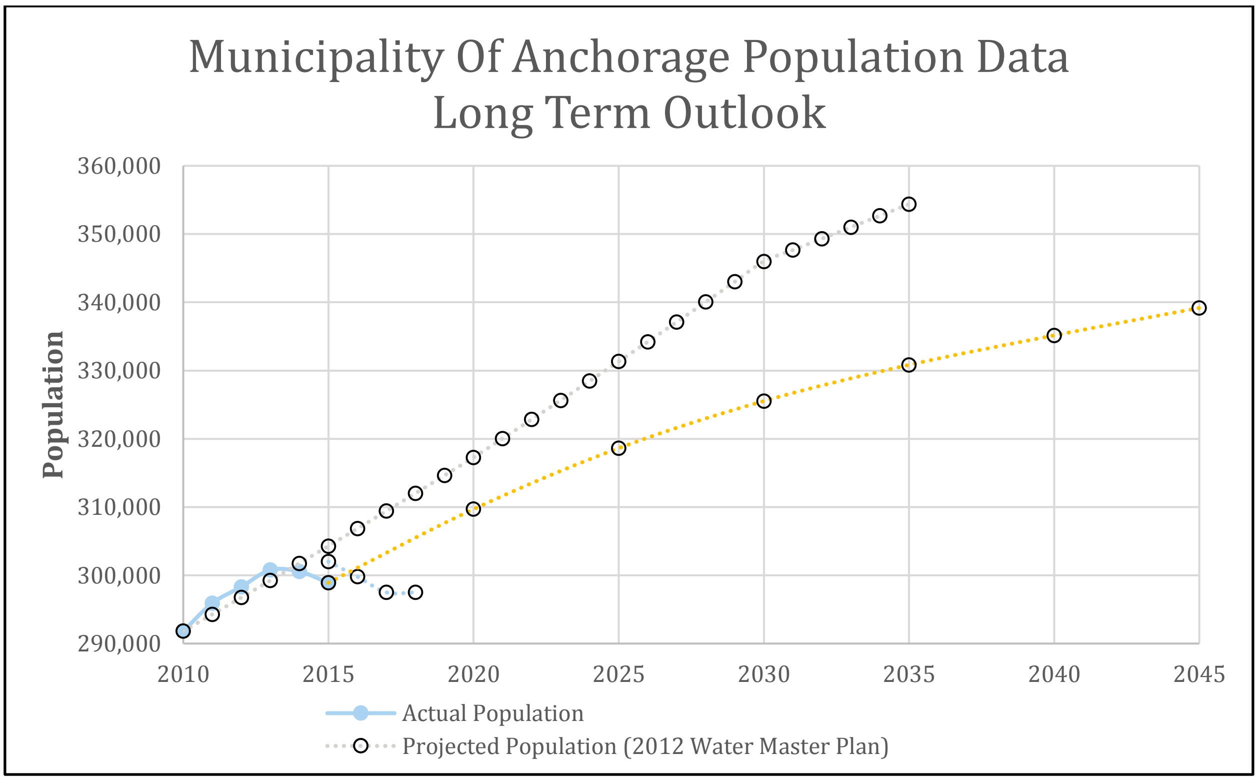

Figure 3-1
Long Term Population Projections Reported by Alternate Sources

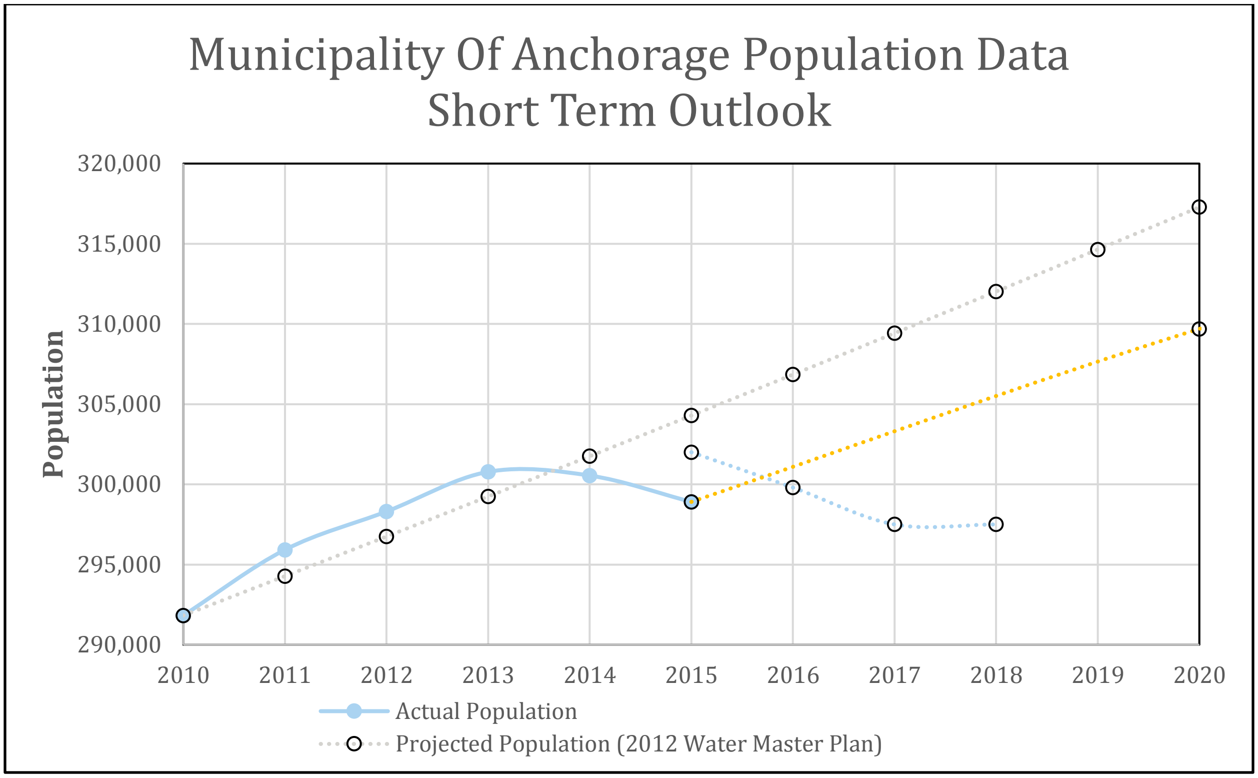

Figure 3-2
Short Term Population Projections Reported by Alternate Sources

Of these three population data sources, the *Alaska Population Projections 2015 to 2045* published by the Alaska Department of Labor & Workforce Development in April 2016 is the most recent review of population trends in Anchorage, provides a long term (30 year) outlook, and captures the economic impacts of oil prices which changed dramatically following 2014. As a result, these data were chosen as the basis for future population in Anchorage for this plan. While the 2012 Water Master Plan offers a very thorough and detailed population analysis, the 2012 Plan was published ahead of the recent and significant drop in the price of oil and, with the advantage of hindsight, may have overestimated future population trends.

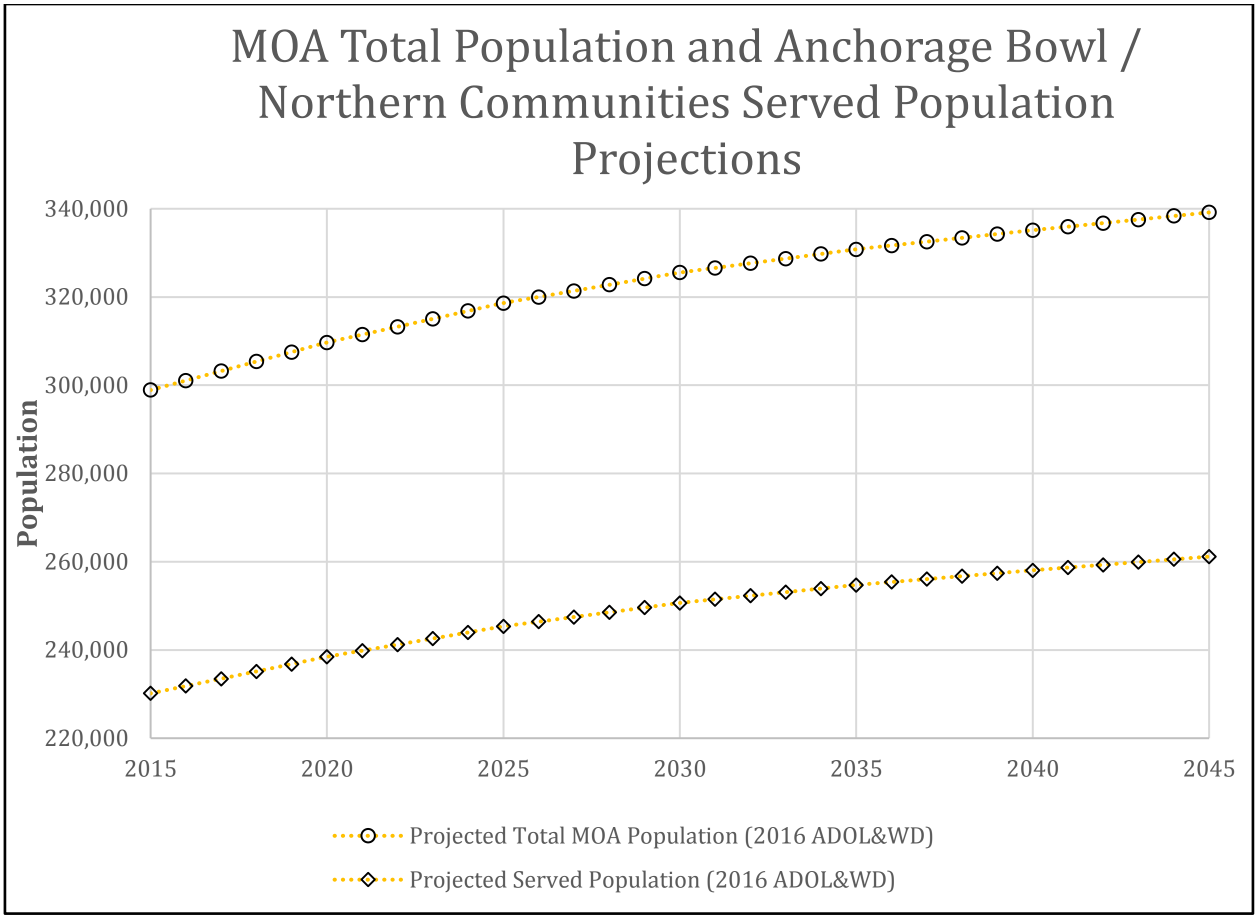

Figure 3-3
MOA Total Population, and Anchorage Bowl/Northern Communities Served Population Projections

Served Population

The AWWU served population reported by the 2012 Water Master Plan as a function of sub-region is repeated in Table 3-1 below. Portions of the sub-region populations not served by AWWU were reported to be served by either onsite wells or other water utilities.

Table 3-1: Anchorage Area 2010 Population Data per the 2012 Water Master Plan

MOA Sub-Region	2010 Sub-Region Population	AWWU Served Population in Sub-Region	AWWU Served Population as Percentage of total Sub-Region Population
Anchorage Bowl	240,343	205,373	85%
Northern Communities	34,982	20,078	57%
Girdwood	2,245	1,533	68%
Turnagain Arm	325	0	0%
JBER	13,931	0	0%
Total	**291,826**	**226,984**	**78%**

The AWWU Water Utility customers of the Anchorage Bowl and the Northern Communities are served potable water by the EWTF, the Ship Creek WTF (SCWTF), and by groundwater wells within the AWWU service area including Girdwood. As indicated in Table 3-1, and as reported in the 2012 Water Master Plan, these customers represented approximately 78% of the total population of those sub-regions in 2010. Excluding the Girdwood sub-region, the population served is approximately 77% of the total population of the Municipality of Anchorage (MOA).

3.2.3 Water Demands

Water demand projections are updated herein using the following methodology. First, historical water demands are identified along with historical populations creating those demands to generate per capita water use data (expressed as gallons per capita per day or gpcd). These per capita water use data are then applied to future population projections to arrive at projected future demands for potable water.

Historical Water Demand

The 2012 Water Master Plan reported the methodology used for projecting future historical water demands from the Water Utility service area. The method included review of historical water demands over a 19-year period between 1992 through 2010. Within this time, the plan identified the largest water demands calculated as average daily demands for 3-, 5-, and 7-day time intervals. It also identified the water demand for the week of January 14 for each year. The 7-day time interval was chosen by the plan as the interval which would most closely reflect a peak sustained water demand to be satisfied with potable water production capacity. The 2012 Water Master Plan reported the peak 7-day demand, and second-largest single day demand for water both occurred in July of 2004.

The largest single day demand for water occurred in 1992 when Mount Spur erupted and volcanic ash was deposited in Anchorage. Water use during this event was assumed to be for wash down purposes, and was not considered by the 2012 Water Master Plan to be a normal event suitable for planning purposes.

The 2012 Water Master Plan compared demands for water with daily air temperatures. A positive correlation was reported to exist with higher summer temperatures coinciding with larger demands for potable water. The warmest month of the year in Anchorage is July which is typically when the largest demands for water occur. The largest 7-day demand for water reported in the 2012 Water Master Plan occurred in July of 2004, which the plan reported to be the hottest month on record up to the year 2010.

In addition to air temperatures, water use in the summer months could also be a function of precipitation. Drier weather could be a factor for water used as irrigation.

Per Capita Water Use

Using data for population served in the combined sub-regions of the Anchorage Bowl and Northern Communities, and the water demand data for the maximum 7-day and peak day water demands, the 2012 Water Master Plan reported per capita water use of **265 gpcd** for the maximum 7-day event, and **285 gpcd** for the one-day peak water use event, both of which occurred in 2004. The plan recommended the 7-day event data be used for addressing potable water production capacity while the peak day event data be used to address combined capacity needs of storage and production.

Current Water Demands

Monthly water production data for 2013 through the end of 2015 obtained from AWWU are presented in Figure 3-4. As shown, a change in water production at the EWTF occurred in November of 2014 and January of 2015 due to construction of the Filter-to-Waste Project at that time. Concurrent with those time periods, the production of water from the SCWTF and Anchorage Bowl groundwater wells increased to meet total demands for water within the Anchorage Bowl and Northern Communities.

Total demand for water in this time period for the combined sub-regions of the Anchorage Bowl and Northern Communities averaged 23 MGD.

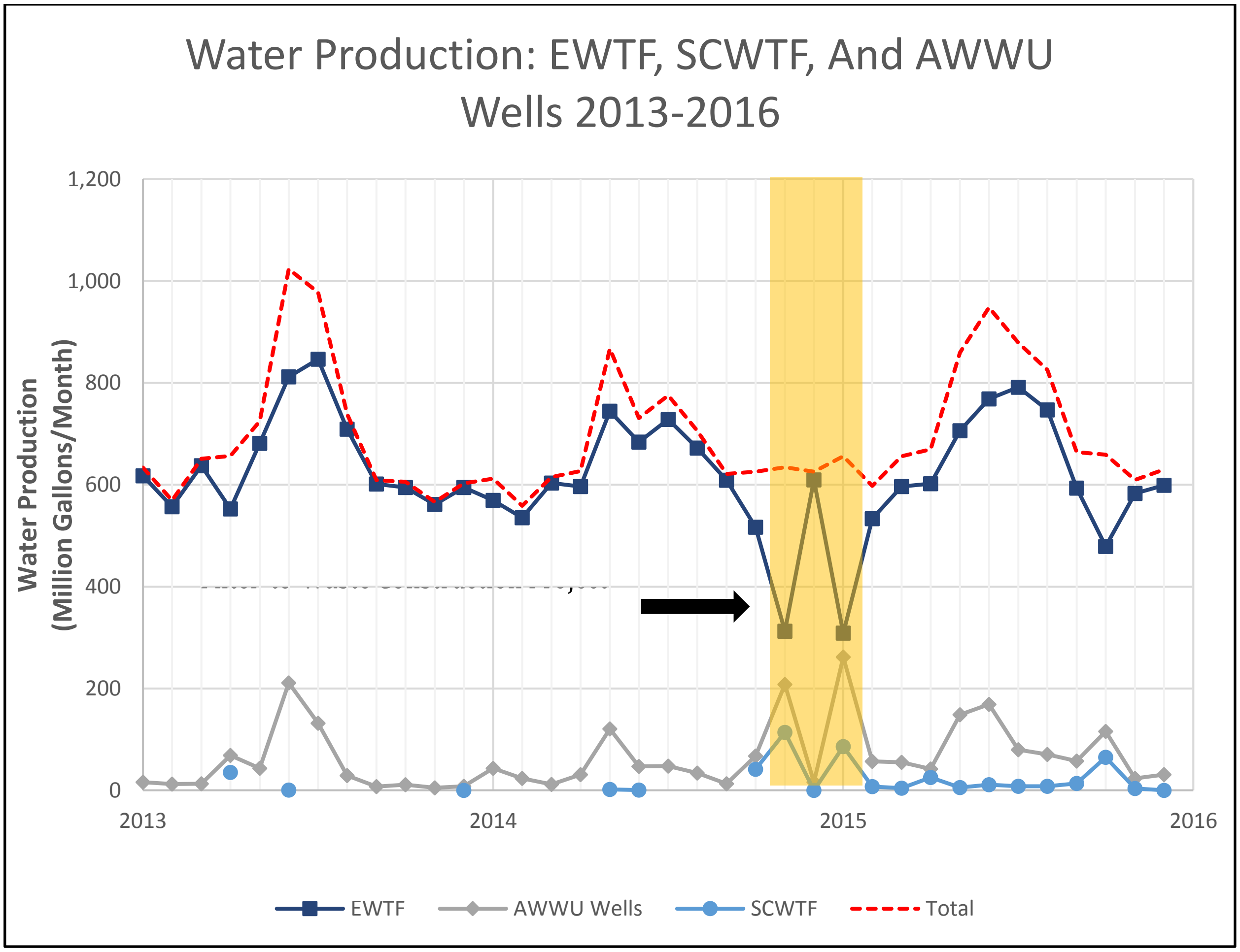

Figure 3-4
Current AWWU Potable Water Production Data for Customers in the Anchorage Bowl and Northern Communities

3.2.4 Current Potable Water Production Capacity

The capacity of AWWU's three sources of potable water and their respective production capacities are addressed below.

Eklutna Water Treatment Facility

While addressed elsewhere in this facility plan, the firm capacity of the EWTF is reported by the 2012 Water Master Plan as 32 MGD. AWWU reports the Eklutna Transmission Main (ETM) is hydraulically limited in its ability to transmit potable water from the Clearwell to the distribution system, with capacity to deliver between 27 and 32 MGD depending on water levels in the storage reservoirs.

Ship Creek Water Treatment Facility

Ship Creek is currently operated as a peaking plant with a firm production capacity of 12 to 14 MGD when operated with ferric sulfate and soda ash as the primary coagulants, and depending on source water quality. Hydraulically, the plant was designed to produce 24 MGD, however with the passage of the Surface Water Treatment Rules, the plant's production capacity has been limited to maintain regulatory compliance. AWWU has switched coagulants and is now using polyaluminum chloride (PACl). This process modification has resulted in lower solids loadings to the filters and longer filter run times. AWWU plans to test the plant's performance in the near future to see if treated water quality remains within regulatory compliance at higher production rates.

Wells

Groundwater wells currently provide approximately 9% of the total potable water produced by AWWU. The 2012 Water Master Plan reported 12 wells located within the Anchorage Bowl have the capacity to produce approximately 20 MGD. AWWU recently reported that there is currently a firm production capacity of 17.8 MGD available from its wells. The wells also supplement total storage requirements for the Utility's distribution system. In the summer months when demand for water peaks the wells are placed into service at a higher rate of production in minimize diurnal drawdown in the storage reservoirs.

3.2.5 Projected Water Demands

The following paragraphs address estimates of projected water demands for the combined sub-regions of the Anchorage Bowl and Northern Communities.

Anchorage Bowl and Northern Communities Water Demands

Estimates of future water demands for the served population within the combined sub-regions of the Anchorage Bowl and the Northern Communities were prepared by using the projections of population served presented in Figure 3-3, and multiplying those population values by values of per capita water use. The resulting estimated projections of water demand for the combined sub-regions are illustrated in Figure 3-5.

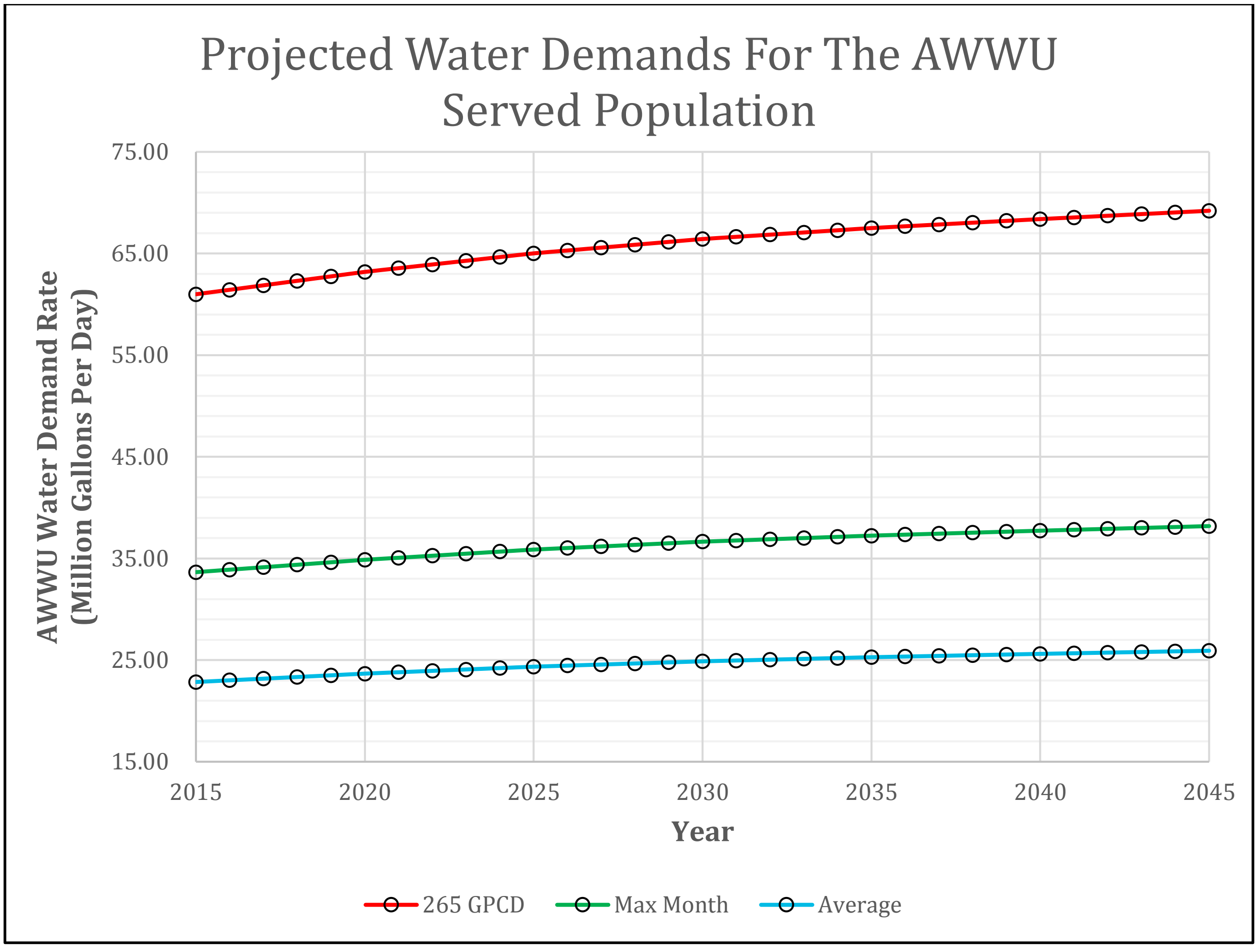

Figure 3-5
Combined Sub-Region Water Use Projections

Values of per capita water use deployed in preparing the data presented in Figure 3-5 are based on average monthly water use data for the time interval of 2013 to 2015 as presented in Figure 3-3 (99.3 gpcd), the highest recent single month's water use data for the time interval of 2013 to 2015 (146 gpcd), and the recommended peak per capita water use value reported in the 2012 Water Master Plan of 265 gpcd.

3.3 Drinking Water Regulations

3.3.1 Objective

A review of current drinking water regulations applicable to the Eklutna Water Treatment Facility (EWTF) has been completed. The objectives of this review were to identify regulatory requirements that impact the configuration and/or operation of the EWTF and its proposed upgrades and to anticipate future regulatory requirements which would be imposed upon the facility in the future.

3.3.2 Regulatory Authorities

There are two statutory authorities for drinking water regulations applicable to the EWTF. One is the Federal Safe Drinking Water Act (SDWA) enacted in 1974 and amended in 1986 and 1996. The law is listed in the United States Code (USC), the codification by subject matter of the laws of the United States, as USC Chapter 6A, Subchapter XII, Safety of Public Water Systems. The United States Environmental Protection Agency (EPA) promulgates and administers regulations addressed by the SDWA. EPA's regulations written as a result of the SDWA are published in the Code of Federal Regulations (CFRs). The CFRs are a compilation of rules categorized by title. Drinking water regulations are generally found in Title 40 CFR, Parts 141 through 143.

The other authority for drinking water regulations that applies to the EWTF is the law of the State of Alaska, Codified as the Alaska Statutes. Title 46 of the Statutes addresses Water, Air, Energy, and Environmental Conservation. Chapter 3 of Title 46 identifies the State of Alaska Department of Environmental Conservation (ADEC) as the agency to promulgate and administer regulations establishing minimum drinking water standards (AS 46.03.020.10.C). The ADEC has promulgated regulations published in the Alaska Administrative Code (AAC) under Title 18, Chapter 80, Drinking Water Regulations.

3.3.3 Applicable Regulations

The following paragraphs address regulations applicable to operations at the EWTF.

Phase I/II/IIB/V Rules

These rules, promulgated from 1987 to 1992, establish Maximum Contaminant Levels (MCLs) and monitoring requirements for chemical contaminants such as inorganic chemicals (IOCs), volatile organic chemicals (VOCs), and synthetic organic chemicals (SOCs). Requirements vary from system-to-system, with nitrate and nitrite typically applicable to all Public Water Systems (PWSs).

Total Coliform Rule

The Total Coliform Rule (TCR) promulgated on June 29, 1989, sets MCLs and monitoring requirements for coliforms in drinking water. It requires the periodic collection and analysis of a number of samples, depending on system size. The TCR also requires Sanitary Surveys be conducted every 5-years for systems collecting fewer than 5 routine samples per month.

Consumer Confidence Report

The EPA's Consumer Confidence Report (CCR) rule, 40 CFR Part 141, Subpart O, became effective as a federal law on September 18, 1998. This rule requires that all Class A PWSs that serve twenty-five (25) or more residents or 15 service connections year-round deliver their first CCR covering water quality data and violations for the calendar year 1998 to their consumers by October 19, 1999. CCRs are due each year and cover the previous calendar year's water quality data and violations.

Surface Water Treatment Rules

In 1989, EPA promulgated the Surface Water Treatment Rule (SWTR, [54 FR 27486 June 29, 1989]). This rule established treatment requirements for all public water systems which operated on either surface water or groundwater under the direct influence of surface water (GWUDI) as a source of water supply. The SWTR was structured to address the occurrence of *Giardia lamblia*, virus and *Legionella* in potable water supplies by requiring the following:

1. Maintenance of a disinfectant residual in water entering and within the distribution system
2. Removal /inactivation of at least 99.9 percent (3-log) of *Giardia*, and 99.99 percent (4-log) of viruses
3. Filtration, unless systems are eligible for filtration avoidance
4. Meeting filtrate turbidity quality criteria including combined filter effluent (CFE) turbidity of:
    a. nephelometric turbidity units (NTU's) at any time, and
    b. 0.5 NTU's for 95 percent of all measurements made each month for conventional and direct filtration plants.
5. Watershed control programs and water quality requirements for unfiltered systems.

Filtration avoidance criteria and requirements are also included in the SWTR, but not presented here as they do not impact the EWTF.

In addition to the federal SWTR requirements, the State of Alaska requires a minimum of 0.5-log inactivation of *Giardia lamblia* to supplement filtration and provide a second treatment barrier for microorganisms (18AAC80.635(d)).

Interim Enhanced Surface Water Treatment Rule

Following the outbreak of *Cryptosporidium* in Milwaukee, EPA promulgated the first of a series of updates to the SWTR, beginning with an Interim Enhanced Surface Water Treatment Rule (IESWTR [63 FR 69478 December 16, 1998]). The requirements and guidelines included:

1. Removal of 99 percent (2-log) of Cryptosporidium for systems providing filtration.
2. Turbidity performance standards for CFE of
    a. 1 NTU as a maximum and
    b. 0.3 NTU as a maximum for 95% of the monthly turbidity data collected based on 4-hour monitoring, superseding the SWTR turbidity requirements
3. Continuous monitoring of individual filter effluent (IFE) turbidity for conventional and direct filtration plants, recording turbidity every 15 minutes.
4. Benchmarking disinfection processes to assess the level of microbial protection provided before complying with requirements of the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR)

5. Inclusion of Cryptosporidium in the definition of GWUDI and in the watershed control requirements for unfiltered systems.

6. Covering all finished water reservoirs.

7. Conduct sanitary surveys for both community and non-community public water systems on a frequency of no less than once every three years for community systems. Elements of a sanitary survey include:

    a. A source water assessment

    b. A review of existing facilities

    c. Observation of system operation

    d. Review of monitoring and reporting

    e. Assessment of system adequacy

Filtrate Turbidity

The IESWTR addresses turbidity measured for both combined filtrate and, for those systems with multiple filters, individual filter turbidity readings.

Individual Filter Effluent

The IESWTR requires individual filter filtrate turbidity to be monitored and recorded a minimum of once every 15 minutes while the system is operational and filtrate is being produced.

An Exceptions Report must be sent to the state if either (1) two successive individual filter turbidity readings taken at 1-minute intervals exceed 1.0 NTU, or (2) an individual filter's filtrate turbidity exceeds 0.5 NTU after 4 hours into the filter run based on two consecutive readings taken 15 minutes apart.

The Exceptions Report must include the results of a Filter Profile if no obvious reason for abnormal filter performance is identified. In this context, a Filter Profile is a graph of filtrate turbidity and/or particle counts plotted as a function of time over the length of a filter run. If required, the filter profile is to be prepared during a period during which one other filter is backwashed.

If an individual filter's filtrate turbidity is greater than 1.0 NTU based on two consecutive readings 15 minutes apart at any time in each of 3 consecutive months, the system must conduct a Self-Assessment. The Self-Assessment must be conducted within 14 days of exceeding the 1.0 NTU limit and include the following.

- Assessment of filter performance
- Preparation of a filter profile
- Identification and prioritization of factors found to be limiting filter performance

- Evaluation of alternative corrective actions
- Preparation of self-assessment report

If an individual filter's filtrate turbidity exceeds 2.0 NTU based on two consecutive measurements made 15 minutes apart at any time in 2 consecutive months, the system must file an Exceptions Report and conduct a Comprehensive Performance Evaluation (CPE). A CPE is a review of a plant's performance and capabilities completed by the ADEC or a third party approved by the state for this review.

Combined Filter Effluent

The IESWTR requires the combined filtrate turbidity to be less than 0.3 NTU at least 95 percent of the readings recorded each month, and in no case shall the combined filtrate turbidity exceed 1 NTU.

Impact on EWTF

The EWTF is operated such that individual filters are taken offline and backwashed prior to their filtrate turbidity reaching 0.1 NTU. As a result, both individual and combined filtrate turbidity values are consistently below any values that would trigger additional reporting requirements or corrective action.

Disinfection Profiling and Benchmarking

The IESWTR also required surface water systems serving more than 10,000 individuals to complete disinfection profiling and benchmarking if the quarterly running annual average values for filtrate total trihalomethanes (TTHMs) and five regulated halo acetic acids (HAA5s) exceed 80 percent of the MCLs for these contaminants. Eighty percent of the MCLs for total trihalomethanes (TTHMs) and halo acetic acids (HAA5s) as identified in the rule equates to 64 and 48 micrograms per liter (µg/L), respectively.

Disinfection profiling requires determining and plotting the log removal of microbial pathogens 1 day each week for a 12-month period. If the system is using chlorine for disinfection, the profile is to be based on the log removal achieved by the disinfection process for *Giardia*. If the system is using chloramines or ozone, the profile is to be based on the log removal achieved by the disinfection process for viruses. Calculations of log removal are based on temperature, pH, disinfectant residual, the geometry of the disinfection contact vessel, and the peak hour water demand for the system. All profiling for those systems required to perform them were to be completed by March 31, 2001. The profile is to be used by the state in reviewing any future plans the system may have in altering their disinfection process. For EWTF and the Anchorage Water Utility's Distribution System, TTHMs and HAA5s have been consistently below the 64 and 48 µg/L values, so profiling has not been a requirement for the EWTF.

Long Term 1 Enhanced Surface Water Treatment Rule

As with the IESWTR, the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR [67 FR 1811 January 14, 2002]) was promulgated to provide increased protection against the occurrence of *Cryptosporidium* for systems using granular media filtration and operating on surface water sources. The requirements of this rule are the same as those for the IESWTR, but apply to systems serving less than 10,000 individuals. This rule therefore does not apply to the EWTF.

Stage 1 Disinfectants/Disinfection Byproducts Rule

Regulations addressing disinfection byproducts have been promulgated to reduce public exposure to a class of contaminants referred to as disinfection byproducts (DBPs). DBPs are formed when naturally occurring organic material is exposed to oxidants commonly used in disinfection. Some disinfectants and DBPs have been shown to cause bladder, colon, and rectal cancers and adverse reproductive and/or developmental effects in laboratory animals.

In the interests of reducing the potential for these health effects occurring in the general public, EPA promulgated a series of rules and regulations. Toxicological studies completed in 1974 showed disinfection byproducts including bromodichloromethane, bromoform, chloroform, dichloroacetic acid, and bromate were carcinogenic in laboratory animals. As a result, in 1979, EPA set an interim MCL for total trihalomethanes (THMs) of 0.10 mg/L as an annual average (November 1979 [44 FR 68624]). Subsequent to that there have been two disinfection byproducts rules.

In 1998 EPA promulgated the first of two new rules addressing disinfection byproducts (DPBs). The first rule was the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR [63 /FR 69390 December 16, 1998]). This rule applies to public water systems that treat their water with a chemical disinfectant and addresses the following:

1. Set maximum residual disinfectant level goals (MRDLGs) for chlorine, chloramines, chlorine dioxide,
2. Set maximum contaminant level goals (MCLGs) for
    a. Four trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform)
    b. Two halo acetic acids (dichloroacetic acid and trichloroacetic acid)
    c. Bromate and chlorite
3. Set National Primary Drinking Water Regulations for
    a. Three disinfectants (chlorine, chloramines, and chlorine dioxide)
    b. Two groups of organic disinfection byproducts (total trihalomethanes [TTHMs]) and halo acetic acids (HAA5s)
    c. Two inorganic disinfection byproducts (chlorite and bromate).
4. Removal of a specified percentage of source water total organic carbon (TOC) unless one of several alternate compliance criteria are met.

DBP and Disinfectant Residual Concentrations

Stage 1 DBPR established MCLs for TTHMs and HAA5s of 80 and 60 μg/L, respectively. Monitoring includes sampling water from several points in the distribution system. Compliance is achieved when the running annual average of samples collected quarterly at each individual location is less than the value of the MCL for the respective DBP.

AWWU's distribution system monitoring has shown that the quarterly running annual average for both TTHMs and HAA5s is consistently lower than the MCL for the regulated DBPs. Other than continued monitoring and reporting, the DBP MCLs have no impact to the EWTF as currently configured and operated.

In addition to MCLs for DBPs, the Stage 1 DBPR establishes maximum residual disinfectant limits (MRDLs) for disinfectant residuals including 4.0 milligrams per liter (mg/L) for chlorine, 4.0 mg/L for chloramines, and 0.8 mg/L for chlorine dioxide.

The only disinfectant used by AWWU is chlorine dosed as hypochlorite. Free chlorine residuals are maintained at or below 1.0 mg/L. This is well below the MRDL set for chlorine. As long as the system is operated to maintain the chlorine residual below the MRDL, there is no impact to EWTF as currently configured and operated.

TOC Removal

Stage 1 DBPR requires systems to remove a percentage of source water total organic carbon (TOC). The required percent removal of TOC a system must achieve in treatment is further defined by the rule as a function of both source water alkalinity and TOC concentrations. Source waters with higher alkalinity and lower TOC concentrations have the lowest percent TOC removal requirements. Conversely, source waters with low alkalinity and high TOC concentrations have the highest TOC removal requirements.

For those systems that cannot meet the TOC removal requirements stipulated by Stage 1 DBPR, the rule goes on to specify treatment techniques that the system must deploy in order to come as close as practical to the TOC removal requirement. These techniques include enhanced coagulation and enhanced softening.

The rule also provides alternate compliance criteria for those systems that cannot meet the required TOC percent removal requirements. These alternative criteria are:

1. The system's source water TOC is <2.0 mg/L.
2. The system's treated water TOC is <2.0 mg/L.
3. The system's source water TOC is <4.0 mg/L, its source water alkalinity is >60 mg/L as $CaCO_3$, and the system is achieving TTHM <40 μg/L and HAA5 <30 μg/L.
4. The system's TTHM is <40 μg/L, HAA5 is <30 μg/L, and only chlorine is used for primary disinfection and maintenance of a distribution system residual.
5. The system's source water specific ultraviolet absorbance (SUVA) prior to any treatment is <2.0 L/(mg-m). SUVA is numerically equivalent to ultraviolet absorbance

of the water at a wavelength of 254 nanometers (UV254) expressed as inverse meters, divided by the dissolved organic carbon (DOC) concentration of the water expressed in mg/L.

6. The system's treated water SUVA is <2.0 L/(mg-m).

The EWTF meets alternative compliance criteria 1, 2, and 4 above. Therefore, there is no impact to the EWTF for the DBP precursor removal portion of the Stage 1 DBPR.

In summary, provisions of Stage 1 DBPR applicable to EWTF are:

1. Maintaining chlorine residuals below the MRDLG and MRDL, both of which are 4.0 mg/L.
2. Maintain distribution system water TTHMs and HAA5s below the MCL's of 80 and 60 µg/L, respectively.
3. Achieve reductions in source water TOC should source water TOC exceed 2.0 mg/L.

Regulatory Requirements for Microbial and DBP Contaminants

In addition to the existing surface water related regulations already mentioned, the EPA under the 1996 reauthorization of the 1986 Safe Drinking Water Act developed a set of interrelated regulations to strengthen control of microbial and DBP contaminants in public drinking water supplies. These standards are referred to collectively as the Microbial/Disinfection By-Products rules.

The current round of rules consists of the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 D/DBPR. These rules require source water monitoring for microbial quality, and improved treatment for microbial inactivation. The Stage 2 D/DBPR and LT2ESWTR were promulgated on January 4th and 5th, 2006, respectively, and became effective on March 6, 2006.

Long Term 2 Enhanced Surface Water Treatment Rule

In 2006, EPA promulgated the Long-Term Stage 2 Enhanced Surface Water Treatment Rule (LT2ESWTR [71 FR 654 January 5, 2006]) to improve the control of microbial pathogens including *Cryptosporidium* while simultaneously controlling the formation of DBPs.

Major provisions of the proposed LT2ESWTR include

1. Source water monitoring for *Cryptosporidium*,
2. Additional treatment for filtered systems that have elevated concentrations of *Cryptosporidium* in their source waters
3. Inactivation of *Cryptosporidium* in unfiltered systems
4. Disinfection profiling and benchmarking to assure compliance with new DBP MCLs
5. Further addressing covers for treated water storage reservoirs, and

6. Criteria to establish what additional treatment is needed for supplemental control of microbial contaminants.

The initial round of source water monitoring for *Cryptosporidium* in Eklutna Lake resulted in the EWTF remaining in the lowest Bin Level (Bin 1) with no upgrades in treatment required. The second round of source water monitoring is currently in effect and will be completed in 2017. To date the results of the current monitoring require no changes in treatment.

Stage 2 Disinfectants/Disinfection Byproducts Rule

The Stage 2 Disinfectants/Disinfection Byproducts Rule (Stage 2 DBPR [71 FR 388 January 4, 2006]) builds upon the requirements set by Stage 1 DBPR by requiring certain systems conduct an Initial Distribution System Evaluation (IDSE) to identify the levels of DBPs in their distribution system and then requiring that system to identify locations within the distribution system for routine monitoring of DBPs.

For systems which utilize source waters which are surface waters or groundwater under the direct influence of surface waters the Stage 2 DBPR outlined specific requirements for the number of locations in the distribution system which must be monitored for DBPs and the frequency of that monitoring. For a system serving a population of between 250,000 and 999,999 people, a total of 12 distribution system locations are to be used for routine quarterly DBP monitoring. The Stage 2 DBPR retains the Stage 1 DBPR MCLs for TTHMs and HAA5s of 80 and 60 μg/L.

Based on current monitoring results for DBPs within the distribution system, the Stage 2 DBPR does not have any significant impact on the EWTF which requires alteration of existing treatment process configurations or operations.

Filter Backwash Recycle Rule

The Filter Backwash Recycle Rule (FBRR [66 FR 31086, June 8, 2001]) requires PWSs operating direct and conventional filtration plants to review their backwash water recycling practices and make approved changes as necessary to ensure they do not compromise pathogenic microbial control, particularly by passing *Cryptosporidium* oocysts through the filter. Generally, the FBRR requires that impacted systems introduce waters to be recycled to the head of the WTP, treat recycled waters through all existing unit processes, report to the State the configuration and operation of the system, and maintain records of recycle operations.

The EWTF is configured to recycle spent filter backwash water to the head of the treatment process. Backwash water decanted from the sludge lagoons is pumped back to the head of the treatment plant upstream of coagulant addition.

A recent project at the EWTF modified the process piping associated with the filter equipment in order to add Filter-To-Waste capability to the existing filters. This project provided the opportunity to direct filtrate produced from a freshly washed filter to the headworks rather than to be dosed with chlorine and directed to the clearwell and ultimately to distribution. These filter-to-waste flows directed to the plant headworks are not regulated under the FBRR.

Assuming AWWU has prepared and submitted the documentation required by the Rule to the primacy agency, the FBRR has no impact for the EWTF in its current configuration or operations. At the time of the Rule's promulgation, the primacy agency was EPA.

Information Collection Rule

The Information Collection Rule (ICR) was a monitoring and data-reporting rule promulgated by the EPA on May 14, 1996. It required that larger water utilities serving 100,000 people or more collect water quality data on their source water and treated water. These data have been used by the EPA to develop drinking water regulations mandated by the 1986 amendments to the Safe Drinking Water Act related to control of microbial contaminants and DBPs. The ICR also collected engineering data on how these larger utilities control such contaminants.

Lead and Copper Rule

The Lead and Copper Rule (LCR [56 FR 26460 June 7, 1991]) was promulgated in 1991, to limit the levels of lead and copper at consumers' taps. For systems that exceed the action levels for lead (0.015 mg/L) and copper (1.3 mg/L), a three-pronged mitigation approach is required. The initial step for Public Water Systems not in compliance with the LCR is to complete a desktop study. The goal of the desktop study is to identify a corrective action program that will eliminate the lead and copper from the source water, or, if the metals are coming from corroding pipe materials, to control the aggressive nature of the water. The recommendations of the desktop study are submitted to the State for review and approval before implementation. Once the corrective action program is installed, the State requires additional testing to verify that the upgrade will bring the system into regulatory compliance. In some instances, follow-up testing may still result in non-compliance. If this is the case, the State is obligated to work with a PWS to optimize the corrosion control program it approved for use, thereby achieving the best possible water quality. The LCR does allow states to approve installed upgrades that have been optimized but that do not completely achieve the targeted action levels.

Arsenic Rule

The 1996 amendments to the Safe Drinking Water Act required the EPA to propose an arsenic regulation that effectively reduced the MCL for arsenic from 50 µg/L to 10 µg/L, and established a monitoring framework for routine sampling consistent with some of the other monitoring requirements. The rule (66 FR 6976, January 22, 2001) was promulgated in 2001, and the new arsenic MCL of 10 µg/L became effective January 23, 2006.

Fluoride Rule and Guidelines

The EPA promulgated the fluoride rule in 1986. This regulation set an MCL of 4.0 mg/L, an MCLG of 4.0 mg/L and a secondary standard of 2.0 mg/L. Monitoring is at least annual, with the state allowed to set more frequent requirements. Daily monitoring is typical for treatment plants that feed fluoride.

The US Department of Health and Human Services revised their recommended limits for fluoride in drinking water in January of 2011 to a range of 0.7 to 1.2 mg/L.

Radionuclides Rule

The Radionuclides Rule, (66 FR 76708, December 7, 2000) promulgated in 2000, applies to all PWSs. The rule imposes MCLs for radioactive contaminants including combined radium-226 and radium-228 at 5 picoCuries per liter (pCi/L), gross alpha particles at 15 pCi/L, beta/photon particles at 4 millirems per year, and uranium at 30 µg/L. Initial monitoring is to be completed by December 31, 2007.

A 1999 proposed Radon in Drinking Water Rule would set an MCL of 300 pCi/L and an alternate MCL of 4,000 pCi/L. Congress direct the EPA to report on the pending radon in drinking water regulation which resulted in a May 2012, *Report to Congress: Radon in Drinking Water*, EPA 815-R-12-002. No additional actions are known at this time.

Revised Total Coliform Rule

The EPA promulgated the Revised Total Coliform Rule (RTCR [78 FR 10269, February 13, 2013]) in 2013. Each public water system (PWS) in Alaska was required to submit a RTCR Sample Siting Plan by February 29, 2016 and be in compliance with the RTCR by April 1, 2016.

Key applicable provisions of the Revised Total Coliform Rule (RTCR) are:

- Setting a maximum contaminant level goal (MCLG) and maximum contaminant level (MCL) for E. coli for protection against potential fecal contamination.
- Setting a total coliform treatment technique (TT) requirement.
- Requirements for monitoring total coliforms and E. coli according to a sample siting plan and schedule specific to the PWS.
- Provisions allowing PWSs to transition to the RTCR using their existing Total Coliform Rule (TCR) monitoring frequency, including PWSs on reduced monitoring under the existing TCR.
- Requirements for assessments and corrective action when monitoring results show that PWSs may be vulnerable to contamination.
- Public notification (PN) requirements for violations.
- Specific language for CWSs to include in their Consumer Confidence Reports (CCRs) when they must conduct an assessment or if they incur an E. coli MCL violation.

3.3.4 Treated Water Quality Requirements

As with all public water systems, the EWTF is required to meet all state and federal guidelines for potable water quality. The federal regulations set forth by the EPA for drinking water dictate a Maximum Contaminant Level (MCL) for various monitored contaminants. An MCL is an enforceable standard. The EPA also defines Maximum Contaminant Level Goal (MCLG) contaminant concentrations which are non-enforceable standards intended to define a concentration below which there is no known or anticipated risk to human health. For some chemicals, e.g. carcinogens, there is no known safe dosage and thus the MCLG is set at ‘zero.’

Inorganic Contaminants (Primary, Secondary)

Primary

Table 3-2: Primary Inorganic Contaminants

Contaminant	MCLG[1] (mg/L)	MCL[2] or TT[3] (mg/L)	Eklutna Finished Water (mg/L)
Antimony	0.006	0.006	ND
Arsenic	0	0.010 as of 01/23/06	ND
Asbestos	7 MFL*	7 MFL*	
Barium	2	2	0.01
Beryllium	0.004	0.004	ND
Cadmium	0.005	0.005	ND
Chromium (total)	0.1	0.1	ND
Copper	1.3	Action Level = 1.3	0.0034
Cyanide (as free cyanide)	0.2	0.2	ND
Fluoride	4	4	0.50
Lead	zero	Action Level = 0.015	ND
Mercury (inorganic)	0.002	0.002	ND
Nitrate (as N)	10	10	0.145
Nitrite (as N)	1	1	0.02
Selenium	0.05	0.05	ND
Thallium	0.0005	0.002	ND

1: Maximum Contaminant Level Goal

2: Maximum Contaminant Level

3: Treatment Technique (Required to Reduce Contaminant Concentration)

*MFL: Million Fibers Per Liter (Fiber > 10 Micrometers)

Secondary

Table 3-3: Secondary Inorganic Contaminants

Contaminant	Secondary MCL[1]	Eklutna Finished Water
Aluminum	0.05 to 0.2 mg/L	0.076
Chloride	250 mg/L	3.1
Color	15 color units	ND
Copper	1.0 mg/L	ND
Corrosivity	Non-corrosive	-1.1 (Langlier)
Fluoride	2.0 mg/L	0.50
Foaming agents	0.5 mg/L	ND
Iron	0.3 mg/L	ND
Manganese	0.05 mg/L	ND
Odor	3 TON*	ND
pH	6.5 - 8.5	

Contaminant	Secondary MCL[1]	Eklutna Finished Water
Silver	0.1 mg/L	ND
Sulfate	250 mg/L	29.0
Total Dissolved Solids (TDS)	500 mg/L	80
Zinc	5 mg/L	ND

1: Maximum Contaminant Level

*TON = Threshold Odor Number

Organic Contaminant (Volatile, Synthetic)

Table 3-4: Organic Contaminants

Contaminant	MCLG[1](mg/L)	MCL[2] or TT[3] (mg/L)	Eklutna Finished Water (mg/L)
Acrylamide	zero	TT[4]	
Alachlor	zero	0.002	
Atrazine	0.003	0.003	
Benzene	zero	0.005	ND
Benzo(a)pyrene (PAHs)	zero	0.0002	
Carbofuran	0.04	0.04	
Carbon tetrachloride	zero	0.005	ND
Chlordane	zero	0.002	
Chlorobenzene	0.1	0.1	ND
2,4-D	0.07	0.07	
Dalapon	0.2	0.2	
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	
o-Dichlorobenzene	0.6	0.6	ND
p-Dichlorobenzene	0.075	0.075	ND
1,2-Dichloroethane	zero	0.005	ND
1,1-Dichloroethylene	0.007	0.007	ND
cis-1,2-Dichloroethylene	0.07	0.07	ND
trans-1,2-Dichloroethylene	0.1	0.1	ND
Dichloromethane	zero	0.005	ND
1,2-Dichloropropane	zero	0.005	ND
Di(2-ethylhexyl) adipate	0.4	0.4	
Di(2-ethylhexyl) phthalate	zero	0.006	
Dinoseb	0.007	0.007	
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	
Diquat	0.02	0.02	
Endothall	0.1	0.1	
Endrin	0.002	0.002	
Epichlorohydrin	zero	TT[4]	
Ethylbenzene	0.7	0.7	ND

Contaminant	MCLG[1](mg/L)	MCL[2] or TT[3] (mg/L)	Eklutna Finished Water (mg/L)
Ethylene dibromide	zero	0.00005	
Glyphosate	0.7	0.7	
Heptachlor	zero	0.0004	
Heptachlor epoxide	zero	0.0002	
Hexachlorobenzene	zero	0.001	
Hexachlorocyclopentadiene	0.05	0.05	
Lindane	0.0002	0.0002	
Methoxychlor	0.04	0.04	
Oxamyl (Vydate)	0.2	0.2	
Polychlorinated biphenyls (PCBs)	zero	0.0005	
Pentachlorophenol	zero	0.001	
Picloram	0.5	0.5	
Simazine	0.004	0.004	
Styrene	0.1	0.1	ND
Tetrachloroethylene	zero	0.005	
Toluene	1	1	ND
Toxaphene	zero	0.003	
2,4,5-TP (Silvex)	0.05	0.05	
1,2,4-Trichlorobenzene	0.07	0.07	ND
1,1,1-Trichloroethane	0.2	0.2	ND
1,1,2-Trichloroethane	0.003	0.005	
Trichloroethylene	zero	0.005	ND
Vinyl chloride	zero	0.002	ND
Xylenes (total)	10	10	ND

1: Maximum Contaminant Level Goal

2: Maximum Contaminant Level

3: Treatment Technique (Required to Reduce Contaminant Concentration)

4: Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows:

Acrylamide = 0.05% dosed at 1 mg/L (or equivalent)

Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent)

Radioactive Contaminants

The Radionuclides Rule also applies to all public water systems. The rule imposes MCLs for radioactive contaminants including combined radium-226, and radium 228 at 5 picoCuries per liter (pCi/L), gross alpha particles at 15 pCi/L, beta/photon particles at 4 millirems per year (mrem/yr), and uranium at 30 µg/L. Initial monitoring was to be completed by December 31, 2007.

Table 3-5: Radioactive Contaminants

Contaminant	MCLG[1] (mg/L)	MCL[2] or TT[3] (mg/L)	Eklutna Finished Water (mg/L)
Alpha particles	zero	15 pCi/L	
Beta particles and photon emitters	zero	4 millirems per year	
Radium 226 and Radium 228 (combined)	zero	5 pCi/L	
Uranium	zero	30 µg/L	

1: Maximum Contaminant Level Goal

2: Maximum Contaminant Level

3: Treatment Technique (Required to Reduce Contaminant Concentration)

* pCi/L: picoCuries per Liter

No compliance issues have been noted to date and it is unlikely that there will be a compliance issue as elevated concentrations of radioactive contaminants are unusual for systems using surface water sources without any anthropogenic influence on the quality of the source water.

3.3.5 Entry Point to Distribution

Chlorine Residual

Treated water from the plant is chlorinated by a 0.8% solution of sodium hypochlorite (NaOCl) which is produced by the onsite generation system. This chlorinated water is then sent to the clearwell where the appropriate chlorine contact time is available to provide the requisite level of disinfection. The residual chlorine leaving the clearwell is typically maintained at 1.0 mg/L.

Fluoride

Fluoride is added to public drinking water supplies in order to reduce the formation of dental caries within the population served by the drinking water supply. EWTF adds fluoride to the drinking water supply in order to provide this benefit to the consumers of the drinking water supply. Fluoride concentrations of between 0.7 mg/L and 1.2 mg/L are considered 'optimal' by the EPA. EPA outlines an enforceable primary limit of 4.0 mg/L as well as a non-enforceable secondary limit of 2.0 mg/L for fluoride.

Current operational practice is to maintain a fluoride concentration in the final treated water at approximately 0.7 mg/L.

3.3.6 Forthcoming Regulations

A review of published information regarding future regulations was conducted to determine what drinking water contaminants might be regulated in the foreseeable future. This included a review of information published by the American Water Works Association (AWWA), the Water Research Foundation (WRF), and the EPA.

While both the State of Alaska and the EPA have the authority to implement drinking water regulations impacting the EWTF, initiation of new regulations or modifications of existing regulations are most likely to be originated by the EPA. In 2007, the EPA granted the State primacy for administration of federal drinking water regulations. Since that time the State has not initiated any regulatory requirements other than those mandated by EPA.

EPA's currently uses two methodologies for developing new or modifying existing regulations.

New contaminants which are known to exist in drinking water but which are currently not regulated can be included on the Contaminant Candidate List (CCL) published by EPA once every 5 years. Candidate contaminants are identified through data generated by EPA's Unregulated Contaminant Monitoring Rule (UCMR) which requires utilities to sample and analyze water for up to 30 identified contaminants once every 5 years. Contaminants reviewed under UCMR are selected by EPA based on internal reviews and recommendations from advisory organizations including the National Drinking Water Advisory Council, and the National Academy of Sciences - National Research Council.

Once a contaminant is identified on the CCL, it may become a regulated contaminant if it may have an adverse effect on the public health, it is known to occur in public water systems at a frequency and concentration to warrant concerns for public health, and, in the opinion of the EPA Administrator, regulation of the contaminant presents a meaningful opportunity for health risk reductions for individuals served by public water systems.

As a result of the latest CCL review, EPA is considering regulation of Strontium and Perchlorate.

In addition to regulating new contaminants, EPA is also mandated to review existing regulations once each six years. This review process has proven to be lengthy with the only revised rule promulgated since the 1996 amendments to the Safe Drinking Water Act being the Revised Total Coliform Rule (RTCR).

Strontium

In October of 2014 the EPA announced a preliminary determination to regulate strontium in drinking water. Strontium poses a hazard to human health because it has the potential to replace calcium in bone and therefore affects skeletal development.

Occurrence

According to the EPA strontium has been detected in 99% of all public water supplies; while most water supplies have very low levels of strontium, strontium is present at concentrations which are 'concerning' to the EPA in 7% of public water supplies. Strontium is introduced into surface water sources by either surface waters in contact with mineral deposits or by the deposition of small airborne particulates into surface waters.

Removal by Treatment Plant

Removal of strontium by conventional coagulation and sedimentation is difficult. Removal efficiencies of 12% by conventional alum or ferric sulfate coagulation have been documented in the literature. Higher removal efficiencies have been documented in plants which utilize softening or ion exchange.

Anticipated Limits

As of the writing of this report the EPA has not released any official data regarding the proposed limits on drinking water concentrations of strontium. A document produced by the AWWA presents a speculative risk assessment analysis which anticipates the MCLG as being between 4.2 and 4.4 mg/L.

Perchlorate

In 2011, the EPA reversed a previous 2009 determination stating that perchlorate did not present a meaningful opportunity to protect public health. The EPA had previously intended to announce a proposed MCL for perchlorate by 2013, but that process has been delayed.

Occurrence

Perchlorate is produced in industrial settings in the manufacture of explosives or high strength fuels. There is a small potential for perchlorate to form naturally, but in almost all cases where perchlorate is found in drinking water sources the source of the perchlorate can be traced back to human activity.

Removal by Treatment Plant

Anionic exchange processes have been shown to be effective at removing perchlorate from drinking water sources, but the cost of implementing this process at a plant which did not previously employ anionic exchange (e.g. for nitrate removal) can be significant.

Anticipated Limits

It is not known what limits will be set by the EPA for perchlorate. California and Massachusetts already impose a limit of 6 μg/L and 2 μg/L respectively. Given the pristine nature of the EWTF water source, it is unlikely that perchlorate would ever become a contaminant of concern.

Carcinogenic Volatile Organic Compounds

Volatile organic compounds (VOCs) are a large group of carbon-based chemical compounds that evaporate or subliminate readily at room temperatures. Carcinogenic VOCs (cVOCs) are a subset of VOCs which can cause cancer.

In 2010, EPA announced a strategy to strengthen protection of public health by promulgating drinking water regulations addressing contaminants as a group rather than by setting MCLs for individual contaminants. The first of these was cVOCs which included 16 VOCs which cause cancer. Of these some were already addressed in existing VOC regulations with individual MCLs ranging from 0.002 to 0.005 mg/L. Unregulated cVOCs include aniline, benzyl chloride, 1,3-buadiene, 1,1-dichloroethane, nitrobenzene, propylene oxide, 1,2,3-trichlorpropane, and urethane.

As of this writing, EPA is reviewing issuance of cVOC regulations.

Expanded DBP Regulations

The EPA is reviewing whether to promulgate additional regulations addressing currently unregulated DBPs as part of its internal 6-year review of existing regulations. Candidate contaminants under consideration are nitrosamines and chlorate which can be introduced into public water supplies partly due to disinfection practices. Review of this issue was to be completed by 2015, but the Agency has yet to announce new regulatory action on these contaminants.

Other Unregulated Contaminants

The EPAs Contaminant Candidate List (CCL) program whereby unregulated contaminants are identified, screened, and selected for regulatory action has proceeded with some delays. The fourth round of candidate contaminant listings (Contaminant Candidate List 4 [CCL 4]) was issued for review in 2015 by the Agency and includes 100 chemicals or chemical groups and 12 microbial contaminants known or anticipated to occur in drinking water. Types of candidate contaminants include chemicals used in commerce, pesticides, biological toxins, DBPs, pharmaceuticals, and waterborne pathogens.

3.3.7 Conclusion

From the review completed in the preparation of this Facility Plan, no excursions from either current or known forthcoming regulatory requirements regarding treated water quality were found for the EWTF.

3.4 Water Reliability

Appendix D includes a complete technical memorandum that evaluates the current and future reliability of Eklutna Lake as a continued water source. The study concludes:

1. The Eklutna Lake system provided ample water for historical withdrawals, at an average rate of 19,417 AFY or 17.3 MGD, without being drawn down below a lake level of 822 feet (vs. 814 feet intake);
2. When applying a consistent annual withdrawal of 17,000 AFY or 15.2 MGD, lake levels are drawn down to the intakes due to the lower runoff and available storage in the 1990s;
3. By the end of the century, precipitation in Anchorage is forecasted to increase by 15% to 30% and temperatures are expected to increase by 4°F to 6°F. The result of these changes are increased runoff and high rates of glacier melting.
4. With forecasted climate change impacts, evaporation at Eklutna Lake will increase by 40%, runoff will increase by 11%, and local precipitation and lower watershed runoff will increase by 20% by the end of the century.
5. This increase in runoff will allow Eklutna Lake to support a withdrawal rate of 40,000 AFY or 36 MGD for continued water supply. Note that this assumes all other flows, including hydropower withdrawals will stay the same.

Section 4

Process Mechanical Infrastructure

4.1 Overview

This section discusses process mechanical systems at the Eklutna Water Treatment Facility (EWTF), and are presented generally in order of the water treatment processes. Separate subsections have been included for the following:

- Section 4.2 - Energy Recovery
- Section 4.3 - Raw Water
- Section 4.4 - Flocculation
- Section 4.5 - Sedimentation
- Section 4.6 - Filtration
- Section 4.7 - Clearwell and Effluent Vault
- Section 4.8 - Waste Washwater
- Section 4.9 - Residuals Management
- Sections 4.10 through 4.15 - Chemical Systems:
    - Section 4.10 - Polymer (Settling Aid Polymer and Filter Aid Polymer)
    - Section 4.11 - Polyaluminum Chloride (PACL)
    - Section 4.12 - Fluoride
    - Section 4.13 - Sodium Hypochlorite (Onsite Generation)
    - Section 4.14 - Soda Ash and Ferric Chloride (Legacy Systems)
    - Section 4.15 - General Chemical Systems

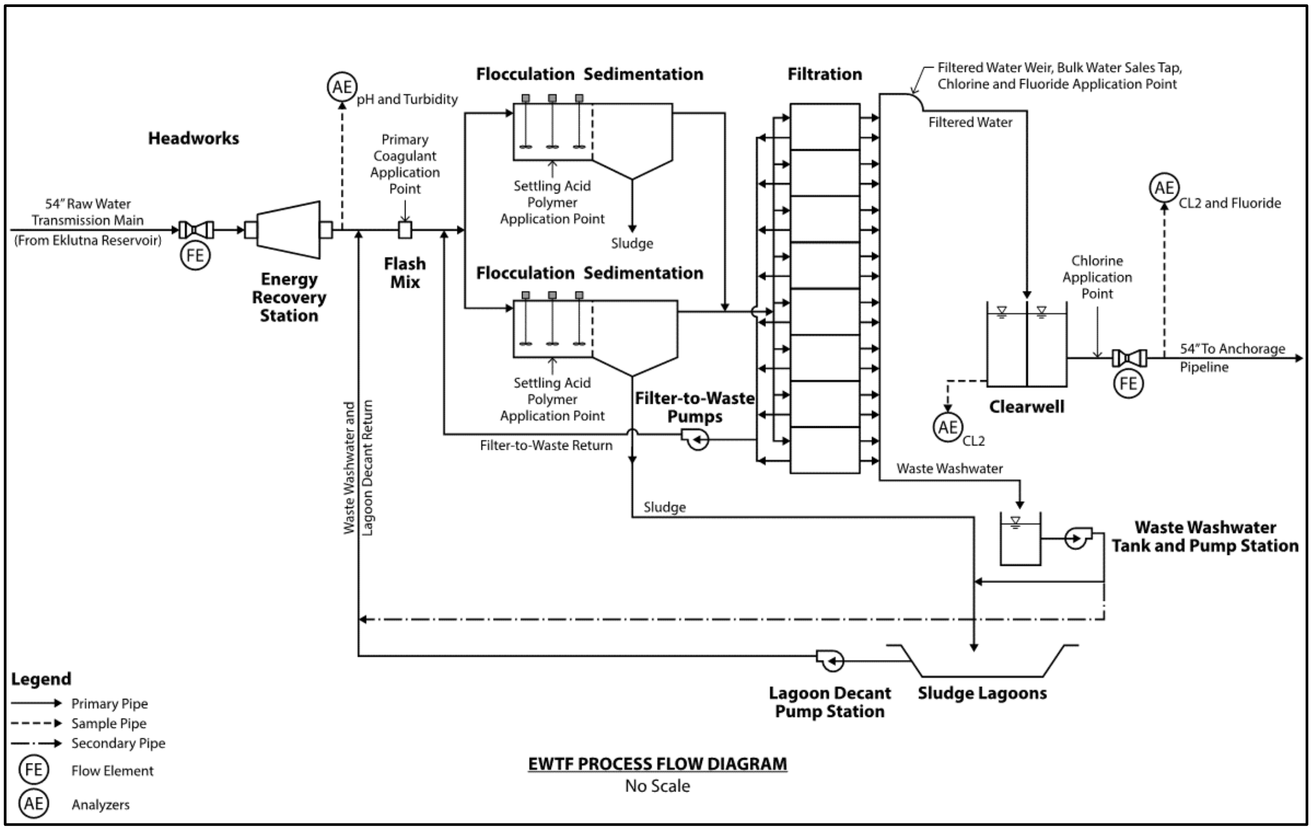

Figure 4-1
Eklutna Process Flow Diagram

Each unit process treatment system was generally evaluated based on the following:

- Ability to meet plant or system capacity
- Impact posed by regulatory requirements
- Likelihood and consequence of failure of its constituent assets
- Need for O&M improvements or increased efficiency
- Effects on worker safety and environment

Based on this evaluation, process mechanical infrastructure was inspected in the field and discussed with AWWU staff and other team disciplines. A preliminary Process Recommendations Review Workshop was held with AWWU on November 8, 2016, to review draft recommendations and obtain additional input. Alternatives were evaluated where applicable for qualitative factors (e.g. ease of operability) and quantitative factors (e.g. net impact on O&M costs) to determine recommended improvements. Each recommended improvement was assessed for Relative Need (i.e. how critical is a given recommendation) and Complexity (i.e. how extensive would the implementation be for a given recommendation). Construction cost estimates were also prepared, which in turn were used to derive planning level project costs presented at the end of each subsection. Please note that construction and other cost estimates included herein are conceptual in nature, and these costs should be refined during future engineering planning, evaluation and design efforts.

4.2 Energy Recovery Station

Eklutna WFP's Energy Recovery Station is located in the area shown below. The facility utilizes excess head on the incoming raw water to generate power for the facility.

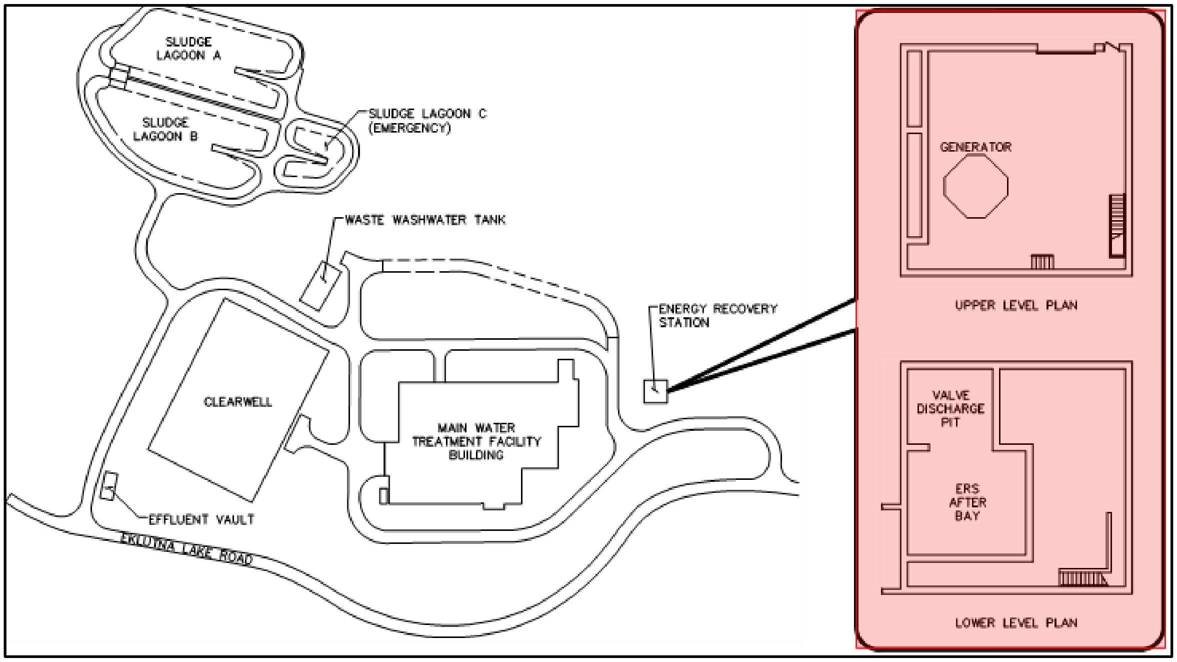

Figure 4-2
Energy Recovery Station Location

4.2.1 Existing Facilities and Infrastructure

The design criteria and capacity for the Energy Recovery infrastructure is shown in the table below.

Table 4-1: Energy Recovery Station Criteria

Component	Unit	Value	Remarks
54" Venturi Tube	No.	1	
Turbine	No.	1	
Rated Output	BHP	922	750 Kw
Capacity	MGD	45	Mfg = Gilkes, Rated net head = 144', Speed = 450 RPM
Actuated Needle Valves - Turbine inlet	No.	2	Auma Actuators
30" Energy Dissipater Valve	No.	1	Turbine Bypass

4.2.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Several assets associated with the energy recovery system (both process mechanical and Instrumentation & Controls) were found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Figure 4-3 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-2: Energy Recovery Station - Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
(P-4 Plant Influent Pipe)	54" Venturi	3	2	2	2	3	3	2	2
Generator Feed & Bypass	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	2	4	2	3	3	3	3
Turbine Generator Feed	42" Isolation Butterfly Valve (BV)	4	2	2	2	4	3	3	3
Turbine Generator Feed	Needle Valve	**5**	2	2	2	4	3	3	3
Turbine Generator Feed	Needle Valve	**5**	2	2	2	4	3	3	3
Turbine Generator	750 KW Hydro Turbine	**5**	2	2	2	4	3	3	3
Turbine Generator Bypass	30" Isolation BV	3	2	2	2	3	3	2	2
Turbine Generator Bypass	30" Sleeve Valve	3	2	2	2	3	3	2	2
Turbine Generator & ERS Controls	Control Panel (including hardware/ software)	4	2	2	2	4	5	3	3
Bridge Crane - Structure	10 Ton Bridge Crane	2	2	2	2	3	3	2	2
Bridge Crane - Equipment	10 Ton Bridge Crane	**2**	2	2	2	3	3	2	2

4.2.3 Assessment

Infrastructure identified as being in need of upgrade during the Facility Plan assessment(s) include the electrical motorized operators (actuators) for each of the following five valves: two (2) needle valves, two (2) isolation valves, one (1) sleeve valve, and the system's control panel and SCADA interface.

ER1 Motorized Valve Operator Replacement

The two needle valves are actuated by Auma electrical motorized operators which are reportedly not reliable nor completely compatible with the existing plant control/SCADA system. Similar actuators serve the remaining motorized valves. This lack of reliability creates increased operator time to ensure the valves have been actuated to the correct position. Below are pictures of the needle valve and actuator.

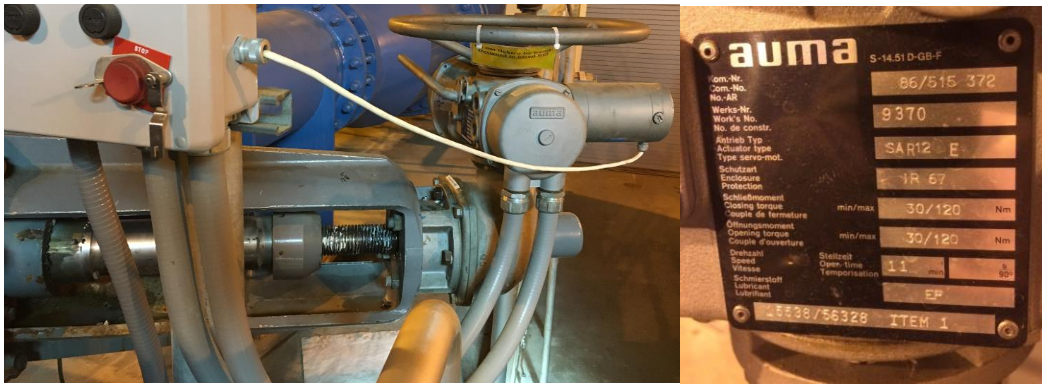

Figure 4-3
Existing Energy Recovery Needle Valve and Operator

Currently the plant utilizes Rotork electrical motorized operators for most of the process valves. These actuators have been found to provide a high degree of reliability and are compatible with the Plant's control/SCADA system.

The existing valve actuators are not consistently reliable and require operator attention is needed, so this is deemed a relative **Medium Need** item. Replacement of the actuators would be straight forward and would not require plant downtime due to the plant's ability to by-pass the generator entirely. Therefore, this item has been given a **Low Complexity**.

Table 4-3 provides a summary of economic considerations for replacing the existing system – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-3: ER1 Motorized Valve Operator Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component of Installing New Actuators	Five Rotork actuators and related electrical and I&C work.	$75,000
Operation & Maintenance Labor Cost Savings	1 hours per week per actuator less operator monitoring time	$22,500 per year

ER2 Generator Control Panel and SCADA Interface

The existing ERS control panel is over 30 years old with an anticipated life of approximately 40 years.

The interface between the existing ERS Generator Control Panel and the Plant SCADA System is not functional. The ability to set the generator MGD setpoint remotely and to remotely start the generator in automatic mode currently do not function consistently.

AWWU has indicated that the procedure for synchronizing and bringing the generator on line cannot be executed remotely and is not sufficiently straightforward to allow all operators to synchronize the generator with the utility power and bring it on line with total confidence.

Gilbert Gilkes & Gordon Ltd. (Gilkes), the ERS Generator OEM, was contacted to identify possible advantages to replacing the existing ERS Control Panel.

The operational benefits to replacing the existing control panel would include the following:

1. Remote operation (e.g., initiating automatic synchronization and setting the generator flow setpoint).
2. Improved operator interface and ERS system startup controls (e.g., modern operator interface touch panel).
3. Faster synchronization with an electronic governor and Allen-Bradley PLC logic.
4. Additional status and trending capabilities through increased integration with Plant SCADA System.
5. Improved reliability.

The potential financial benefits of proactively replacing the existing ERS control panel before an unexpected failure of the control panel results in the unavailability of the ERS include the following:

1. Avoid the increased cost associated with an expedited effort for engineering, procurement, delivery, installation, integration, and testing of a new control panel after an unanticipated failure of the ERS control panel.
2. Avoid the incurred increase in electrical energy costs due to a significantly longer period in which the ERS would be out of service and unavailable to generate energy if its failure was unexpected and unscheduled.

Replacing the ERS control panel sometime over the next five years and providing improved Plant SCADA Integration with the ERS before the expected end of the service life for this control panel is justified by the increased functionality, likely reduction in procurement and installation costs, and the reduced time-period over which the ERS would be unavailable (and its associated savings in energy costs).

Table 4-4 provides a summary of economic considerations for replacing this control panel – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-4: ER2 Generator Control Panel and SCADA Interface – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component of Replacing Generator Control Panel	Includes new panel by OEM, field start-up and plant SCADA system interface	$365,000 (incl. approx. 4 months of downtime for installation requiring purchased power at $20k per month)
Operation & Maintenance Labor Cost Savings	8 hours per week less operator monitoring time	$36,000 per year

4.2.4 Alternatives Evaluations

The existing actuators could be replaced with other reliable valve actuators. However, an assessment of the alternative brands should be made prior to plans to replace the actuators to determine the available service and value. In addition, the EWTF has a number of Rotork actuators functioning reliably and standardization of equipment is beneficial.

4.2.5 Summary of Recommendations

Tables 4-5 and 4-6 summarize the recommendations associated with the Energy Recovery unit process.

Table 4-5: Energy Recovery Station Summary of Recommendations

ID	Description	Rationale	Relative Need
ER1	Replace electrical actuators on five valves serving incoming raw water	Reliability, improved controls, reduce needed operator attention	Medium
ER2	Replace Control Panel and provide new and improved SCADA interface functionality for remote operations and monitoring of ERS	Increased functionality, improved reliability, and the likely reduction in time and cost for planning, engineering, procurement, and installation of replacement equipment approaching its end of useful (reliable) life	High

Table 4-6 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-6: Energy Recovery Station - Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs.)
ER1	$75,000	Low	$36,000	$18,000	$15,000	$140,000	$22,500	6
ER2	$365,000	High	$96,000	$65,700	$73,000	$600,000	$36,000	17

Implementation of the above recommendations would alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process to the extent practical along with more frequent inspection of the remaining mechanical equipment (i.e. equipment not recommended for repair/replacement at this time).

Because the total project cost derived for planning purposes is below $500k, Recommendations ER1 and ER2 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.2.6 Special Considerations for Implementation

Replacement of the electrical motor actuators should not create plant production or water quality problems during implementation. The actuators can be programmed prior to installation minimizing the time to construct. In addition, the generator by-pass can be used during installation of the needle valve and isolation valve actuators, minimizing the impact to plant operations, albeit increasing short-term electricity costs.

4.3 Raw Water

The raw water system conveys water from the Energy Recovery Station to the riser box and flocculation basins. As part of this system, the primary coagulant (PACL) is injected and "flash mixed" with the raw water prior to the flocculation basins.

Figure 4-4
Existing Raw Water pipe from the Energy Recover Station also showing the mixing water and chemical injection on the top of the pipe.

4.3.1 Existing Facilities and Infrastructure

The existing Raw Water infrastructure is comprised of a 54-inch diameter pipeline and a hydraulic jet counter current Flash Mixer for mixing of the plant's primary coagulant. The criteria for the system is shown below.

Table 4-7: Raw Water Infrastructure Criteria

Component	Unit	Value	Remarks
Flash Mixer Type			Hydraulic Jet
Raw Water Pipeline	in	54	
Mixer energy	Sec-1	750	

4.3.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Two assets associated with the raw water system (related to its transmission to the EWTF and energy recovery system) were found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Figure 4-3 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-8: Raw Water – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Tunnel	Exposed 54" Raw Water Pipe	3	2	2	2	3	3	2	2
Flash Mixer	Mixing Nozzle	3	2	2	2	3	3	2	2
Flash Mixer	6" Pressure Control Valve	3	2	2	2	3	3	2	2
Flash Mixer	6" Butterfly Valve	3	2	2	2	3	3	2	2
Flash Mixer	6" Flow Meter	3	2	2	2	3	3	2	2
Wash Water Return/ Lagoon Decant	12" Flow Meter	3	2	2	2	3	3	2	2
Lake Diversion Tunnel	8,690 LF 72" PCCP pipe in 9' tunnel	5	5	2	2	5	3	3	3
Pipe P-4	32,304 LF 54" and 60" MLCP pipe	5	5	2	2	5	3	3	3
Intake - Flow Control	Kubota 54" Ring FolLower Valve	3	2	2	2	3	3	2	2
Intake - Flow Control	Pratt 54" Butterfly Valve	3	2	2	2	3	3	2	2
Intake - Flow Control	Hydraulic Power Supply	2	2	2	2	3	3	2	2
Raw Water Transmission - Flow Control	Pratt 54" Butterfly Valve	3	2	2	2	3	3	2	2
Raw Water Transmission - Flow Control	Hydraulic Power Supply	3	2	2	2	3	3	2	2

4.3.3 Assessment

The Raw Water infrastructure was assessed from a process mechanical aspect and the following three items of concern were identified.

Raw Water Pipeline Seismic Restraints (RW1)

Six pipe seismic restraints are missing that could jeopardize the integrity of the pipeline during a seismic event. It is recommended that the existing pipe restraints be reinstalled after an engineering assessment of the existing restraint equipment against the latest seismic code. If the condition of these restraints or their mounting have degraded or if the restraints do not meet code requirements, new supports should be fabricated. In addition, there is one restraint missing on the influent pipe, that should be included with this item.

This item has a **High Relative Need** due to possible problems that could result from an unrestrained pipeline in a seismic event; and a **Very Low Complexity** since the installation of these restraints is straightforward and will not impact the production of water or water quality.

Table 4-9 provides a summary of economic considerations with possible O&M costs savings for mitigating flood damage impacts – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-9: RW1 Raw Water Pipe Seismic Restraints – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	Reinstall Seismic Restraints on 42-inch Pipeline (assumed the existing restraints are suitable) (including one on Influent pipe)	$2,500
Operation & Maintenance Labor Cost		NA
Energy Cost		NA
Possible Maintenance Cost Savings	Possible damage of pipeline during seismic event with unforeseeable consequential damages	NA

Flash Mix Condition Assessment (RW2)

O&M documents identify a mixer energy of at least 750 (sec^{-1}). Based on available information at the time of this writing regarding the installation geometry and equipment, it appears that significantly more energy is likely available for flash mixing and no upgrades are recommended to improve the available mixing energy.

The condition of the flash mix mechanism within the raw water pipeline could not be accessed during recent inspections. Given that a corrosive chemical (polyaluminum chloride, PACL) is in contact with the mechanism and that coagulation is a critical process component, a detailed condition assessment is recommended once every approximately five years moving forward. No costs have been provided for this item since there is no initial construction cost identified at this time and the condition assessment may not result in a capital recommendation.

This item has a **High Relative Need** due to possible water quality and production problems that might arise from a failed coagulant mixer; the inspection of the mixer will require plant shutdown, dewatering and a confined space entry.

Flash Mix Feed Water PRV Replacement (RW3)

The pressure reducing/regulator valve for the high-pressure water pipeline feeding the flash mix unit has reportedly had problems and is nearing the end of its useful life. Due to the critical nature of the coagulant mixing system, this valve should be replaced prior to complete failure.

This item has a **High Relative Need** due to possible water quality and production problems that might arise from failed coagulant mixer feed water; and a **Low Complexity** since the replacement of this valve would be relatively quick and require a short plant shutdown.

Figure 4-5
Flash mix feed water isolation valve and PRV

Table 4-10 provides a summary of economic considerations with possible O&M costs savings for replacing the existing PRV valve – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-10: RW3 PRV Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component for Replacement of PRV	One PRV	$15,000
Operation & Maintenance Labor Cost Savings	Assumed 24 hours per year	$2,000
Energy Cost		NA
Periodic Maintenance Cost	Estimated annual maintenance work on existing valve if not replaced, plus parts	$3,000 per year

Raw Water Tunnel and Pipe (See Civil Discussion, Section 2 of this document)

Details regarding a targeted condition assessment of accessible portions of the raw water pipeline are discussed in Section 2 of this document.

4.3.4 Alternatives Evaluations

For the three recommended actions, the following alternatives were identified:

Raw Water Pipeline Seismic Restraints (RW1): No alternative was identified for this recommended upgrade. However, an engineering analysis of the pipeline and the seismic restraint should be conducted to verify the suitability of the existing restraints with current seismic code requirements prior to implementation.

Flash Mix Coagulant Mixer Condition Assessment (RW2): No alternative was identified for the recommended action. Once the condition of the mixer is assessed, and if modifications are needed, alternatives may be identified at that time.

Flash Mix Feed Water PRV Replacement (RW3): No alternative was identified for replacement of this asset. However, there are multiple valve manufacturers and models that could be used on the feed water line.

4.3.5 Summary of Recommendations

Tables 4-11 and 4-12 summarize the recommendations associated with the Raw Water unit process.

Table 4-11: Raw Water Summary of Recommendations

ID	Description	Rationale	Relative Need
RW1	Reinstall seismic restraints on 42-inch diameter pipeline	Reliability, Improved Controls, Reduce Needed Operator Attention	High
RW2	Perform condition assessment of flash mix coagulant mixer	Reliability, Critical Treatment Process	High
RW3	Replace PRV on high pressure flash mix feed water system	Reliability, Critical Treatment Process	High

Table 4-12 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-12: Raw Water – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs)
RW1	$2,500	Very Low	$1,250	$350	$500	$5,000	$0	N/A
RW2	N/A – Engineering effort only (i.e. no capital improvement)							
RW3	$15,000	Low	$10,000	$2,100	$3,000	$30,000	$5,000	6

Implementation of the above recommendations would not alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process; however, a detailed condition assessment is recommended in Section 2 (see Civil discussion) and is being scheduled to occur in late 2018.

Because the total project cost derived for planning purposes is below $500k, Recommendations RW1 through RW3 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.3.6 Special Considerations for Implementation

As discussed above, it is recommended that the existing pipeline seismic restraints (RW1) be evaluated according to the current seismic code prior to reinstallation. The other two items, RW2 and RW3 both require plant shutdowns to implement. In addition, special safety requirements need to be met in order to conduct the flash mixer assessment (RW2) due to the confined entry requirement.

Implementation of the above recommendations would not alone alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process; however, these items will be mitigated through the recommendations discussed specific to a detailed condition assessment in the Civil section of this report (See Section 2).

4.4 Flocculation

The EWTF has a conventional treatment train consisting of two flocculation basins, each with three stages and three compartments. There are a total of 18 two-speed flocculators that provide tapered flocculation of the coagulated water in preparation for settling in the sedimentation basins. The figure below shows the location of the flocculation basins in the plant facilities.

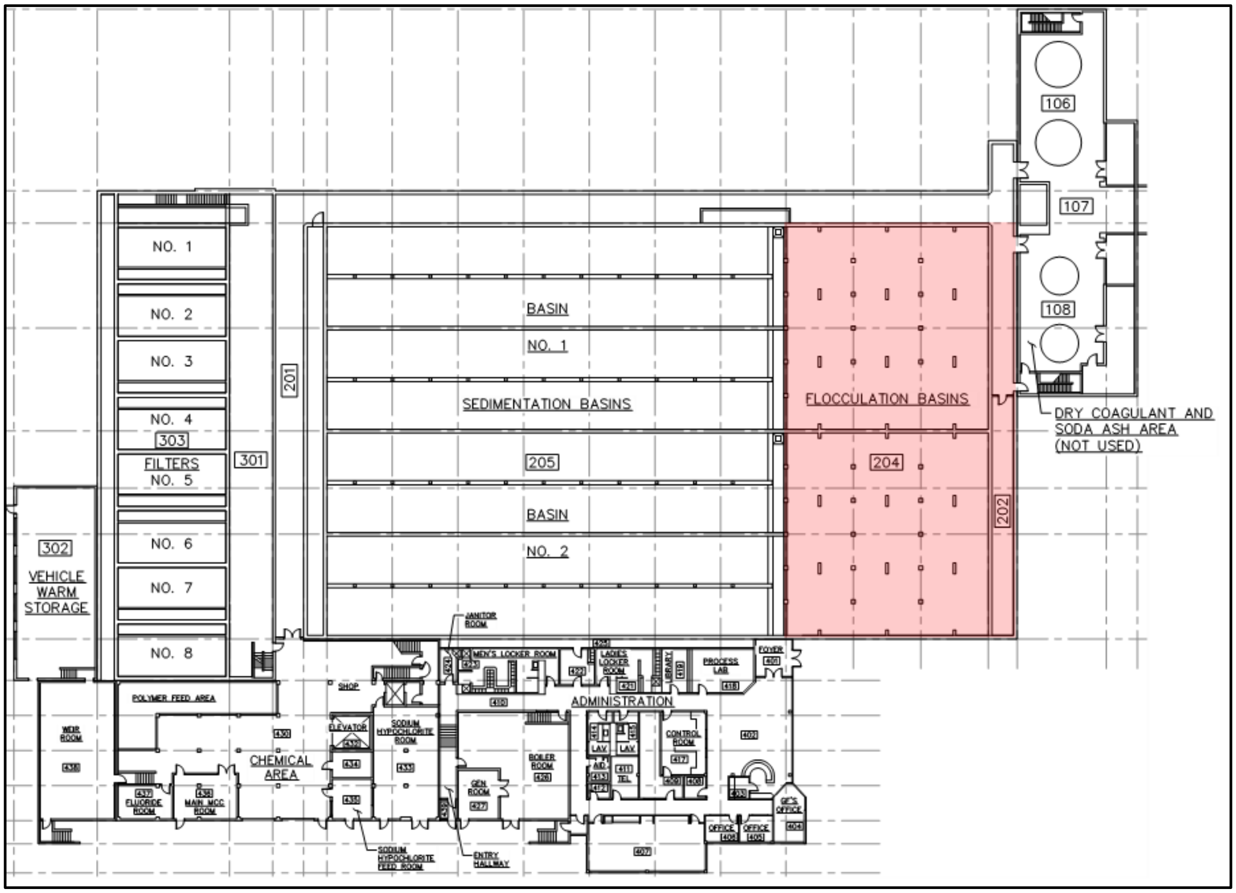

Figure 4-6
Flocculation Basins Location

4.4.1 Existing Facilities and Infrastructure

An assessment of the flocculation process was conducted for this project using the design criteria below.

Table 4-13: Flocculation Criteria

Component	Unit	Value	Remarks
Number of Basins	No.	2	Parallel basins
Number of Stages per Basin	No.	3	
Number of Compartments per Basin Stage	No.	3	
Compartment Size (per basin)	ft.	25W x 25L	
Water Depth	ft.	12	at nominal flow of 35 MGD
Detention Time per Basin	min	41	at nominal flow of 35 MGD
Velocity through basin	ft./min	1.8	at nominal flow of 17.5 MGD per basin
Flocc Basin Influent Channel	ft.	7W x 5H	tapers down to 5' W
Inlet Channel - Entrance to Basin	No.	4	24" BFV with downward inlet deflector (4 per basin)

Component	Unit	Value	Remarks
Flocculator - Type			Vertical shaft - 2 speed motor*
Mechanical Mixers - Number per Basin	No.	9	
Discharge - to downstream sediment basin			Diffuser Wall

*Stage 1 has a 69.6 ratio with an output speed of 16.8 and 12.5 RPMs; Stages 2 and 3 have a 85.7 ratio with an output speed of 13.7 and 10.2 RPMs.

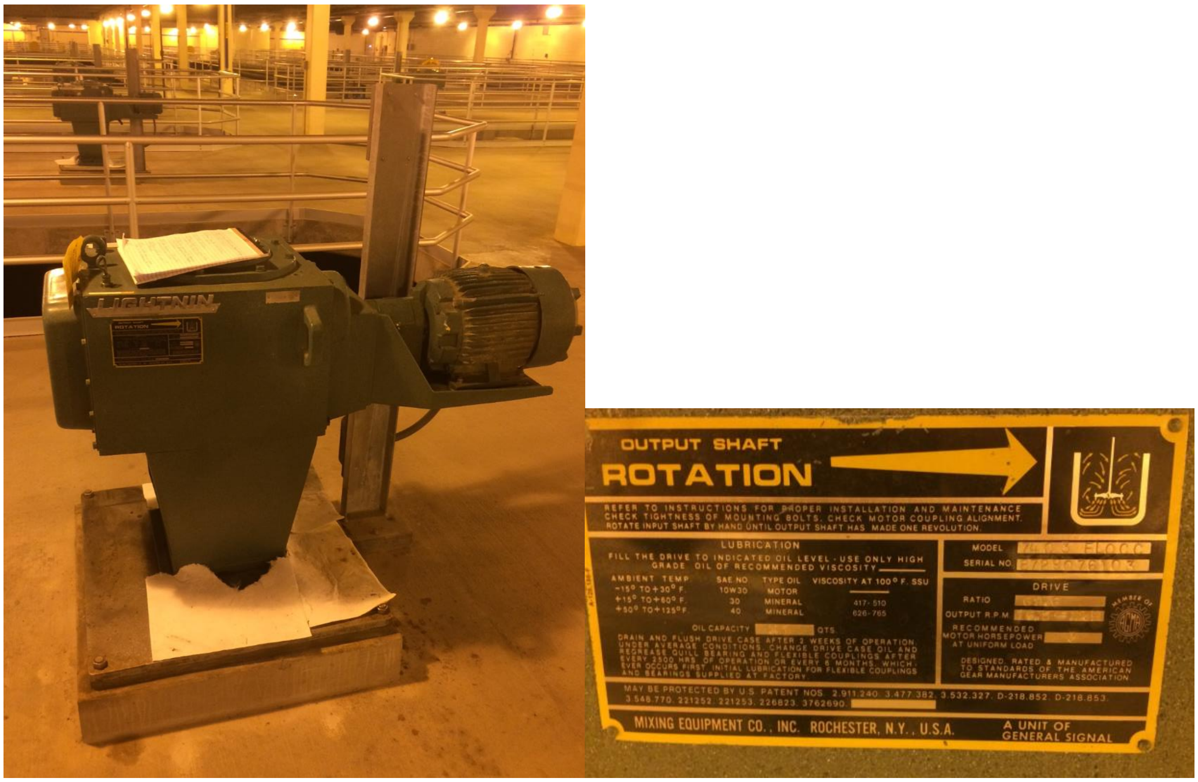

Figure 4-7
Existing Flocculator and Name Plate Data

The flocculation mechanical mixers, known as flocculators, though in good condition, were installed in 1988 and are nearing the end of their useful life. The gear boxes have been rebuilt several times and there are spare gear boxes at the plant. It is recommended that these units be continually assessed (vibration monitoring, gear box oil contaminate assessment, wear assessment, oil leakage monitoring, etc.) to determine when a staged replacement program should begin.

In addition to the flocculators, a need for personnel monitoring for overall worker safety in this area was identified. Additional CCTV camera coverage in the flocculation, sedimentation and filtration area(s) would enhance worker safety and is further discussed in Section 2.

4.4.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major,* or *catastrophic* risk rating level that would require mitigation through capital and/or operational recommendations in accordance with the governing AWWU Risk Response policy.

Table 4-14: Flocculation – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Flocc Basin No. 1	24" Influent Butterfly Valve (BV)	3	2	2	2	3	3	2	2
Flocc Basin No. 1	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 1	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 1	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2	24" Influent Butterfly Valve (BV)	3	2	2	2	3	3	2	2
Flocc Basin No. 2	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 2	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 2	24" Influent BV	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear, shaft & mix blade)	3	2	2	2	3	3	2	2

4.4.3 Assessment

Flocculator Replacement (FLC1)

It is recommended that the flocculators be continually assessed as to the timing and extent of future potential replacement.

Table 4-15 provides a summary of economic considerations for complete replacement of each of the 18 flocculators with similar units by Lightnin – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-15: FLC1 Flocculator Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component for Replacement of 18 Flocculators	Lightnin Model 74Qd (2-speed motors, gear box, shaft and paddles)	$1,000,000
Operation & Maintenance Labor Cost Savings		Same as Existing
Energy Cost Savings		Same as Existing
Periodic Maintenance Cost		Same as Existing

4.4.4 Alternatives Evaluations

The construction cost shown in the table above is based on a preliminary quote for the complete replacement of 18 Lightnin Flocculators that includes the 2-speed motor, gear box, shaft and impeller (paddles). The supply and install would be approximately $980,000, without electrical and ancillary costs. Should it be determined that a re-build of the flocculators, approximately $275,000, or replacement of the gear box reducer, approximately $475,000, would be appropriate, the cost of this action would be greatly reduced. In addition, there are other flocculators on the market, which could be evaluated prior to purchasing.

During the Sedimentation Basin Evaluation, conducted by AWWU in March and April of 2014, the flocculator paddles and shafts, were evaluated as being in good condition. Therefore, it is likely that the flocculator motors and gear boxes could be replaced without the shaft and paddles being replaced. In addition, the replacement could then take place from the top deck so that basins do not need to be out of service. Should the shafts and paddles remain in good condition, an alternative is to replace the flocculators' gear box and 2-speed motor, at an approximate cost of $700,000.

A second alternative is to replace the flocculator's gear box and motor, though provide variable speed motors and variable frequency drive electrical gear. The variable speed would provide greater flexibility in optimizing the mixing energy in each of three stages of flocculation and could possibly provide a more settable floc in the sedimentation basins. This alternative would have an approximate cost of $1,000,000, assuming the shafts and paddles are not replaced. However, it is recommended that more testing be conducted to determine if the enhanced tapered flocculation would provide a proportional level of benefit.

4.4.5 Summary of Recommendations

Based on available information and discussions with AWWU staff, **no capital upgrades are recommended at this time**. Instead, routine condition assessment of existing flocculators for appropriately staging the eventual replacement of 18 flocculators is recommended. Trending of assessments conducted on a recurring basis over 6 to 12-month intervals is recommended until significant degradation is observed.

4.4.6 Special Considerations for Implementation

Eventual replacement of flocculators (including shafts and paddles) will require shutdown of one basin at a time and dewatering thus reducing the plant capacity by about 50 percent. However, replacement of the motors and gear boxes without shaft and paddle replacement, will not require basin shutdowns. Continued assessment of the flocculators will help determine the need and extent of flocculator replacement work. The assessment may indicate that flocculators could be replaced in a staged fashion, such as three at a time over a longer period. In addition, bench-scale and plant-scale testing could be conducted to determine if optimizing mixing energy and providing a more variable speed of each stage of flocculation would have significant benefit for installing variable frequency drives.

4.5 Sedimentation

The conventional treatment train at the EWTF includes two sedimentation basins. The location of these basins within the facilities is shown below.

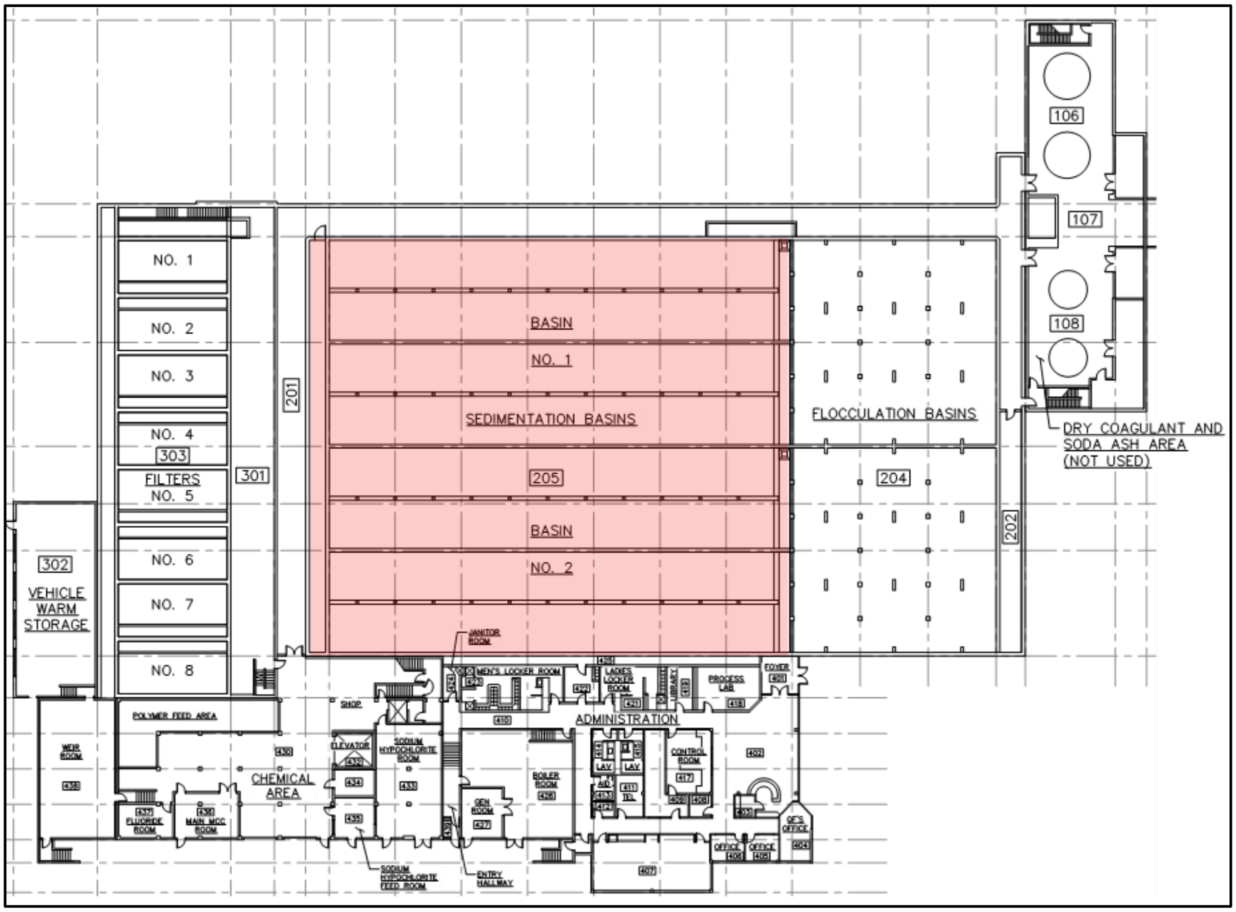

Figure 4-8
Sedimentation Basins Location

4.5.1 Existing Facilities and Infrastructure

The criteria for design of the sedimentation basins are shown in the table below.

Table 4-16: Sedimentation Basin Criteria

Component	Parameter	Value	Remarks
Basin type			Horizontal flow, rectangular
Number of Basins	No.	2	
Basin size	ft.	75x 170	With center dividing wall
Water Depth	ft.	12	At nominal flow of 35 MGD
Detention time per basin	min	94	At nominal flow of 35 MGD
Velocity through basin	ft./m	1.8	At nominal flow of 35 MGD
Basin Inlet number and type	No.	8	Downward facing inlet deflection boxes, 24" dia
Basin length/width ratio		4.5	
Sludge withdrawal from basin			Chain and flight system with telescoping valves
Settled water discharge type			V-Notch Weir

Component	Parameter	Value	Remarks
Settled Water Weir Length per Basin	ft.	75	
Weir Overflow rate	gpm/ft. L	162	
Drain Valves	inch	10	3, currently manually actuated

The criteria for the basins is typical in the industry for conventional treatment facilities. However, in a review of settled water turbidities between January 2011 and November 2016, the average settled water turbidities were 6 NTU or greater 9 percent of the time and 2 NTU or lower only 33 percent of the time. Though not a requirement or regulation, it is generally preferable to have settled water turbidities below 2 NTU for long filter runs. This may be a function of the type of water (i.e., containing glacial silt, a.k.a. "flour"). AWWU has conducted coagulant studies in the past and have not found a primary coagulant and/or polymer that provide consistently lower turbidities. However, filter run times are reportedly long, greater than 48 hours, and therefore do not present a problem (See Subsection 4.6 for further discussion).

Three items were identified as warranting further evaluation for the sedimentation basins: (SED1) wear plates and a portion of the embedded guide plate or rail; (SED2) chain drive motors; and (SED3) difficulties involved with opening the three-sedimentation basin drain valves.

Wear Plates and Guide Rail Replacement (SED1)

In an evaluation of the sedimentation basins conducted by AWWU between March 2014 and April 2014, the north sedimentation basin's lower wear shoe and a portion of the lower stationary guide rail were found to be in poor condition needing replacement "within the year." This item is identified herein as SED1. The evaluation concluded that other assets were in fair to excellent condition.

A subsequent field inspection conducted during this Facility Planning effort identified only a limited run of the lower stationary guide rail for the North basin that requires refurbishment as opposed to replacing the entire lower stationary guide plate – it was found to be in a recessed condition when compared to analogous hardware along the rest of the basin length. It was further determined that construction of an artificially raised section of guiderail could be accomplished with minimal disruption (i.e. downtime) by use of a "puddle weld" technique.

Figure 4-9
North Sediment Basin – Worn Basin Wear

Figure 4-10
North Sediment Basin – Corroded Guide Shoe

Collector Drives Replacement (SED2)

The second item, identified as SED2, involves the chain drive motors. The units are starting to show wear and are nearing the end of their useful life, though they remain functional. It is recommended that the condition of the four longitudinal chain drive motors and two cross collector drive motors be continually assessed and monitored for eventual replacement.

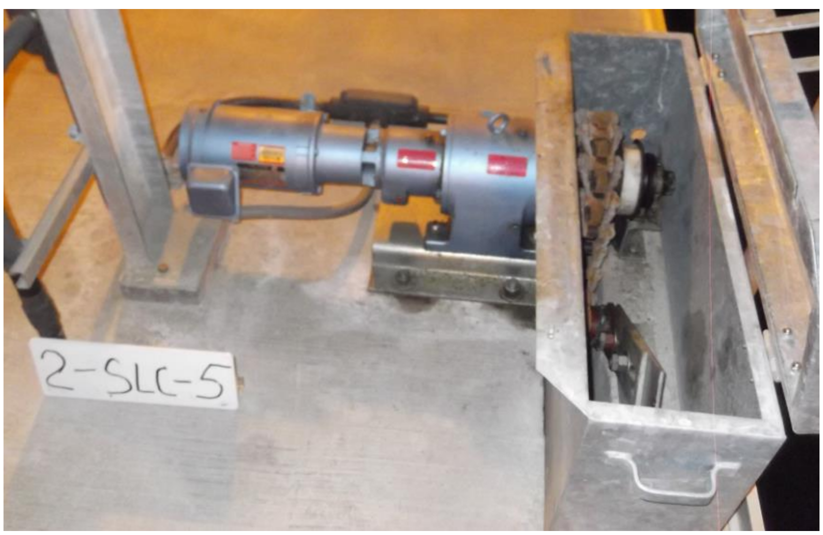

Figure 4-11
Existing Chain Drive Motor

Addition of Motorized Actuator to Basin Drain Valves (SED3)

There are three sedimentation basin drain valves, 2-PV-1, -2 and -3, used to drain Sedimentation Basin 1 and Sedimentation Basin 2 respectively. As shown in the pictures below, these 10-inch plug valves require grating removal, and a pipe wrench to assist hand wheel operation and apply adequate torque to prevent leakage. Operation of a valve is a two-person job, in an awkward position within the valve pit that presents a potential risk of injury or compromised worker safety.

Figure 4-12
Two of three sedimentation drain valves

4.5.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major,* or *catastrophic* risk rating level that would require mitigation through capital and/or operational recommendations in accordance with the governing AWWU Risk Response policy.

Table 4-17: Sedimentation - Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	3	2	2	2	3	3	2	2
Sed Basin No.1	8" Telescoping Valve	2	2	2	2	3	3	2	2
Sed Basin No.1	Sludge Cross Collector	3	2	2	2	3	3	2	2
Sed Basin No.1	Sludge Cross Collector	4	2	2	2	3	3	2	2
Sed Basin No.1	Sludge Cross Collector	3	2	2	2	3	3	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	3	2	2	2	3	3	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	3	2	2	2	3	3	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	3	2	2	2	3	3	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	3	2	2	2	3	3	2	2
Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	3	2	2	2	3	3	2	2
Sed Basin No.1	8" Telescoping Valve	2	2	2	2	3	3	2	2
Sed Basin No.2	Sludge Cross Collector	3	2	2	2	3	3	2	2
Sed Basin No.2	Sludge Cross Collector	4	2	2	2	3	3	2	2
Sed Basin No.2	Sludge Cross Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	4	2	2	2	3	3	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	3	2	2	2	3	3	2	2
Building Mechanical	Heat & Vent	1	2	2	2	3	3	2	1
Building Electrical	Interior Lighting	3	2	2	2	3	3	2	2
Building Electrical	Panelboards	3	2	2	2	3	3	2	2

4.5.3 Assessment

Guide Rail Refurbishment (SED1)

It is recommended that the 20-foot section of guide rail that was found to be recessed below grade be refurbished with a strap and puddle weld to artificially raise the existing infrastructure to be even with analogous hardware in the balance of the basin. This type of construction will not require concrete demolition as originally thought.

Table 4-2 provides a summary of economic considerations for replacing the wear shoe and rail section – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-18: SED1 Wear Plates and Guide Rail Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction cost component - replacement of traveling wear shoe and 20-ft section of guide rail in North Sedimentation Basin		$10,000
Operation & Maintenance Labor Cost Savings		Same as Existing

Item	Criteria	Cost
Energy Cost Savings		Same as Existing
Periodic Maintenance Cost		Same as Existing

These items are vital to the sedimentation process and the removal of sludge from the basin. If these items are not replaced, failure of the sludge system in the north basin will occur causing shutdown and possible added damage to the sludge collection mechanisms. SED1 therefore has a **HIGH Relative Need**; replacement of these items will require one of two basins be taken down.

Collector Drives Replacement (SED2)

It is recommended that the collector chain drives be monitored for wear approximately once per year and these units be scheduled for replacement when degradation of their condition is observed (likely during this planning horizon). Given the likelihood that degradation will be observed in the next 5-10 years, costs for this upgrade are discussed further however planned capital expenditures are deferred to the second half of the planning horizon acknowledging that visual observation of increased wear should be a condition precedent for scheduling this upgrade.

Table 4-2 provides a summary of economic considerations – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-19: SED2 Collector Drives Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction cost component - replacement of 4 longitudinal collector drives and 2 cross collector drives		$80,000
Operation & Maintenance Labor Cost Savings		Same as Existing
Energy Cost Savings		Same as Existing
Periodic Maintenance Cost		Same as Existing

This recommended improvement has a **LOW** Relative Need since the drive units are functional and monitoring is adequate at this time; and a **LOW** complexity since the drive units can be accessed from the top deck of the sedimentation basins. However, sludge collection and removal is a vital part of the process and will require replacement in the near future (likely during this planning horizon).

Addition of Motorized Actuator to Basin Drain Valves (SED3)

It is recommended that an electrical motorized actuator be installed at each of the three sedimentation plug valves. A reliable actuator, such as Rotork actuator, should be used for this intermittent use. The actuators do not need to be programmed for any automatic operation, but should be provided with push button stations for open and close operation. Locating electrical equipment with pits could subject these items to flooding, and a review of possible flooding should be conducted.

Table 4-20 provides a summary of economic considerations – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-20: SED3 Addition of Motorized Actuator to Basin Drain Valves – Cost Impact Summary

Item	Criteria	Cost
Construction cost component - add three motorized actuators and push button stations to sedimentation basin drain valves, including electrical work.	Three 10-inch open close plug valve actuators	$50,000
Operation & Maintenance Labor Cost Savings	Based on two AWWU operators for 2 hours per valve once a quarter each year	$4,300
Energy Cost Savings		Negligible
Periodic Maintenance Cost		Same as Existing

SED3 has a **LOW** Relative Need since the actuators are not vital to water quality or production; operator modifications would not require lengthy shutdown of the basins.

Monitoring of Sedimentation Basin Drain Lines (SED4)

Though the visual condition of the sedimentation basin drain lines appears to be adequate and occasional flushing has not identified any potential sediment build-up, it is recommended that all lines exiting the sedimentation basin (i.e. those with high potential to accumulate deposits such as the drain lines) be periodically inspected by running a CCTV camera as far into the line as is practical. This should be coordinated with periodic cleaning of the basins and is not recommended to initiate more frequent instances where these tanks would require being removed from service.

4.5.4 Alternatives Evaluations

No alternatives were identified for either SED1 or SED2. In both cases, these are components of the sludge collection system, and as such need replacement essentially in-kind as described above. In lieu of the addition of motorized actuators to the sedimentation basin drain valves (SED3), manual operators on stands above the grating could be provided as an alternative. However, this may limit access through the grating and to the valves. Such manual operators on stands do not represent as robust a final installation and are not recommended.

4.5.5 Summary of Recommendations

Tables 4-21 and 4-22 summarize the recommendations associated with the Sedimentation unit process.

Table 4-21: Sedimentation Summary of Recommendations

ID	Description	Rationale	Relative Need
SED1	Replacement of traveling wear plates and 20-ft section of guide rail in North Sedimentation Basin	Reliability; Failure of items causing additional damage	High
SED2	Monitoring and replacement of 4 longitudinal collector drives and 2 cross collector drives	Reliability; Failure causing short time impact to production	Low
SED3	Addition of three motorized actuators for sedimentation basin drain valves	Reliability; Time consuming to actuate	Low
SED 4	CCTV monitoring of drain lines and other pipes exiting sedimentation basins	Higher potential for sediment deposits	Low

Table 4-22 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-22: Sedimentation – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs)
SED1	$10,000	Very Low	$5,000	$1,400	$2,000	$18,000	$0	N/A
SED2	$80,000	Low	$10,000	$11,200	$16,000	$117,000	$0	N/A
SED3	$50,000	Low	$10,000	$9,500	$10,000	$80,000	$4,300	19
SED4	N/A – operational recommendation only							

Because the total project cost derived for planning purposes is below $500k, Recommendations SED1 through SED3 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.5.6 Special Considerations for Implementation

None.

4.6 Filtration

The EWTF's filtration system consists of eight self-backwashing filters in the location shown below.

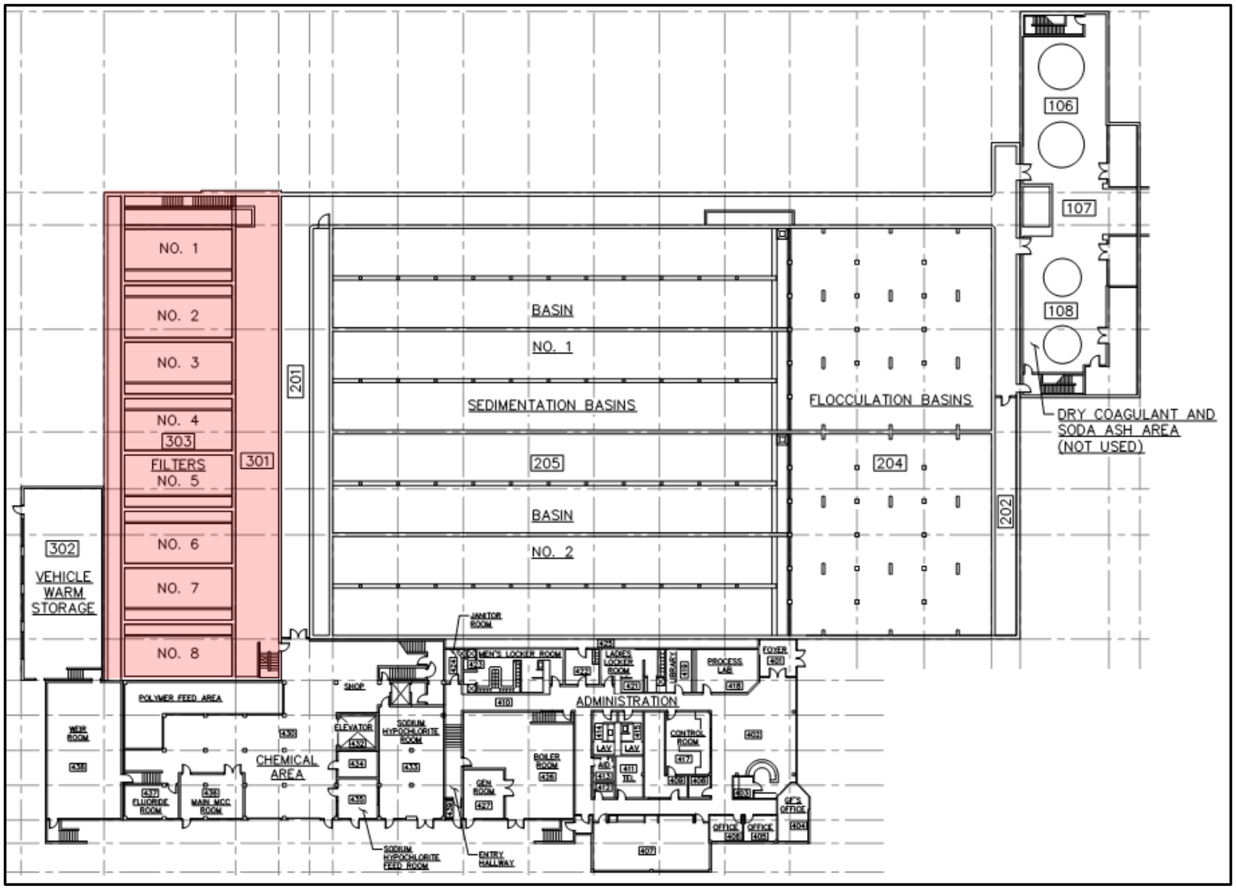

Figure 4-13
Location of Filters

4.6.1 Existing Facilities and Infrastructure

Recent modifications of the filters include filter-to-waste improvements that were completed in 2015. Design criteria for the existing filtration system is shown below.

Table 4-23: Filtration System Design Criteria

Component	Unit	Value	Remarks
Filter Type			Gravity self-backwashing filters
Number of filters	No.	8	
Filter bed area	ftxft	14.83 x 40	593 ft^2 each
Filter box max water depth	ft.	21.8	
Filtration rate with all filters	gpm/ft^2	5.1	at nominal flow of 35 MGD

Component	Unit	Value	Remarks
Filtration rate with 1 filter out of service	gpm/ft^2	5.8	at nominal flow of 35 MGD
Media: Anthracite	in.	20	
Total Sand	in.	10	
Gravel	in.	18	
Backwash Rate	gpm/ft2	15-20	
Filter underdrain type			Precast concrete teepees
Surface wash pumps	No.	2	
Surface wash pump capacity	gpm	1,780	
Filter-to-Waste Pump	No.	2	
Filter-to-Waste Pump Capacity	Gpm	3,000	

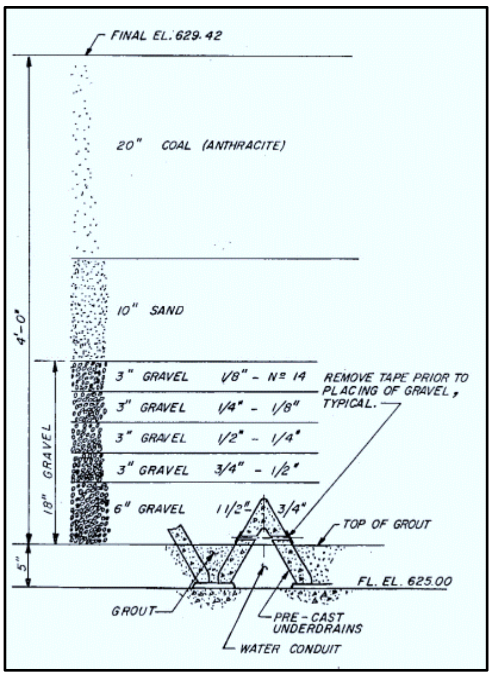

Figure 4-14
Filter Media Design Profile

The filter media originally installed consisted of 20-inches of anthracite, 10-inches of sand, and 18-inches of gravel above precast filter bottoms. Reportedly, very little filter media carryover or loss has been seen in the waste washwater channels. Addition of anthracite has been performed in the past.

4.6.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. One asset associated with the filtration system (a broad asset covering large diameter exposed piping and valves) was found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Figure 4-3 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, the moderate risk asset should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-24: Filtration – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Filter Gallery	Original, Major, Exposed Valves (that are not listed separately) & Piping	2	2	2	2	3	3	2	2
Filter Gallery	FTW, Major, Exposed Valves (that are not listed separately) & Piping	1	2	2	2	3	3	2	1
Filter Gallery	Original, Major, Non-Exposed Piping	3	2	2	2	3	3	2	2
Filter Gallery	FTW, Major, Non-Exposed Piping-	1	2	2	2	3	3	2	1
Filter Effluent Control Area	Exposed, Major Valves (not listed elsewhere) & Pipe	4	2	4	2	3	3	3	3
Filter Effluent Control Area	Filter Surface Wash Pump No.1	3	2	2	2	3	3	2	2
Filter Effluent Control Area	Filter Surface Wash Pump No.1	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.1 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.1 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 1 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.1 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.1 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 1 Filter to Waste Water (FTW) BV	1	2	2	2	3	3	2	1
Filter No.1	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.1	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.1	Filter Media	3	2	2	2	3	3	2	2
Filter No.1	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.2 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.2 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 2 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.2 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.2 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 2 FTW BV	1	2	2	2	3	3	2	1
Filter No.2	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.2	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.2	Filter Media	3	2	2	2	3	3	2	2
Filter No.2	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.3 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.3 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 3 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No. 3Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.3 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 3 FTW BV	1	2	2	2	3	3	2	1
Filter No.3	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.3	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.3	Filter Media	3	2	2	2	3	3	2	2
Filter No.3	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.4 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.4 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 4 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.4 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.4 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 4 FTW BV	1	2	2	2	3	3	2	1
Filter No.4	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.4	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.4	Filter Media	3	2	2	2	3	3	2	2
Filter No.4	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.5 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.5 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 5 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.5 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.5 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 5 FTW BV	1	2	2	2	3	3	2	1
Filter No.5	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.5	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.5	Filter Media	3	2	2	2	3	3	2	2
Filter No.5	Filter Underderdrain	3	2	2	2	3	3	2	2

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Filter Influent Channel	24" Filter No.6 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.6 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 6 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.6 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.6 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 6 FTW BV	1	2	2	2	3	3	2	1
Filter No.6	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.6	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.6	Filter Media	3	2	2	2	3	3	2	2
Filter No.6	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.7 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.7 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 7 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.7 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.7 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 7 FTW BV	1	2	2	2	3	3	2	1
Filter No.7	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.7	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.7	Filter Media	3	2	2	2	3	3	2	2
Filter No.7	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Influent Channel	24" Filter No.8 Influent BV	3	2	2	2	3	3	2	2
Filter Gallery	36" Filter No.8 Influent BV	1	2	2	2	3	3	2	1
Filter Effluent Channel	42" Filter No. 8 Filtered Water BV	1	2	2	2	3	3	2	1
Filter Gallery	36" Filter No.8 Waste Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	12" Filter No.8 Surface Washwater BV	1	2	2	2	3	3	2	1
Filter Gallery	16" Filter No. 8 FTW BV	1	2	2	2	3	3	2	1
Filter No.8	Backwash Troughs	3	2	2	2	3	3	2	2
Filter No.8	Surface Wash Rotating Arms	3	2	2	2	3	3	2	2
Filter No.8	Filter Media	3	2	2	2	3	3	2	2
Filter No.8	Filter Underderdrain	3	2	2	2	3	3	2	2
Filter Gallery	FTW Pump No.1	1	2	2	2	3	3	2	1
Filter Gallery	FTW Pump No.2	1	2	2	2	3	3	2	1

4.6.3 Assessment

Reportedly, the filters have adequately long run times, greater than 48 hours, before backwashing is initiated, with acceptable filter headloss and water quality within required limits. A review of the combined filter effluent (CFE) turbidity data between January 2011 and November 2016 showed an average turbidity of 0.06 NTU, though there were nine days out of 2,096 days (0.4%) where the maximum turbidity was above 0.100 NTU. The laboratory data, though not an online analysis for shorter time intervals, appears to show that filtered water turbidity was well within the regulatory requirements. The highest laboratory reading was 0.234 NTU which is well below the maximum 0.3 NTU or 0.5 NTU requirements in the regulations, See Section 3.

As discussed in the previous sections, settled water turbidity exceeds 2 NTU 67 percent of the time, though the good filtered water quality and adequately long filter runs indicate that the moderately high settled water turbidity does not impact the filtration process. The Unit Filter Run Volume has been approximated as over 6,500 where 5,000 is considered “good.”

Filter Assessment (FLT1)

To better understand the condition of the unexposed filtration system, a field evaluation of the filter media, and the filter bottoms was performed as part of this Facility Planning effort. Appendix E contains the complete filter evaluation analysis and technical memorandum, including the standard operating procedure (SOP) that was followed to facilitate this evaluation. This supplemental evaluation was undertaken to inform AWWU as to:

- Possible media loss (is media being carried over in backwashing)
- Distribution of media (are the layers consistent throughout the filter)
- Breakdown of media (is anthracite being broken down)

From this information, recommendations on media replacement, changes in media, additional studies, and other items were anticipated. Per the results described in Appendix E, no such recommendations are warranted at this time.

Filter Startup SOP Preparation (FLT2)

During construction of the Filter-to-Waste Project, the filters were dewatered. To restart the filtration process, the filters need to be backwashed prior to being put on-line. However, with self-backwashing filters, this can present a problem if there is not adequate filtered water in the system. The process was successfully completed and the filters were placed back into service. It is recommended that AWWU staff review the current Standard Operating Procedure (SOP) for the filtration system and document methods used for start-up of dry filters.

FLT2 has a **LOW** Relative need since the filters being dry is a rare occurrence; however formal procedures for infrequent circumstances are best practice and are frequently the most valuable when those rare circumstances are present.

Filtered Water Turbidimeters (FLT3)

The reliability of each of eight (8) filtered water turbidimeters has been degrading in recent years. To arrive at a uniform and consistent measure of filtered water turbidity, it is recommended that a plant-wide turbidimeter replacement be undertaken. This would include replacement of the instruments as well as system integration work to re-map inputs/outputs to the SCADA system accordingly.

FLT3 has a **HIGH** Relative need since the filtered water turbidity is the primary metric for plant performance on water quality and the confidence in current instrumentation is diminishing.

4.6.4 Alternatives Evaluations

Items FLT1 (filter evaluation) and FLT2 (SOP preparation) have no alternatives. However, should concerns arise out of the filter evaluation, alternatives may be identified. Multiple manufacturers of turbidimeters are well established in the industry. During design, a preferred manufacturer should be selected that can meet the desired I/O and communications requirements.

4.6.5 Summary of Recommendations

At this time, there is no indication that modifications to the filters, such as provisions for air backwash or changes in media type are warranted. In addition, modifications to the sedimentation basins, such as plate or tube settlers, do not appear to be warranted as the filtered water turbidity is routinely and consistently outperforming industry standards. This evaluation should be revisited in the event substantially increased capacity is desired from the EWTF.

The sole capital recommendation is to replace the instrumentation (turbidimeters) serving the filters (FLT3).

Based on available information and discussions with AWWU staff, the following actions are recommended for the filtration process:

Table 4-25: Sedimentation Summary of Recommendations

ID	Description	Rationale	Relative Need
FLT1	Evaluation of filter media and possible follow-up actions	Reliability; Water Quality	High (completed as part of this Facility Plan)
FLT2	Review and modification of SOP for Filter Backwashing Procedures	Water Quality, Ability to startup dry filters	Low
FLT3	Replace eight turbidimeters	Increase confidence and consistency in primary drinking water quality performance metric	High

Implementation of the above recommendations would not alleviate the 'moderate risk' item noted in the Asset Management Plan for this unit process; therefore, more frequent inspection of the process mechanical equipment per the recommendations of the Asset Management Plan are recommended instead of any planned repair or replacement.

4.6.6 Special Considerations for Implementation

FLT1 (evaluation of filters) and FLT2 (SOP preparation) have no special implementation considerations.

4.7 Clearwell and Effluent Vault

The EWTF's 15-million-gallon clearwell reservoir and effluent vault are located as shown on the following figure.

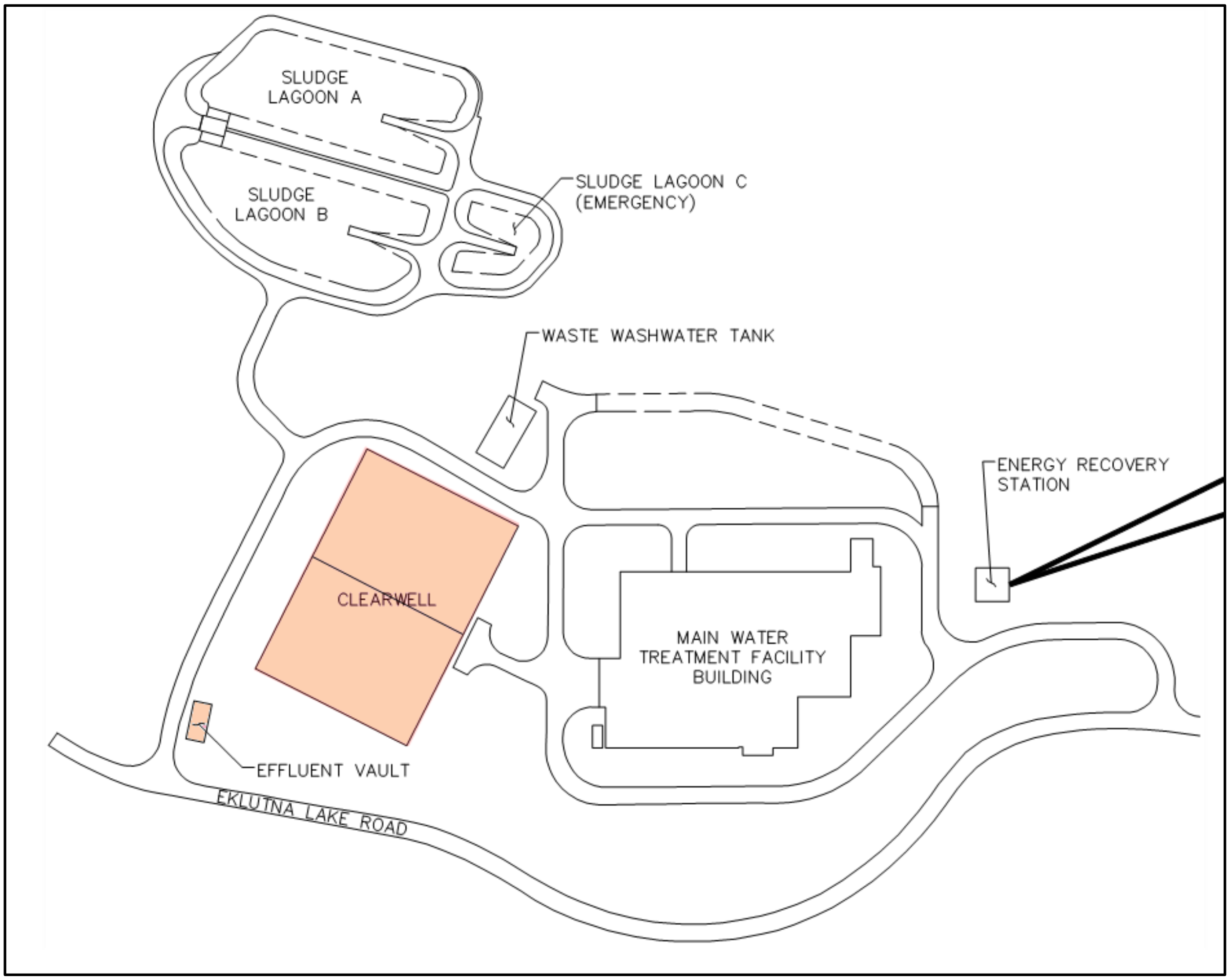

Figure 4-15
EWTF Clearwell and Effluent Vault Location

4.7.1 Existing Facilities and Infrastructure

The existing clearwell's design criteria is shown below.

Table 4-26: Clearwell Design Criteria

Component	Unit	Value	Remarks
Type			Buried reinforced concrete
Total Capacity	MG	15	Divided into two basins
Dimensions	ftxft	340 x 230	
Sidewater depth	ft.	20	
Total Water depth (from middle of hopper bottom)	ft.	30	

Reportedly, there were no significant cracks in the clearwell interior identified when it was dewatered and visually inspected during the Filter-to-Waste Project. Sample pumps have been installed for monitoring finished water quality. Below are the items of concern identified for modification.

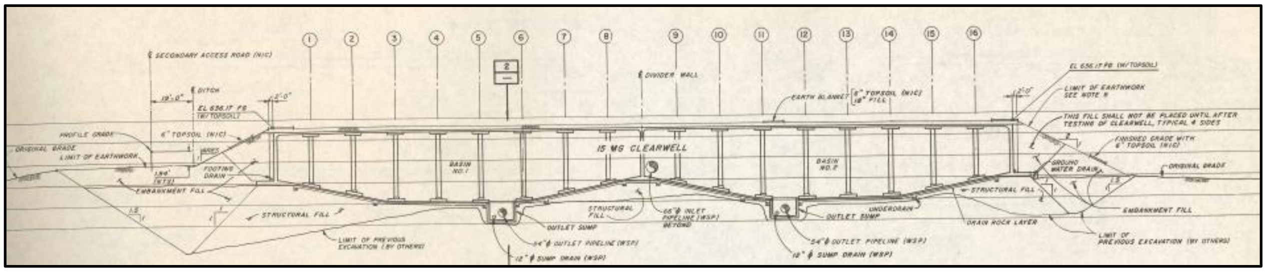

Figure 4-16
1986 Clearwell Design Drawing

4.7.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Several assets associated with the clearwell reservoir and effluent vault were found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Table 4-27 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-27: Clearwell and Effluent Vault – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Basins 1 & 2	Exposed & Submerged, Major Pipe	2	2	4	2	3	3	3	2
Basins 1 & 2 +directly adjacent	Buried, Major Pipe	3	2	2	2	3	3	2	2
Basin No.1- Inlet Structure	54" Inlet BV	4	2	2	2	3	3	2	2
Basin No.1- Outlet Sump	54" Outlet BV	4	2	2	2	3	3	2	2
Basin No.1- Outlet Sump	12" Drain Check Valve	3	2	2	2	3	3	2	2
Basin No.1- Outlet Sump	12" Drain BV	4	2	2	2	3	3	2	2
Basin No.2- Inlet Structure	54" Inlet BV	4	2	2	2	3	3	2	2
Basin No.2- Outlet Sump	54" Outlet BV	4	2	2	2	3	3	2	2
Basin No.2- Outlet Sump	12" Drain Check Valve	3	2	2	2	3	3	2	2
Basin No.2- Outlet Sump	12" Drain BV	4	2	2	2	3	3	2	2
Underdrain	Pump Station	3	2	2	2	3	3	2	2
Underdrain Piping		4	2	2	3	3	4	3	3
Effluent Vault	Exposed Major Valves (that are not listed elsewhere) & Pipe	3	5	4	2	5	3	4	3
Effluent Vault	14" Air- Vacuum & Air Release Valve	3	2	2	2	3	3	2	2
Effluent Vault	14" Air- Vacuum & Air Release Valve	3	2	2	2	3	3	2	2
Effluent Vault	36"BV	3	2	2	2	3	3	2	2
Effluent Vault	36"BV	3	2	2	2	3	3	2	2
Effluent Vault	36 Venturi	4	2	2	2	3	3	2	2
Effluent Vault	36"BV	3	2	2	2	3	3	2	2
Effluent Vault	12"BV	3	2	2	2	3	3	2	2
Effluent Vault	12"BV	3	2	2	2	3	3	2	2
Effluent Vault	36"BV	3	2	2	2	3	3	2	2
Effluent Vault	36"BV	3	2	2	2	3	3	2	2

4.7.3 Assessment

Clearwell Influent and Effluent Valves' Actuator Modifications (CW1)

The 66-inch diameter clearwell inlet valves, 8-V-1 and -2, and the 54-inch diameter outlet valves, 8-V-3 and -4, show corrosion, though they have substantive remaining service life. These valves should be regularly inspected since they are vital to plant operation and maintenance. It is recommended that the stems be replaced and mounted in torque tubes, and the actuator/gear reducers be replaced and located at grade above the clearwell.

Figure 4-17
Clearwell influent (left) and effluent (right) valves and gear box/actuators

Table 4-28 provides a summary of economic considerations for the actuator modifications – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-28: CW1 Clearwell Influent and Effluent Valves' Actuator Modifications – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	New actuator/gear box above clearwell, stem and torque tube for two 66" valves and two 54" valves	$120,000
Operation & Maintenance Labor Cost		Same as existing
Energy Cost		NA
Maintenance Cost		Same as existing
Simple Pay Back Period		NA

Clearwell Drain Valves (CW2)

The clearwell's two 12-inch butterfly drain vales have gear reducer boxes under water and have significant stem corrosion and torque damage, as shown below. The stems should be replaced and mounted in torque tubes and the actuator/gear reducers should be relocated at grade above the clearwell.

Figure 4-18
Clearwell drain valve corrosion and stem damage

Table 4-29 provides a summary of economic considerations for the clearwell drain valve modifications – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as existing costs have not been included below.

Table 4-29: CW2 Clearwell Drain Valves – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	New 12-inch valves, actuator/gear box above clearwell, stem and torque tube for two 12" valves	$100,000
Operation & Maintenance Labor Cost		Same as existing
Energy Cost		NA
Maintenance Cost		Same as existing
Simple Pay Back Period		NA

Clearwell Hypochlorite Injection Point Modifications (CW3)

The permanent sodium hypochlorite injection points, used to chlorinate the clearwell, are in the Surfacewash Pump Room. During clearwell maintenance, a small amount of hypochlorite is occasionally added at the sump location in the clearwell for disinfection of the clearwell prior to resuming operations. During this clearwell disinfection process, elevated chlorine levels have been observed in the clearwell. The materials of construction for structures and equipment in the clearwell are suitable for this service however a formalized standard operating procedure (SOP) for disinfection of the clearwell (during clearwell maintenance) that mitigates elevated chlorine levels that could potentially propagate to the finished water distribution system is warranted. Formalizing this SOP will allow for a wide circulation of this infrequent procedure to future AWWU staff and inclusion in the EWTF's O&M manual.

Final Effluent Weir Underdrain Valve Modifications (CW4)

The Final Effluent Weir Underdrain Valve (6-inch butterfly valve) used to control the underdrain filtrate and allow clearwell water backflow for backwashing the filters (under certain head conditions) has a bent stem and is currently served by a manually operated crank actuator. The valve reportedly has severe leakage. The valve stem may need to be replaced if damaged further, however it should be supported so it does not deflect, and the shaft square nut elevated so that the plant's "mule" can be used to open and close the valve.

It is assumed that this would not be performed as part of a capital improvement and therefore represents an engineering and/or O&M outlay.

Clearwell & Effluent Vacuum Relief & Vent Tube Cleaning (CW5)

The existing vacuum rupture disks are 30 years old and should be replaced at this time. Three rupture disks should be fabricated by the selected manufacturer: one for testing (to confirm the rupture pressure), one to be installed, and one to be stored by AWWU on site as a spare. Future replacement of the disks should be performed based on the manufacturer's recommendations. In addition, a CCTV inspection of the vent tubes should be coordinated during replacement.

Table 4-30 provides a summary of economic considerations for the vacuum relief rupture disks and vent tube cleaning – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as existing costs have not been included below.

Table 4-30: CW5 Vacuum Relief Rupture Disks and Vent Tube Cleaning – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	Replace vacuum relief rupture disks, obtain spare disks, and clean vent tubes	$15,000
Operation & Maintenance Labor Cost		N/A
Energy Cost		N/A
Maintenance Cost		N/A
Simple Pay Back Period		N/A

Clearwell & Effluent Valve Access/Security (CW6)

There are multiple locations where actuators and/or gearboxes are located on/in the clearwell (i.e. with direct access to finished water prior to entering AWWU's distribution system). The current configuration generally includes an unsecured aluminum plate/box and a swing plate, which function admirably for the safety of AWWU staff in terms of eliminating potential access/tripping hazards; however, they result in a series of unsecured access points that should be eliminated.

Table 4-31 provides a summary of economic considerations for the minor security provisions described earlier in this section – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as existing costs have not been included below.

Table 4-31: CW6 Clearwell & Effluent Valve Access/Security Provisions – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	Minor hardware provisions for securing clearwell penetration access points.	$12,000
Operation & Maintenance Labor Cost		N/A
Energy Cost		N/A
Maintenance Cost		N/A
Simple Pay Back Period		N/A

4.7.4 Alternatives Evaluations

Prior to design, valve inspections should be undertaken, as part of CW1, CW2, and CW4 to determine the extent of the modifications and replacements. However, no alternatives were identified for the recommended modifications.

To provide additional security of potentially open/access points to finished water in the clearwell, secured access should be provided. This could be accomplished by establishing monitored access points with online instrumentation tied to the SCADA system; however, that would be most appropriate for a remote facility that could potentially be accessed by the public without AWWU staff present. For the locations associated with the EWTF clearwell, a manual means of securing these access points, such as a hard key/lock arrangement is most appropriate. An allowance to supply the requisite hardware of $12,000 is therefore included as a recommended capital expenditure, derived from an allowance of $2k per location for a total of six locations.

4.7.5 Summary of Recommendations

Table 4-32 summarizes the recommendations associated with the clearwell reservoir and effluent vault.

Table 4-32: Clearwell and Effluent Vault Summary of Recommendations

ID	Description	Rationale	Relative Need
CW1	New actuator/gear box above clearwell, stem and torque tube for two 66" Influent valves and two 54" Effluent valves	Reliability; Operability	High
CW2	New 12-inch valves, actuator/gear box above clearwell, stem and torque tube for two 12" drain valves	Reliability (Mitigation of Corrosion Damage); Operability	High
CW3	Relocate hypochlorite injection points within clearwell away from valves and appurtenances	Reliability (Mitigation of Corrosion Damage)	Medium
CW4	Replace stem, provide stem support, and locate nut above for Final Effluent Underdrain Valve	Reliability; Operability	High
CW5	Replace vacuum relief rupture disks, obtain spare disks, and clean vent tubes	Reliability	Medium
CW6	Include provisions to avoid unsecure clearwell/effluent stem and other penetrations (non-alarming)	Safety & Security (of finished water)	High

Table 4-33 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-33: Clearwell and Effluent Vault – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs)
CW1	$120,000	Low	$10,000	$22,800	$24,000	$177,000	$0	N/A
CW2	$100,000	Low	$10,000	$9,000	$20,000	$139,000	$0	N/A
CW3	$5,000	Very Low	$2,500	$700	$1,000	$9,000	$0	N/A
CW4	N/A – Assumed O&M outlay only (i.e. no capital improvement)							
CW5	$50,000	Low	$12,000	$7,000	$10,000	$79,000	$0	N/A
CW6	$12,000	Very Low	$2,500	$500	$2,400	$17,000	$0	N/A

Implementation of the above recommendations would alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process to the extent practical.

Because the total project cost derived for planning purposes is below $500k, Recommendations CW1 through CW6 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.7.6 Special Considerations for Implementation

As part of CW1, the influent and effluent valves should be inspected to determine the extent of corrosion, and the viability of replacing the actuators with above grade actuators without a lengthy shutdown. Should major valve modifications be needed, a more extensive shutdown plan would need to be coordinated to facilitate construction.

Relocation of the hypochlorite injection points, as part of CW3, should be designed to provide adequate dispersion of the chemical while mitigating corrosion of metals in the clearwell.

4.8 Waste Washwater

The waste washwater system conveys used filter backwash water from the filters through the waste washwater tank to the lagoons. As shown in Figure 4-19, the waste washwater can be returned to the raw water from the tank, by passing the lagoons. However, this flow path is not used by staff. These facilities are shown on the figure below. The lagoons are discussed further in the Residuals Management section.

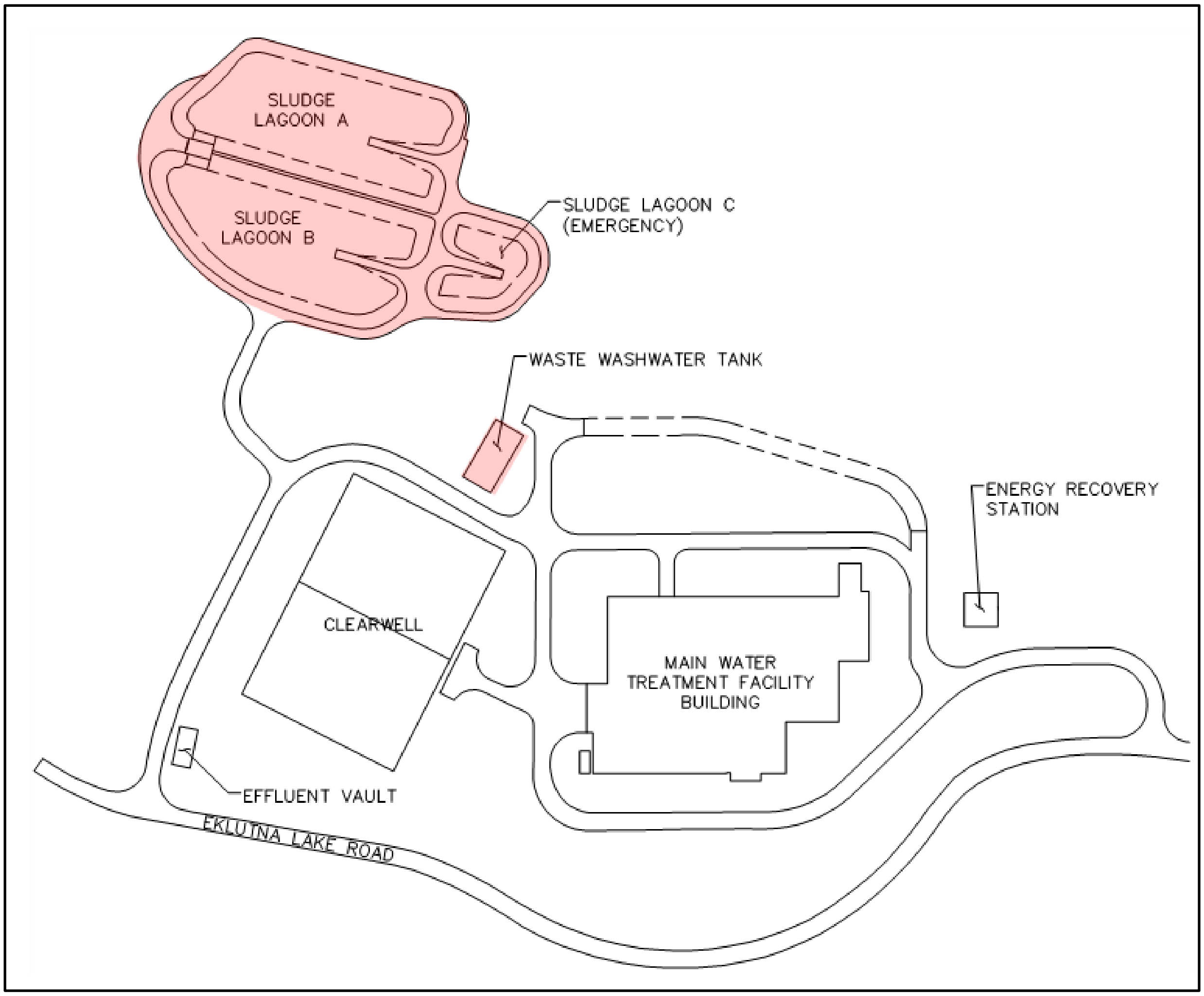

Figure 4-19
Waste Washwater Tank and Lagoons at the EWTF

4.8.1 Existing Facilities and Infrastructure

The existing waste washwater facilities consist of the tank and three pumps used to convey the equalized waste washwater volume to the lagoons. The design criteria for the tank and pumps are shown below.

Table 4-34: Waste Washwater Design Criteria

Component	Unit	Value	Remarks
Waste Washwater Tank Capacity	gal	339,600	Two compartments with 169,800 gal each
Waste Washwater Pump	No.	3	
Waste Washwater Pump Capacity	gpm	1,050	

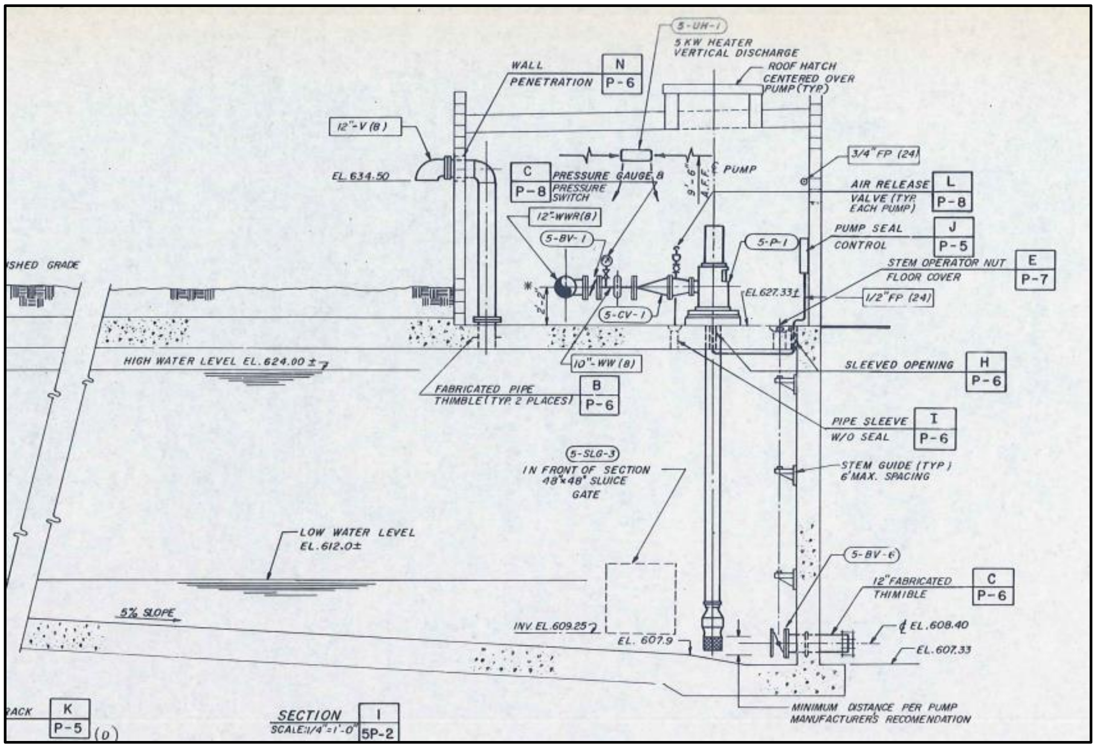

Figure 4-20
Waste Washwater Tank and Pumps Design Drawing

4.8.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major,* or *catastrophic* risk rating level that would require mitigation through capital and/or operational recommendations in accordance with the governing AWWU Risk Response policy.

Table 4-35: Waste Washwater – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Waste Washwater Pump Sta.	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	2	2	2	3	3	2	2
Waste Washwater Tank	24"H x 48"W Sluice Gate	3	2	2	2	3	3	2	2
Waste Washwater Tank	24"H x 48"W Sluice Gate	3	2	2	2	3	3	2	2
Waste Washwater Tank	38"H x 48"W Sluice Gate	3	2	2	2	3	3	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.1 (Vertical Turbine)	3	2	2	2	3	3	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.2 (Vertical Turbine)	2	2	2	2	3	3	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.3 (Vertical Turbine)	4	2	2	2	3	3	2	2
Waste Washwater Pump Sta.	10" Backpressure Valve	3	2	2	2	3	3	2	2

4.8.3 Assessment

Each of the two older waste washwater pumps were initially identified as possible items for replacement during field investigations performed in support of this Facility Planning effort owing primarily due to their age and remaining service life. However, after further discussions with AWWU, it appears there are no observable problems and the pumps are all functioning as intended. In the future, AWWU could evaluate removal of the waste washwater pumps and possible use of gravity flow to the lagoons, if return directly to the raw water is not going to be used. No other items were identified for evaluation and therefore no alternatives were evaluated nor any further capital improvement, O&M or engineering efforts were developed.

4.9 Residuals Management

The EWTF's residual management system consists of two duty lagoons and a third lagoon used for emergency purposes. These lagoons treat waste washwater from the filter backwash system and sludge from the sedimentation basins. Their location is shown on the figure below.

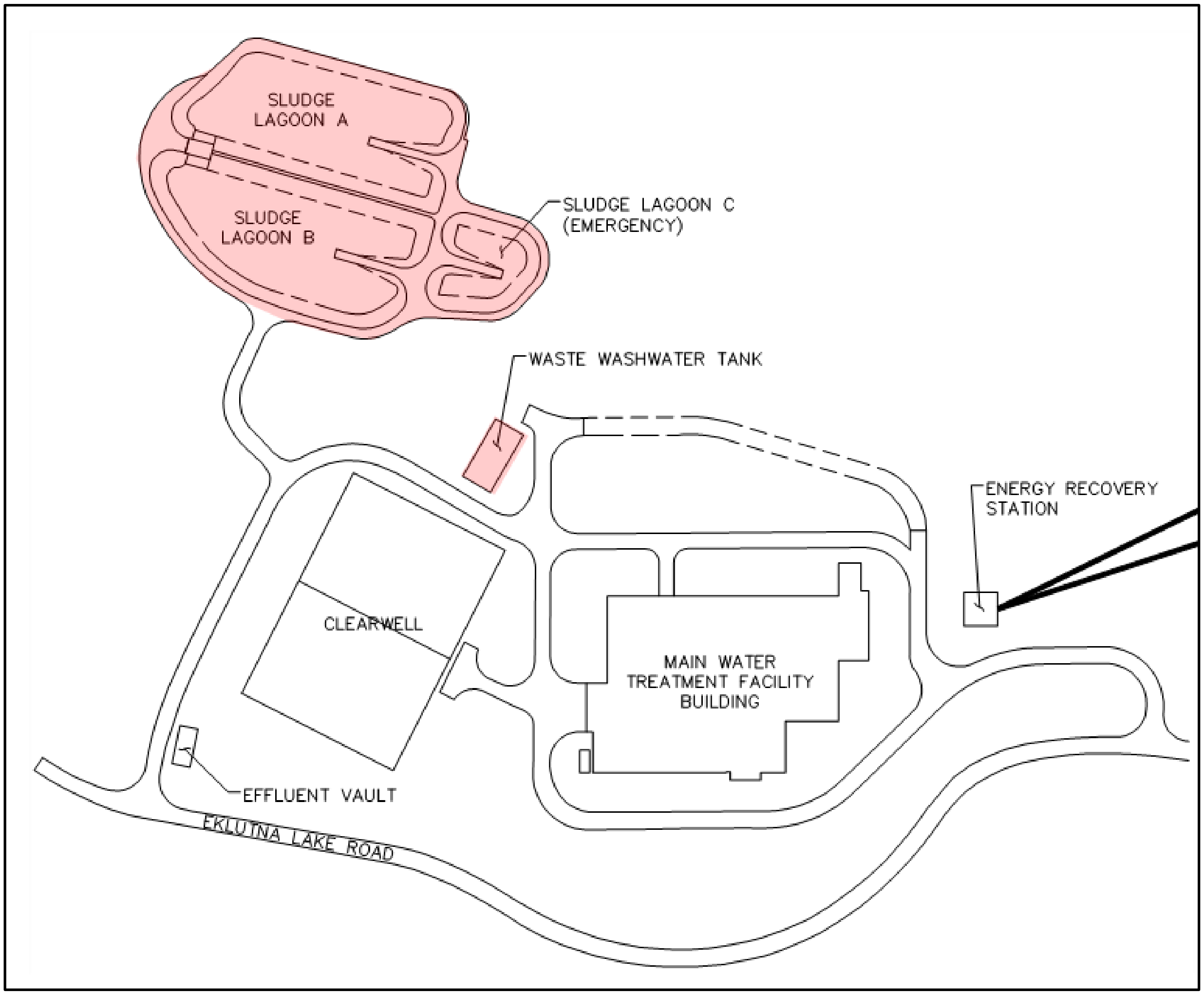

Figure 4-21
Residuals Management Facilities at the Eklutna WTF

4.9.1 Existing Facilities and Infrastructure

The existing facilities include three lagoons and three decant pumps. Periodically, AWWU isolates a lagoon for drying and sludge removal. Design criteria for the items are shown below.

Table 4-36: Residuals Management Design Criteria

Component	Unit	Value	Remarks
Average Sludge Production	lbs./day	3,380	Avg. from original record drawings
Average Sludge Volume	gal/day	40,395	Avg. from original record drawings
Number of Lagoons	No.	3	
Effective Lagoon A Volume	gal	3,217,000	
Effective Lagoon B Volume	gal	3,269,000	
Total Volume	gal	6,486,000	
Effective Emergency Lagoon Volume	gal	696,000	
Lagoon Decant Return Pumps	No.	3	
Lagoon Decant Pump Capacity	gpm	1,050	

4.9.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Two assets associated with the residuals management system (pumps) were found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Table 4-37 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-37: Residuals Management – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Lagoon Decant PS	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	2	2	2	3	3	2	2
Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on NE side)	3	2	2	2	3	3	2	2
Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on SW side)	3	2	2	2	3	3	2	2
Lagoon Decant PS	Lagoon Decant Return Pump No. 1	4	2	2	3	3	3	3	3
Lagoon Decant PS	Lagoon Decant Return Pump No. 2	4	2	2	3	3	3	3	3
Lagoon Decant PS	Lagoon Decant Return Pump No. 3	2	2	2	3	3	3	3	2

4.9.3 Assessment

The team inspected the facilities, and with AWWU staff identified the following areas of concern.

Replacement of Two Lagoon Decant Pumps (RM1)

Two of the three lagoon decant pumps, used to convey decant water to the head of the plant, are older and not functioning well, requiring parts and labor to keep them operational.

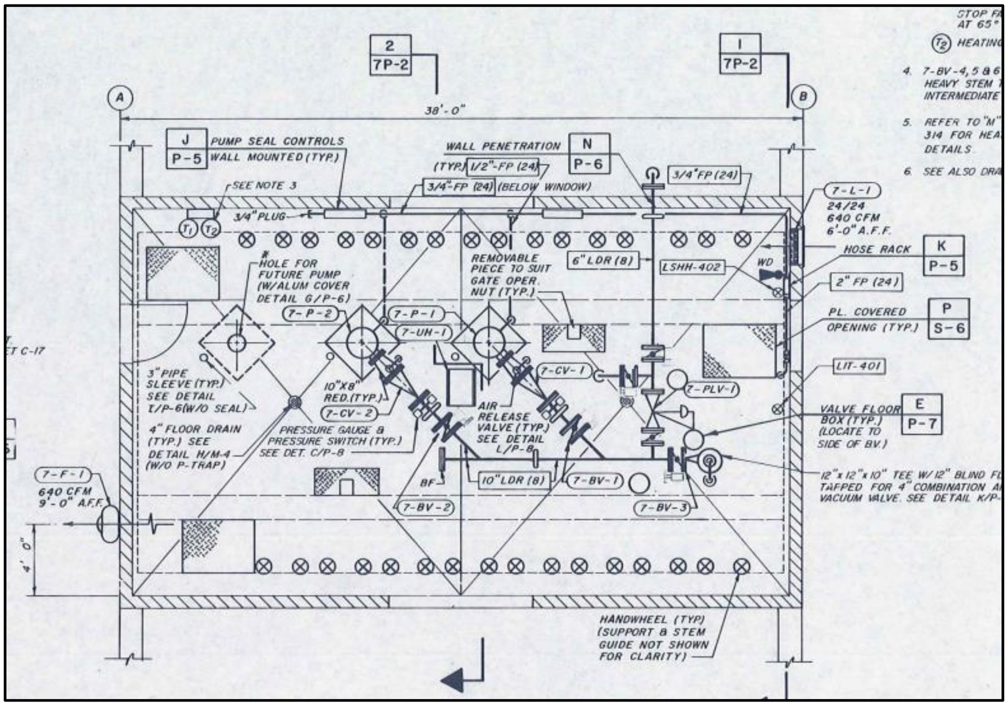

Figure 4-22
Lagoon Decant Pump Station Design Drawing (future pump space is where the newer decant pump is located)

Table 4-38 provides a summary of economic considerations for replacing the two existing pumps – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-38: RM1 Decant Pump Replacement – Cost Impact Summary

Item	Criteria	Cost
Construction cost component - replacement two lagoon decant pumps, construction cost		$100,000
Existing Maintenance Labor Cost	8 hours per month of labor, assumed above normal	$9,000 per year
Energy Cost Savings	Same	NA
Existing Maintenance Parts	$10,000 per year assumed above normal	$10,000 per year

This item has a **HIGH** Relative Need due to possible failure of two out of three lagoon pumps that would reduce the plant's treatment capacity; the pumps can be replaced one at a time allowing two duty pumps to remain functional.

Mitigate Waste Washwater Backup into Sedimentation Basin (RM2)

AWWU identified the possibility of a backup of waste washwater through the sludge piping into the sedimentation basins if the waste washwater pipe to the lagoons becomes plugged. Though this has not occurred historically, the negative impact of such an event would be substantial and therefore this item was evaluated further. The lowest impact approach is to provide a low flow switch (thermal dispersion type) in the lagoon piping. If a backwash is occurring and no flow in sensed in the pipeline, the backwash could be terminated and alarmed.

Table 4-39 provides a summary of economic considerations for installing this new instrumentation – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-39: RM2 Mitigate WW Backup into Sedimentation Basins – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component - installation of flow sensor switch in waste washwater pipe with programming by AWWU		$15,000
Maintenance Labor Cost (if backup event occurred)	24 hours per event	$2,000 per event

This item has a **LOW** Relative Need since this type of event has not occurred and the likelihood is unknown. Such a flow switch could be installed with little impact to the facility or production.

Residuals Disposal On Site

Residuals from sedimentation are generally land applied in the area denoted in Figure 4-23. This practice should continue per the original design and operational intent of the facility; however, this practice may need to be revisited in the future if any further changes in pertinent regulations are adopted. AWWU should contact the State to obtain any updated permitting to support continued practice of on-site disposal in the future to update document records on file.

Figure 4-23
Location of On-Site Disposal

4.9.4 Alternatives Evaluations

One alternative identified for the Lagoon Decant Pumps was to add variable frequency drive motors to all three of the pumps, to provide a more continuous return flow back to the raw water. This is estimated as an additional $75,000 for all three variable frequency drives and related electrical work though is not immediately recommended. It is recommended that the return flow to the raw water be kept under 10 percent of the influent flow. One decant pump (1,050 gpm) is less than 10 percent for influent flows above 15 mgd; and two decant pumps (approximately 2,100 gpm) is less than 10 percent of influent flows above 30 mgd.

There are a few alternatives to RM2, mitigation of backup into the sedimentation basins, such as:

- motorized valves on the piping that would be closed when sludge is not being withdrawn from the sedimentation basins
- Installation and/or configuration of solid state overload relays on both backwash water discharge pump motor starters configured to alarm when pump motor current deviates

from the normal motor current measured when pumping to lagoon through an unobstructed lagoon outfall line

- Flow meter (electro-magnetic type) installed on the other discharge line, which shares the lagoon outfall line with the backwash water discharge line, for reverse flow detection in the other discharge line
- The above alternatives would offer only incrementally increased confidence in the avoidance of the identified condition (backflowing sludge into the basins) at substantially increased capital and O&M costs and thus are not recommended.

4.9.5 Summary of Recommendations

Tables 4-40 and 4-41 summarize the recommendations associated with the Energy Recovery unit process.

Table 4-40: Residuals Management Summary of Recommendations

ID	Description	Rationale	Relative Need
RM1	Replacement two lagoon decant pumps	Reliability; Maintaining Plant Production	High
RM2	Installation of flow sensor switch in waste washwater pipe with programming by AWWU	Reliability; Plant Maintenance Prevention	Low

Table 4-41 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-41: Residuals Management – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs)
RM1	$100,000	High	$24,000	$20,000	$20,000	$164,000	$19,000	9
RM2	$15,000	Low	$10,000	$1,800	$3,000	$30,000	$0	N/A

Implementation of the above recommendations (specifically RM1) would alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process.

Because the total project cost derived for planning purposes is below $500k, Recommendations RM1 and RM2 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.9.6 Special Considerations for Implementation

There are no special considerations to note regarding the potential future design and construction of the recommended alternatives.

4.10 Polymer

The EWTF has Settling Aid Polymer and Filter Aid Polymer shown in the areas below.

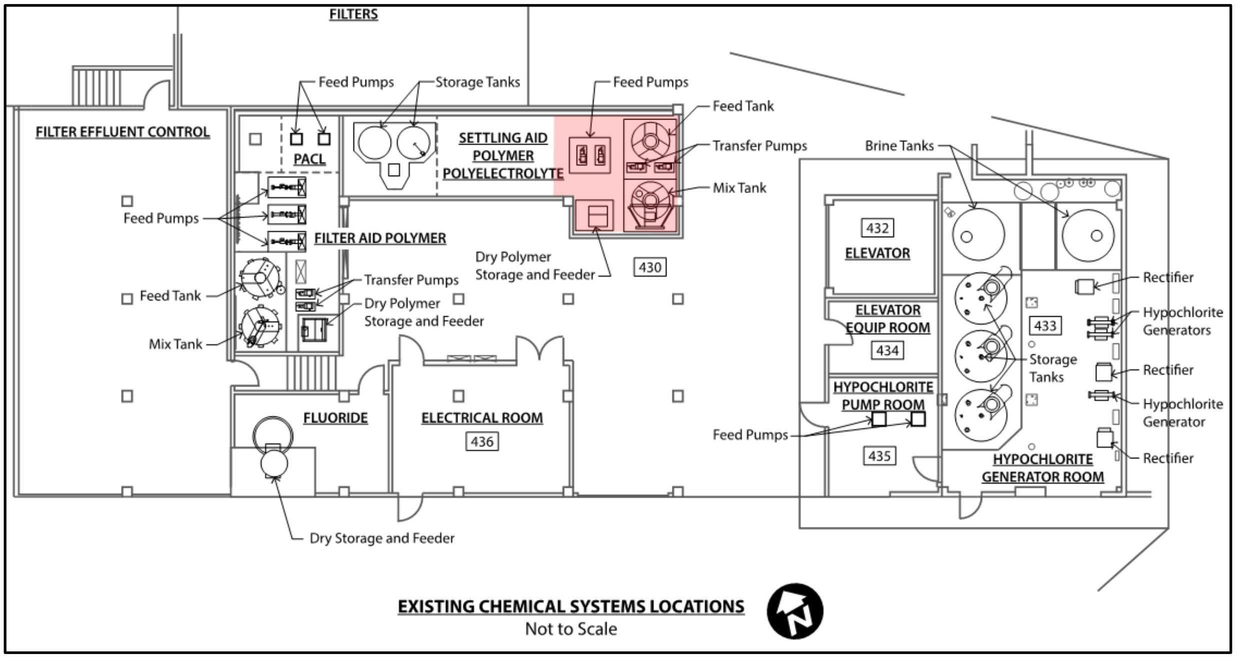

Figure 4-24
Settling Aid Polymer Location

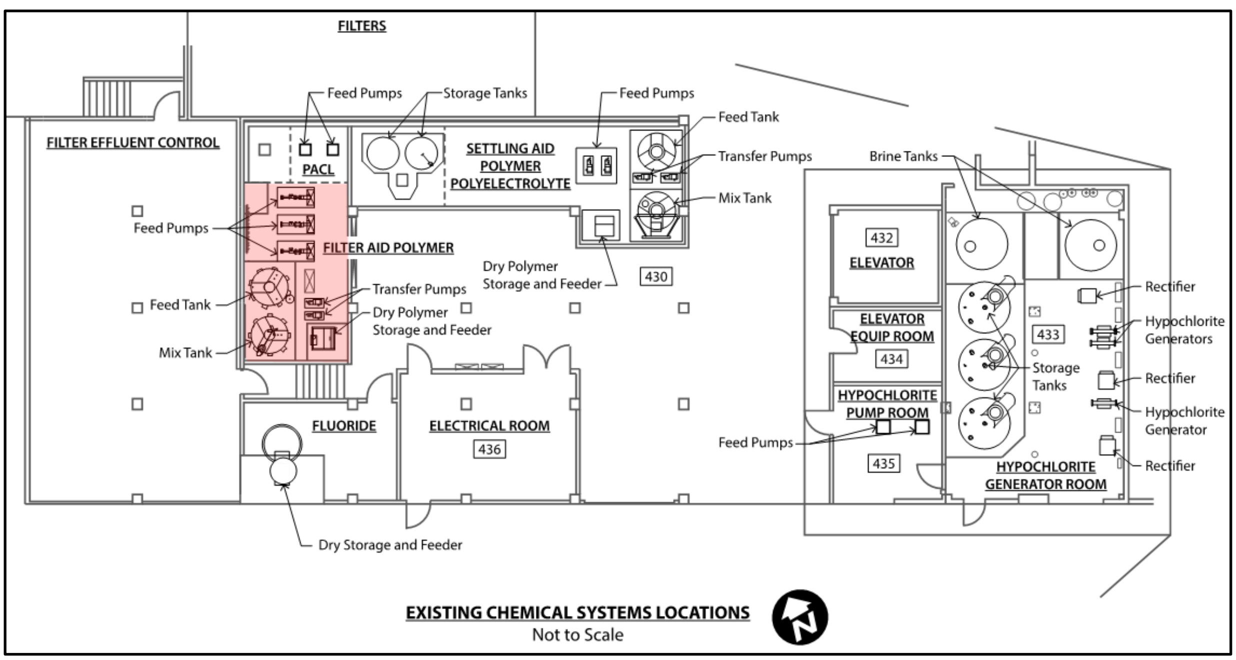

Figure 4-25
Filter Aid Polymer Location

4.10.1 Existing Facilities and Infrastructure

Existing equipment for the Settling Aid Polymer is shown in Table 4-42. Existing Filter Aid Polymer equipment is shown in Table 4-43. Settling Aid Polymer equipment was installed in approximately 2015. Filter Aid Polymer equipment was installed in approximately 2010.

Table 4-42: Settling Aid Polymer Design Criteria

Component	Unit	Value	Remarks
Polymer feed type			Dry Storage hopper, Polymer mixing, metering pumps
Mix Tank Capacity	gal	500	
Metering pumps	No.	2	Progressive cavity pumps
Polymer Feed Tank Capacity	gal	1000	
Polymer metering pump range	gpm	0-1.192	1.192 gpm = max flow rate of 0.022 mg/l@ 32 MGD
Minimum dose	mg/l	0.018	
Average dose	mg/l	0.02	Normal dose is 0.02 mg/l. pump is flow paced based on plant flow.
Maximum dose	mg/l	0.022	

Table 4-43: Filter Aid Polymer Design Criteria

Component	Unit	Value	Remarks
Polymer Feed Type			Dry Storage hopper, Polymer mixing, metering pumps
Mix Tank Capacity	gal	500	
Polymer Feed Tank Capacity	gal	750	1000 gal
Metering pump	No.	3	Progressive cavity pumps
Polymer metering pump range	gpm	0.2-8	
Min. Dose	mg/l	0.008	
Avg. Dose	mg/l	0.01	Normal dose is 0.01 mg/l. Pump is flow paced based on plant flow
Max. Dose	mg/l	0.02	

4.10.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major,* or *catastrophic* risk rating level that would require mitigation through capital and/or operational recommendations in accordance with the governing AWWU Risk Response policy.

Table 4-44: Polymer – Summary of Asset Management Output

GENERAL	LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
		15%	25%	25%	20%	15%		
Asset	Condition Assessment Rating (LoF Score) (g)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Dry Polymer Storage Hopper skid	2	2	2	2	3	3	2	2
Dry Polymer Storage Hopper skid	2	2	2	2	3	3	2	2
Dry Polymer Storage Hopper skid	2	2	2	2	3	3	2	2
Mix/ Age Tank	2	2	2	2	3	3	2	2
Mixer No.1 (eductor)	2	2	2	2	3	3	2	2
Mixer No.2 (propeller)	2	2	2	2	3	3	2	2
Feed Tank	2	2	2	2	3	3	2	2
Transfer Pump No.1	2	2	2	2	3	3	2	2
Transfer Pump No.2	2	2	2	2	3	3	2	2
Solution Metering Pump No.1 (Progressing Cavity)	2	2	2	2	3	3	2	2
Solution Metering Pump No.1 (Progressing Cavity)	2	2	2	2	3	3	2	2
Solution Metering Pump No.1 (Progressing Cavity)	2	2	2	2	3	3	2	2
Dry Polymer Storage Hopper skid	1	2	2	2	3	3	2	1
Dry Polymer Storage Hopper skid	1	2	2	2	3	3	2	1
Dry Polymer Storage Hopper skid	1	2	2	2	3	3	2	1
Mix/ Age Tank	1	2	2	2	3	3	2	1
Mixer No.1 (eductor)	1	2	2	2	3	3	2	1
Mixer No.2 (propeller)	1	2	2	2	3	3	2	1
Feed Tank	1	2	2	2	3	3	2	1
Transfer Pump No.1	1	2	2	2	3	3	2	1
Transfer Pump No.2	1	2	2	2	3	3	2	1
Solution Metering Pump No.1 (Progressing Cavity)	1	2	2	2	3	3	2	1
Solution Metering Pump No.1 (Progressing Cavity)	1	2	2	2	3	3	2	1

4.10.3 Assessment

Settling Aid Polymer equipment was installed in approximately 2015. Filter Aid Polymer equipment was installed in approximately 2010. The equipment is functioning reliably and is in good condition. **No recommendations for the polymer systems were identified for this unit process.**

4.11 Poly Aluminum Chloride (PACl)

The Poly Aluminum Chloride equipment at the EWTF is located in the area shown below.

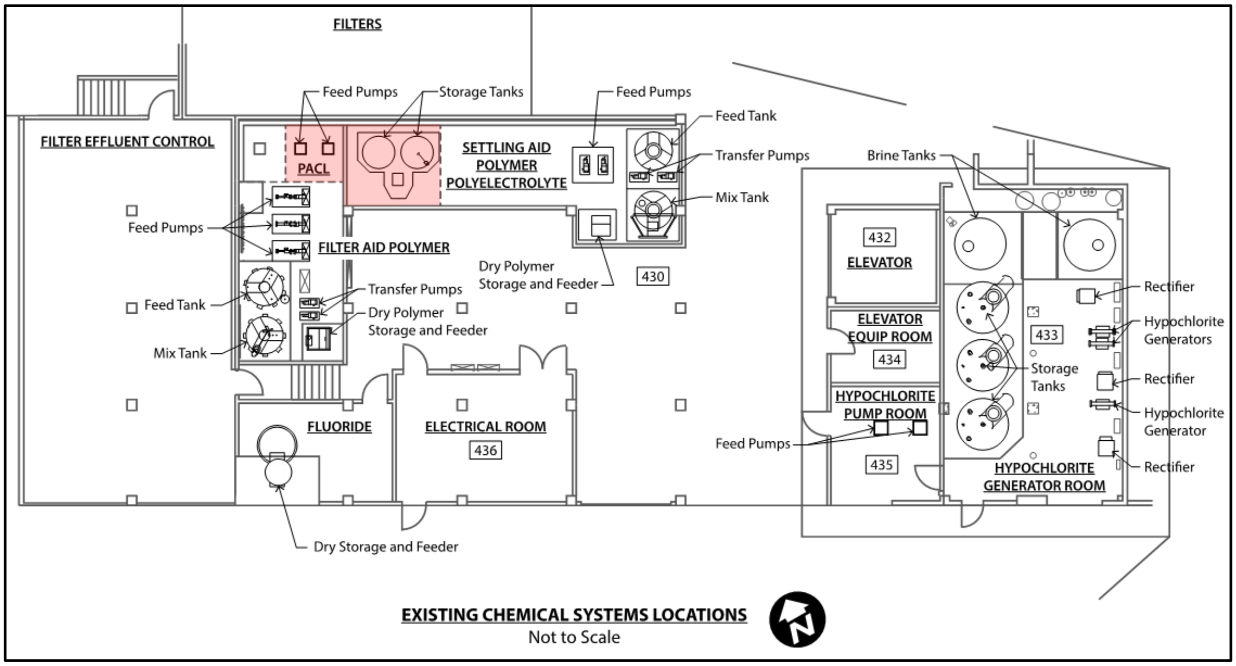

Figure 4-26
Poly Aluminum Chloride Location

4.11.1 Existing Facilities and Infrastructure

The existing Poly Aluminum Chloride feed system equipment is listed in Table 4-45 below.

Table 4-45: Poly Aluminum Chloride Design Criteria

Component	Unit	Value	Remarks
Coagulant system type			Bulk storage and metering pumps
Storage Capacity	gal	~ 650	2 tanks
Metering pump	No.	2	Blue & White Peristaltic Pumps
Metering pump range	gpm	0-0.181	Max flow equates to 10 mg/l dose at 32 MGD
Min. Dose	mg/l	2.0	
Avg. Dose	mg/l	5.0	Dose is chosen by the operator. Pump is flow paced based on plant flow
Max. Dose	mg/l	10.0	

4.11.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major,* or *catastrophic* risk rating level that would require mitigation through capital and/or operational recommendations in accordance with the governing AWWU Risk Response policy.

Table 4-46: Poly Aluminum Chloride – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Poly Aluminum Chloride (PACL)	Tank	3	2	2	2	3	3	2	2
PACL	Tank	3	2	2	2	3	3	2	2
PACL	Tank	3	2	2	2	3	3	2	2
PACL	Metering Pump No.1 (Peristaltic)	2	2	2	2	3	3	2	2
PACL	Metering Pump No.2 (Peristaltic)	2	2	2	2	3	3	2	2
PACL	Metering Pump No.3 (Peristaltic)	2	2	2	2	3	3	2	2

4.11.3 Assessment

Replace Two PACL Metering Pumps with Three New Pumps (PACL1)

The current metering pumps have a maximum capacity of 17.3 gph and one tank lasts about 3 days. There are two existing pumps. A third pump would add redundancy and reliability and would serve as a backup pump when a single PACL pump is not available. The additional swing pump installation should be capable to replace either duty pump through a three-way valve and automatically rotate between duty and standby mode. Since the coagulation is a vital process for treating the water, a reliable PACL metering pump system is needed.

The existing Blue White peristaltic metering pumps' interface is difficult to set and has been sent back to the supplier multiple times for maintenance. Potential alternatives will be explored to implement a more straightforward configuration of pumps with easier operation, calibration and interface. Hypochlorite is currently fed with Watson Marlow peristaltic pumps that have been reliable and easy to set the controls on.

Table 4-47 provides a summary of economic considerations for replacing the existing PACL metering pumps – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-47: PACL1 Replace Two PCL Metering Pumps with Three New Pumps – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component - replace two existing PACL metering pumps with three peristaltic metering pumps with piping and usable control interface, similar to the hypochlorite feed pumps		$75,000
O&M Labor Cost Savings	6 days per month savings	$7,000 per year
Maintenance Parts	Savings with new pumps	Same as Existing
Power Usage	Same as Existing	Same as Existing

Because the system functions as installed and this item is primarily to add redundancy and reliability, this is classified as a **Low Need** item. Replacement of the pumps could be staged to minimize outages.

Add Bulk PCL Storage Tank (PACL2)

Because there is no bulk PACL production in the region, 270-gallon totes are delivered at 15 totes per shipment. With small existing storage tanks, AWWU operations staff must make multiple trips to transfer tote material into the tanks. One or more 1000 to 3000-gallon tanks would provide a more flexible schedule for changeout of totes and result in more efficient use of staff time.

Table 4-48 provides a summary of economic considerations for adding one new tank or replacing the existing tanks with larger units – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-48: PACL2 Add Bulk PCL Storage Tank – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component - add Tank for Tote Transfer and Use; or Replace Existing with larger Tanks		$40,000
O&M Labor Cost Savings	Savings of about 9 hours per month	$9,000 per year savings

Because the system functions as installed and this item is primarily to lessen the required O&M associated with the existing system, this is classified as a **Low Need** item.

4.11.4 Alternatives Evaluation

As an alternative to PACL1, replacement of two existing metering pumps with three new metering pumps, and different pump manufacturers may be investigated. However, Watson Marlow peristaltic metering pumps have a positive track record of performance at the EWTF and they are proving to be reliable and to coordinate well with the controls system.

4.11.5 Summary of Recommendations

Tables 4-49 and 4-50 summarize the recommendations associated with the Energy Recovery unit process.

Table 4-49: Poly Aluminum Chloride Summary of Recommendations

ID	Description	Rationale	Relative Need
PACl1	Replace two existing metering pumps with three new pumps	Reliability, improved chemical use	Low
PACl2	Add Tank(s) for tote transfer and use	Improved Operations	Low

Table 4-50 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-50: Poly Aluminum Chloride – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs)
PACl1	$75,000	High	$24,000	$15,000	$15,000	$129,000	$7,000	18
PACl2	$40,000	Low	$15,000	$4,800	$8,000	$68,000	$9,000	8

Because the total project cost derived for planning purposes is below $500k, Recommendations PACL1 and PACL2 are subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.11.6 Special Considerations for Implementation

Pumps can be replaced incrementally and plant operations can be maintained during pump replacement. The storage tanks can be replaced and/or added while continuing the current operation with totes, with minimal downtime to hard pipe the tank into the PACL pumps.

4.12 Fluoride

The EWTF's Fluoride system is located in the area shown below. Fluoride is required at the EWTF to provide a finished water concentration of 0.7 mg/l, as recommended for drinking water by the U.S. Department of Health and Human Services.[1] This target concentration is the total of background fluoride plus fluoride added through chemical addition. This section describes the equipment options for this chemical and offers design recommendations.

[1] Previous guidance for higher concentrations (e.g., 0.8-1.2 mg/l) was superseded with publication of "Public Health Service Recommendation for Fluoride Concentration in Drinking Water for Prevention of Dental Caries", May 1, 2015; https://federalregister.gov/a/2015-10201.

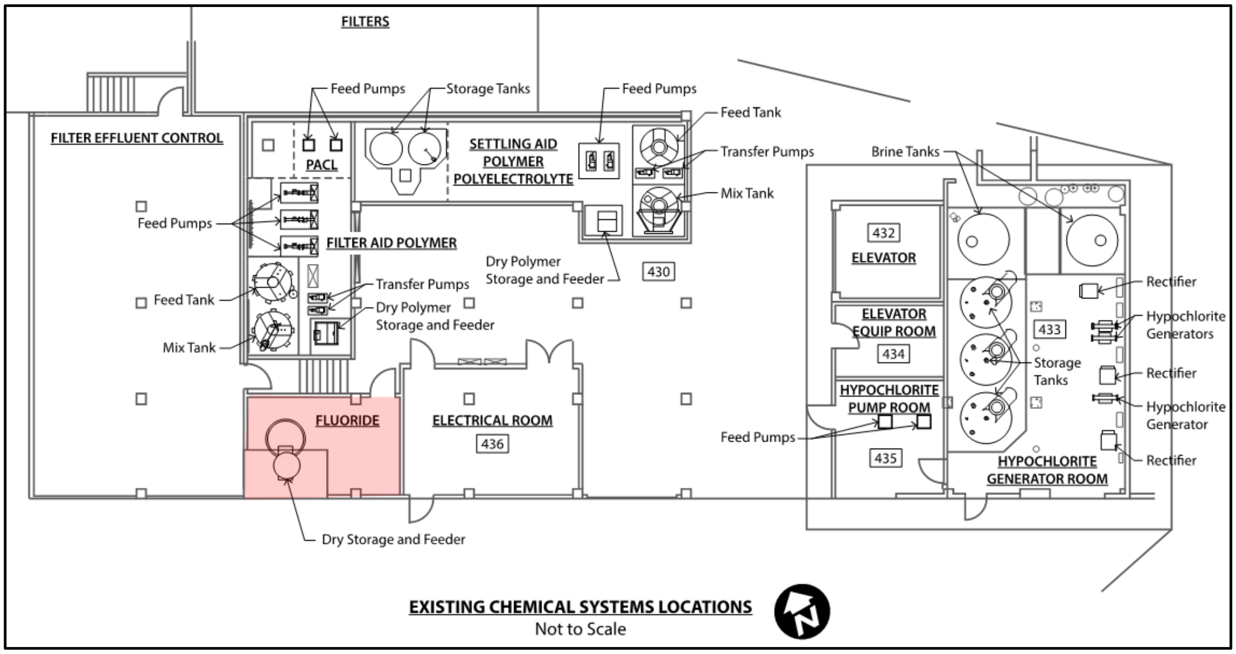

Figure 4-27
Location of Existing Fluoride Equipment

4.12.1 Existing Facilities and Infrastructure

Eklutna WTF has a dry fluoride feed system that was installed in 1988 and consists of a bag loader with dust collector, conical storage hopper, slide gate, dry feeder and mixing tank with mixer. The system is sized for dry sodium fluorosilicate which is manually fed from 50-lb bags into the bag loader. The bag loader discharges into the hopper which feeds the gravimetric feeder into the mixing tank. The existing system is a constant feed, variable concentration system that relies on a siphon from the mixing tank to the feed point.

Table 4-51: Existing Dry Fluoride System Criteria

Component	Unit	Value	Remarks
Bag Loader and Dust Collector			Manufacturer - BIF per site photo
Dry Storage Hopper	ft3	35	per record drawings
Mixing Tank	gal	550	per record drawings
Mixer	hp	1.5	per record drawings
Sodium Silicofluoride storage	lb.	30,200	50 lb. bags
Dry Feeder	ft3/hr.	0.06-0.58	per record drawings
Min. Dose	mg/l	0	
Avg. Dose	mg/l	0.7	Per CDC direction dose rate shall be no higher than 0.7 mg/l
Max. Dose	mg/l	0.7	

4.12.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. Several assets associated with the fluoride system (both process and building mechanical) were found to have a *moderate* risk level. No assets were found to have a *major* or *catastrophic* risk rating level. The risk matrix shown in Table 4-52 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-52: Fluoride – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Sodium Silcoflouride (Fluoride)	Storage Hopper	3	2	2	3	3	3	3	3
Fluoride	Bag Loader	3	2	2	3	3	3	3	3
Fluoride	Dust Collector	3	2	2	3	3	3	3	3
Fluoride	Slide Gate	3	2	2	3	3	3	3	3
Fluoride	Dry Feeder	3	2	2	3	3	3	3	3
Fluoride	Solution Tank	3	2	2	3	3	3	3	3
Fluoride	Solution Tank	3	2	2	3	3	3	3	3
Fluoride	Ventilation System	3	3	5	3	3	3	4	3

4.12.3 Assessment

The fluoride system is original equipment and does not provide precise and accurate feed of fluoride to the finished water. In addition, the bag loading system should be replaced and upgraded to minimize dust exposure to staff when loading the dry bags. The original storage hopper is framed into the upper floor and should be retained if possible. A new bag loading system should be retrofitted to the existing hopper feed point on the upper floor, and a new gravimetric feed system should be retrofitted to the existing hopper discharge point on the fluoride platform on the lower floor.

Figure 4-28
Existing Fluoride Bag Feeder and Bags of Sodium Fluorosilicate

Figure 4-29
Existing Fluoride Storage Hopper, Dry Feeder and Mixing Tank

Table 4-53 provides a summary of economic considerations for replacing the existing system – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-53: FL1 Replace Fluoride System with New Dry System – Cost Impact Summary

Item	Criteria	Cost
Construction Cost Contribution	Demo of existing equipment, new glove box style bag feeder and compactor, gravimetric chemical feeder, mixing tank and mixer, retrofitting to existing hopper; plus, related electrical and I&C work.	$500,000
Approximate Operation & Maintenance Labor Cost Savings	Reduced O&M requirements	$33,000 per year
Energy Cost Savings	Same as existing	NA
Maintenance Parts Savings	Miscellaneous parts requirements for Existing	$1,000 per year
Chemical Cost Savings	Same as existing	NA
Total Savings with New System		$34,000 per year

4.12.4 Alternatives Assessment

There are three fluoride chemical alternatives commonly used for potable water fluoridation: sodium fluorosilicate (existing system, also called sodium silicofluoride), sodium fluoride, and hydrofluorosilicic acid. These options are considered below.

Sodium fluorosilicate (dry): Eklutna WTF is currently using sodium fluorosilicate in the existing dry fluoride system. The new dry system equipment may be replaced in kind to feed sodium fluorosilicate. Sodium fluorosilicate solutions are mildly acidic (pH 4). The process flow diagram for the existing dry fluoride system at Eklutna is shown in Figure 4-30. In lieu of a siphon, chemical metering pumps would be used to provide a more accurate dose to the feed point.

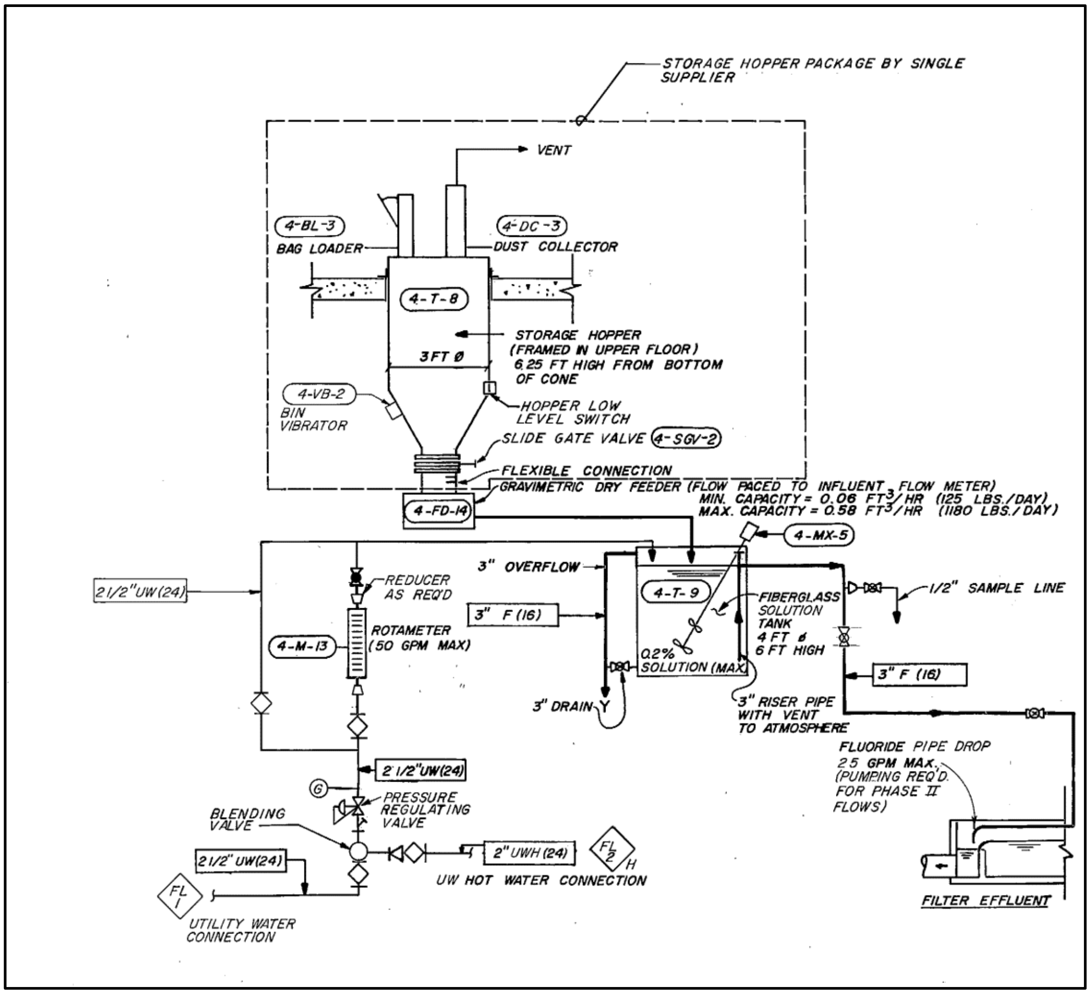

Figure 4-30
Process Schematic of Existing Dry Fluoride Feed System

Sodium fluoride (dry): Sodium fluoride is the alternate dry fluoride chemical choice, and is also sold in 50-lb bags. Sodium fluoride is slightly less expensive per pound, but must be dosed at a higher rate. The chemical costs are comparable. The added benefit of sodium fluoride is its higher solubility in water, which allows for a smaller solution mixing tank (2-3% for sodium fluoride vs. 0.2% for sodium silicofluoride). The solution flow rate would be lower than the existing flow rate for sodium fluorosilicate, so evaluation of the existing solution pumps and piping to the feed point would be required. Sodium fluoride solutions have neutral pH. The process and required equipment is equivalent to that of the sodium fluorosilicate system, with some differences in equipment sizing and possible additional equipment, depending on the supplier.

Sodium hydrofluorosilicic acid (liquid): Another option is to replace the current dry fluoride handling system with a liquid fluoride system using hydrofluorosilicic acid. Hydrofluorosilicic acid systems are less mechanically complex as compared to the dry material alternatives, resulting in lower capital costs. Based on previous correspondence with AWWU, a liquid fluoride system is not an acceptable alternative for use at the Eklutna WTF, and this alternative will not receive further consideration.

Replacement of the current dry system with another dry system will require an upgrade to the bag handling equipment. The current bag feeder requires the operator to cut open the 50-lb bag of sodium fluorosilicate, dump the bag into the bag handler, then dispose of the empty bag. The glove box style dump station with bag compactor shown in Figure 4-31 decreases the exposure of the operator to fluoride dust compared with the current system. The bag is emptied within an enclosed space with a viewport and gloved access. Empty bags pass into the bag compactor, so that dust does not leave the loading station.

Figure 4-31
Example Dry Fluoride Dump Station Bag Equipment
Standard 50-lb bag dump with bag compactor (left), fully contained glove box type dump station with bag compactor (middle) [*Hapman Industries*]. Standard bag dump station with dust collector (right) [*Acrison*].

Replacement of the current fluoride system to a new dry system will require new dry chemical feeder equipment at the discharge of the dry storage hopper. Eklutna currently has a gravimetric feeder. Gravimetric feeders offer higher accuracy than volumetric feeders, but have higher capital cost. Gravimetric feeders have an accuracy between +/- 0.25% to 1% or better, whereas volumetric feeders have an accuracy between +/- 1%-2% or better.

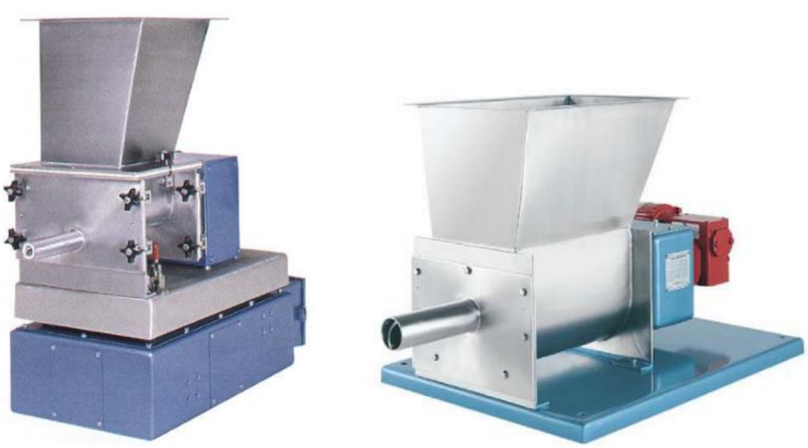

Figure 4-32
Example Dry Fluoride Feeder Equipment
Weight-Loss Gravimetric Feeder (left) and Volumetric Refill Feeder (right) [*Acrison, Inc.*]

Replacement of the fluoride dissolving/mixing tank and mixer is recommended as part of the fluoride system replacement. Currently, the mixing tank is a 550-gallon FRP tank with a diameter of 4'-0" and height of 6'-0", with a 1.5 hp mixer. The tank needs to be replaced with a similarly sized tank and mixer if sodium fluorosilicate will remain as the fluoride chemical. The tank can be replaced with either another FRP tank or a cross-linked polyethylene tank. Review of available tank dimensions for each material will be necessary. If sodium fluoride is the selected chemical, the current tank can be replaced with a 200-gallon stainless steel tank with up to two ½ hp mixers. FRP or cross-linked polyethylene can also be used. Four new level probes will also be required in the new tank regardless of the size of the tank in order to set alarms for low-low, low, high, and high-high levels in the tank.

Figure 4-33
Example 200-gallon stainless steel fluoride dissolving tank with mixer

4.12.5 Summary of Recommendations

The EWTF is operating with its original dry fluoride feed system that was installed in 1988. A new fluoride system is recommended to enhance operator safety and increase chemical feed accuracy. Based on recent discussions with AWWU and the most recent analogous chemical system design (of a new fluoride system for the Ship Creek Water Treatment Facility, SCWTF), a dry fluoride system is recommended for the replacement system at the EWTF. The existing system that feeds sodium fluorosilicate can be replaced with a new system to feed either sodium fluorosilicate or sodium fluoride. It is further recommended that AWWU coordinate the specific chemical and equipment system with that to be installed at the SCWTF to provide commonality and optimized chemical supply costs.

Table 4-54: Fluoride System Summary of Recommendations

ID	Description	Rationale	Relative Need
FL1	Replace Fluoride System with new Dry System	Safety, Improved Control, Improved Water Quality, Improved Operations	High

Table 4-55 derives a planning level 'project' cost for the above recommendation, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-55: Fluoride – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs.)
FL1	$500,000	High	$204,000	$100,000	$100,000	$904,000	$34,000	27

*Soft Costs intended to reflect AWWU labor/expenses, permitting, etc.

Implementation of the above recommendations would alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process as they are all considered part of a full replacement fluoride system.

Because the total project cost derived for planning purposes exceeds $500k, Recommendation FL1 is subject to a Business Case Evaluation (BCE)-1 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.12.6 Special Considerations for Implementation

The system consists of several separate components including the bag loader/dust collector, dry storage hopper, dry chemical feeder, mixing/dissolving tank and mixer. The existing dry storage hopper should be reused if possible, as it is framed into the second floor. The dry chemical feeder and mixing tank/mixer are often packaged together by a single manufacturer. Depending on the style of bag feeder desired, the bag feeder can be ordered with the other equipment as a package, or ordered from a different manufacturer.

Planning will be required to minimize disruptions to Maintenance of Plant Operations during the replacement of the fluoride system, as there is no redundancy in the system. The existing dry hopper provides some storage during the changeout of the bag loader. The existing mixing tank provides storage during the replacement of the dry chemical feed system. Fluoride will not be available during the replacement of the mixing tank.

System design should be sufficiently flexible to allow for either sodium fluoride or sodium silicofluoride (i.e. the two dry chemical options).

4.13 On-Site Hypochlorite Generation

The EWTF has an existing On-site Sodium Hypochlorite Generation System (OSHG) with supporting equipment. The OSHG system consists of brine storage tanks, horizontal cylinder hypochlorite generators, electrical rectifiers, controls, hypochlorite storage tanks, and peristaltic chemical feed pumps. The system is designed to disinfect finished water and replaced a previous gas chlorination system. In 2009, a similar system installed at the Ship Creek WTF had a serious incent requiring the installation of multiple safety devices. The OSHG system is located in the area shown below.

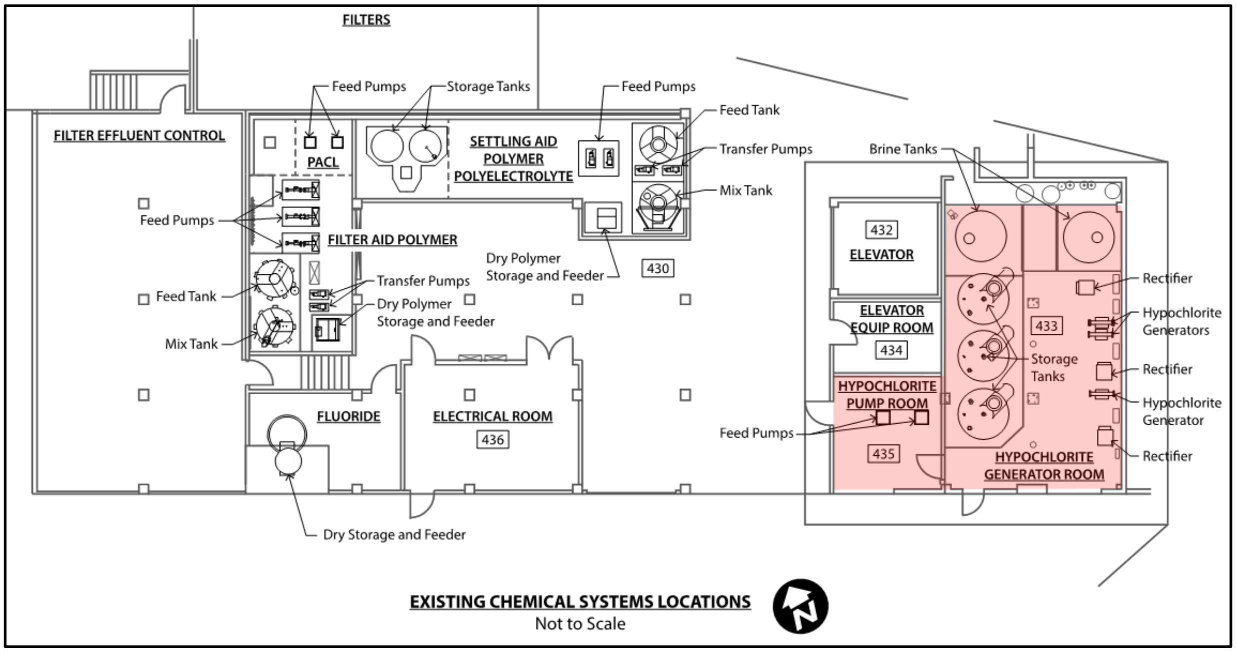

Figure 4-34
Location of Existing OSHG Equipment

4.13.1 Existing Facilities and Infrastructure

The onsite sodium hypochlorite generation equipment was largely installed in 2000, at the same time a similar system at Ship Creek WTP was installed. The hypochlorite storage tanks were replaced in 2014. The brine tanks are approximately 16 years old and should be replaced due to their critical nature and possible brittleness. The tanks' housekeeping pad needs replacement also, due to corrosion and cracking.

The age of the existing hypochlorite peristaltic metering pumps is unknown, but the pumps appear to be fairly new, can reliably meet capacity and do not need to be replaced. However, a third pump is needed for reliability and to meet high flow and disinfection needs when two pumps are needed.

The criteria for the existing OSHG system is shown in the following table.

Table 4-56: Existing OSHG System

Component	Unit	Value	Remarks
Sodium hypochlorite generation systems	lb/day	560	ClorTec on-site sodium hypochlorite generation system - 0.8% hypochlorite
NaOCl Storage Tanks	No.	3	
NaOCl Storage Volume	Gal	9,000	Total Storage Volume (3,000 gal per tank)
Brine Storage Tanks	No.	2	
Brine Storage Volume	Gal	6,000	Total Storage Volume (3,000 gal per tank)
Metering Pump	No.	2	Watson Marlow peristaltic pumps
Metering Pump Range	gpm	0.003-4.8	

Component	Unit	Value	Remarks
Minimum dose	mg/l	N/A	
Average Dose	mg/l	1.0	Normal Dose is 1.0 mg/l. Pump is flow paced based on plant flow
Maximum Dose	mg/l	N/A	Two pumps required to dose at max flow of 32 MGD.

4.13.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF.

Table 4-57: On-Site Hypochlorite Generation – Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Hypo Generation System	Bulk Storage Tank No. 1 (3,000 gal-FRP)	1	2	2	2	3	3	2	1
Hypo Generation System	Bulk Storage Tank No. 2 (3,000 gal-FRP)	1	2	2	2	3	3	2	1
Hypo Generation System	Bulk Storage Tank No. 3 (3,000 gal-FRP)	1	2	2	2	3	3	2	1
Hypo Generation System	Bulk Storage Tank No. 4 (3,000 gal-Poly)	4	2	2	2	3	3	2	2
Hypo Generation System	Bulk Storage Tank No. 5 (3,000 gal-Poly)	4	2	2	2	3	3	2	2
Hypo Generation System	Brine Storage Tank No. 1 (100 gal-Poly)	3	2	2	2	3	3	2	2
Hypo Generation System	Brine Storage Tank No. 2 (100 gal-Poly)	3	2	2	2	3	3	2	2
Hypo Generation System	Water Softener	3	2	2	2	3	3	2	2
Hypo Generation System	Programmable Logic Controller	3	2	2	2	3	3	2	2
Hypo Generation System	Programmable Logic Controller	3	2	2	2	3	3	2	2
Hypo Generation System	Programmable Logic Controller	3	2	2	2	3	3	2	2
Hypo Generation System	Generation System Control Panel	3	2	2	2	3	3	2	2
Hypo Generation System	Rectifier	3	2	2	2	3	5	3	3
Hypo Generation System	Hypo Generation Cells (2 columns of 3 horiz cylinders)	4	2	2	2	3	3	2	2
Hypo Generation System	Rectifier	3	2	2	2	3	5	3	3
Hypo Generation System	Hypo Generation Cells (1 column of 2 horiz cylinders)	4	2	2	2	3	3	2	2
Hypo Generation System	Rectifier	3	2	2	2	3	5	3	3
Hypo Distribution System	Metering Pump No. 1 (Peristaltic)	2	2	2	2	3	3	2	2
Hypo Distribution System	Metering Pump No. 2 (Peristaltic)	2	2	2	2	3	3	2	2
Hypo Distribution System	Blower	3	2	5	2	3	3	3	3

4.13.3 Assessment

Replace Existing On-Site Hypochlorite Generation System (CL1)

The existing OSHG equipment was installed in 2000, resulting in parts being difficult to obtain. Plant staff is not satisfied with the suppliers' service of the equipment. Similar equipment installed at the Ship Creek WTP encountered serious safety issues in 2009. The new sodium hypochlorite storage tanks have closed top and entrained hydrogen is causing foaming in the tanks, which results in level measurement errors. Exhaust for the generators and storage tanks should be vented outside. Figure 4-35 shows photos of two of the three existing ClorTec equipment skids, and one of the three existing rectifiers. Figure 4-36 shows a photo of the existing Watson Marlow sodium hypochlorite peristaltic pumps.

Figure 4-35
Existing ClorTec OSHG skids (left) and an OSHG system electrical rectifier (right)

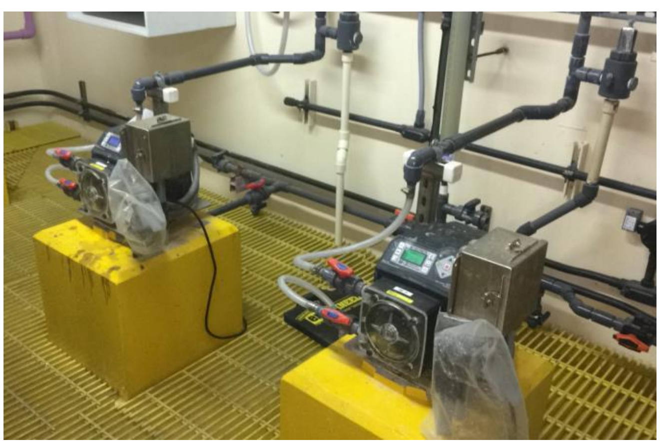

Figure 4-36
Existing Watson Marlow sodium hypochlorite peristaltic pumps

Table 4-58 provides a summary of capital costs with the approximate O&M costs savings for replacing the existing on-site hypochlorite generation system. The construction cost contribution for the new hypochlorite system is based on:

- Three skid-mounted Microclor MC-200 OSHG systems
- Three transformer rectifiers
- Three generator control panels
- One blower power panel
- One Master Control Panel
- Three hydrogen dilution blowers for generators
- Three hydrogen dilution blowers for storage tank
- Seven Cartridge Filters
- One dual tank water softener
- Two heat exchangers
- One acid cleaning system
- Two brine tanks
- A third feed pump with piping header modifications feeding for the various application points
- Replace brine tank house keeping pad.

Table 4-58 provides a summary of economic considerations with possible O&M costs savings for providing a new OSHG system – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-58: CL1 Replace On-Site Hypo Generation System - Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	Demo of existing equipment, replace with three hypochlorite generation units and brine tanks; and 1 additional feed pump plus related electrical and I&C work.	$800,000
Approximate Operation & Maintenance Labor Cost Savings	Reduced O&M requirements, about 1 hour per day	$33,000 per year
Energy Cost Savings	Same as existing	NA

Item	Criteria	Cost
Maintenance Parts Savings	Same as existing	NA
Chemical Cost Savings	Same as existing	NA

CL1 has a **HIGH** Relative Need due to the critical need for the hypochlorite in treating water and the difficulties in maintaining the system.

Modify Bulk Salt Loading System (CL2)

The existing feed facility for loading bulk salt into the storage hopper for the on-site sodium hypochlorite system is shown in the figure below. Figure 4-37 shows a photo of the existing bulk salt feeding area. Current procedures require Operations staff has to situate the bag over the opening, which can be strenuous and creates a potential falling hazard (through the opening).

Figure 4-37
Bulk salt feed area

There are a few options for unloading salt into the storage area. The viability of these options will depend on available overhead space above the loading area, and the salt sack size. One option for lifting and dumping of 1-ton supersacks is the supersack bag loader by Acrison (see Figure 4-38). Based on the Eklutna record drawings, the clearance above the salt loading area is unclear, but this supersack loader requires about 18’ of clearance from the floor. There are various options for floor-mounted and wall-mounted jib cranes of varying capacities that can be explored when capacity and clearance requirements are determined.

Figure 4-38
Supersack bag loader [*Acrison*] (left) and 1-ton wall mounted jib crane [*L.K. Goodwin Co.*] (right)

Table 4-59 provides a summary of economic considerations with possible O&M costs savings for modifying the bulk salt loading system – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below.

Table 4-59: CL2 Modify Bulk Salt Loading System - Cost Impact Summary

Item	Criteria	Cost
Construction Cost Contribution	Install bag loader system	$25,000
Approximate Operation & Maintenance Labor Cost Savings	Reduced O&M requirements by about 9 hours per month	$10,000 per year
Energy Cost Savings	Minor	NA
Maintenance Parts Savings	Miscellaneous parts requirements for Existing	NA
Chemical Cost Savings	Same as existing	NA
Total Savings with New System		$10,000 per year

CL2 has a **HIGH** Relative Need due to the safety concerns associated with the salt loading operation.

4.13.4 Alternatives Assessment

The current chlorine based disinfection alternatives are bulk delivery of 12.5% sodium hypochlorite, onsite generation of 12.5% sodium hypochlorite, and onsite generation of 0.8%

sodium hypochlorite solution using an onsite sodium hypochlorite generator (OSHG). Based on discussions with AWWU, replacement of the existing OSHG system is preferred over bulk sodium hypochlorite delivery. Current equipment that will be retained supports generation of low strength solution. The sodium hypochlorite storage tanks and sodium hypochlorite pumps are fairly new and operating reliably, and the brine tanks require inspection and may not need to be replaced. There are three Clortec OSHG units, along with electrical rectifiers, that will be replaced.

The leading manufacturers providing OSHG systems are Parkson (Miox), PSI, Evoqua and ClorTec. Eklutna and Ship Creek have both had similar ClorTec OSHG systems since 2000. Due to aforementioned safety issues that have been encountered and lack of reliable service by the manufacturer, AWWU has expressed interest in replacing the current ClorTec systems with new systems that have more recently upgraded technology. Since both Clortec and Evoqua employ horizontal electrolyzer cells, the two top alternate systems are the manufacturers are PSI and Miox. The PSI MicroClor system has vertical electrolyzer cells as shown in Figure 4-39. Miox OSHG systems empty cassette electrolyzer units with vertical plates as shown in Figure 4-40.

Current demand for 0.8% sodium hypochlorite at the Eklutna WTF is 560 ppd, and is not expected to change. PSI has proposed 3X200 ppd MicroClor units. Miox offers a medium-sized modular model called the “Rio” that can be configured to generate between 100-500 ppd 0.8% sodium hypochlorite. Therefore, 2X300 ppd Rio units would provide needed capacity at Eklutna.

Figure 4-39
PSI MicroClor existing installed 2X200 ppd units [*PSI*]

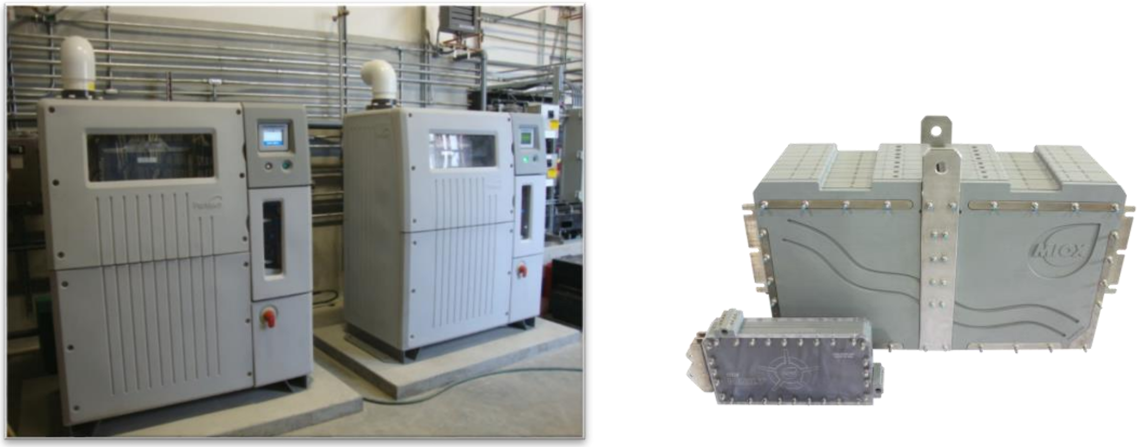

Figure 4-40
Miox existing installed 2X300 ppd Rio units [*Parkson*] (left), and Miox cassette-style vertical electrolyzers [*Parkson*] (right)

4.13.5 Summary of Recommendations

The current OSHG systems should be replaced with a new system that maintain generation capacity. The SCWTF is also replacing its OSHG system, therefore for ease of training, operation and troubleshooting, and reduction in required spare parts, it is recommended that AWWU select similar manufacturers/models for both facilities. For example, Microclor 200 ppd units could be used for the EWTF if that vendor is ultimately awarded the supply contract for the new OSHG system planned for the SCWTF. Microclor also has a 300 ppd unit.

The salt loading area should be improved by adding a job crane or bag loader. Further analysis of existing conditions is required before further recommendations can be made on the salt loading area.

Table 4-60: On-Site Hypochlorite Generation Summary of Recommendations

ID	Description	Rationale	Relative Need
CL1	Replace On-Site Hypo Generation (OSHG) System	Reliability; Improved Operations; Safety	High
CL2	Modify bulk salt loading system	Safety	High

Table 4-61 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-61: On-Site Hypochlorite Generation – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs.)
CL1	$800,000	High	$288,000	$160,000	$160,000	$1,408,000	$0	N/A
CL2	$25,000	Low	$15,000	$3,000	$5,000	$48,000	$0	N/A

Implementation of the above recommendations would alleviate the 'moderate risk' items noted in the Asset Management Plan for this unit process as a new replacement OSHG system would be provided with complete new components.

Because the total project cost derived for planning purposes exceeds $500k, Recommendation CL1 is subject to a Business Case Evaluation (BCE)-1 per AWWU's draft BCE guidance document dated August 2016. With a total Project Planning cost less than $500k, recommendation CL2 is subject to a BCE-0. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.13.6 Special Considerations for Implementation

Some planning will be required to minimize disruptions to Maintenance of Plant Operations during the demolition of the existing OSHG units and rectifiers and installation of new systems. However, there is redundancy in every point of the system (bring tanks, OSHG systems, sodium hypochlorite storage tanks and sodium hypochlorite pumps), and some or all of the existing tanks and pumps will be retained. Therefore, it should be possible to demolish and replace one unit at a time to maintain some sodium hypochlorite generation capacity. Sodium hypochlorite solution stored in the existing storage tanks can be used when brief shutdowns are required to bring the new OSHG systems online.

4.14 Legacy Chemical Systems (Soda Ash/Ferric Chloride/Powder Activated Carbon)

The existing Soda Ash and Ferric Chloride systems are not in use and are maintained in an empty condition. They are located in the area shown in Figure 4-41. Ferric Chloride was stored in the larger tanks and soda ash was stored in the smaller tanks adjacent to the flocculation basins.

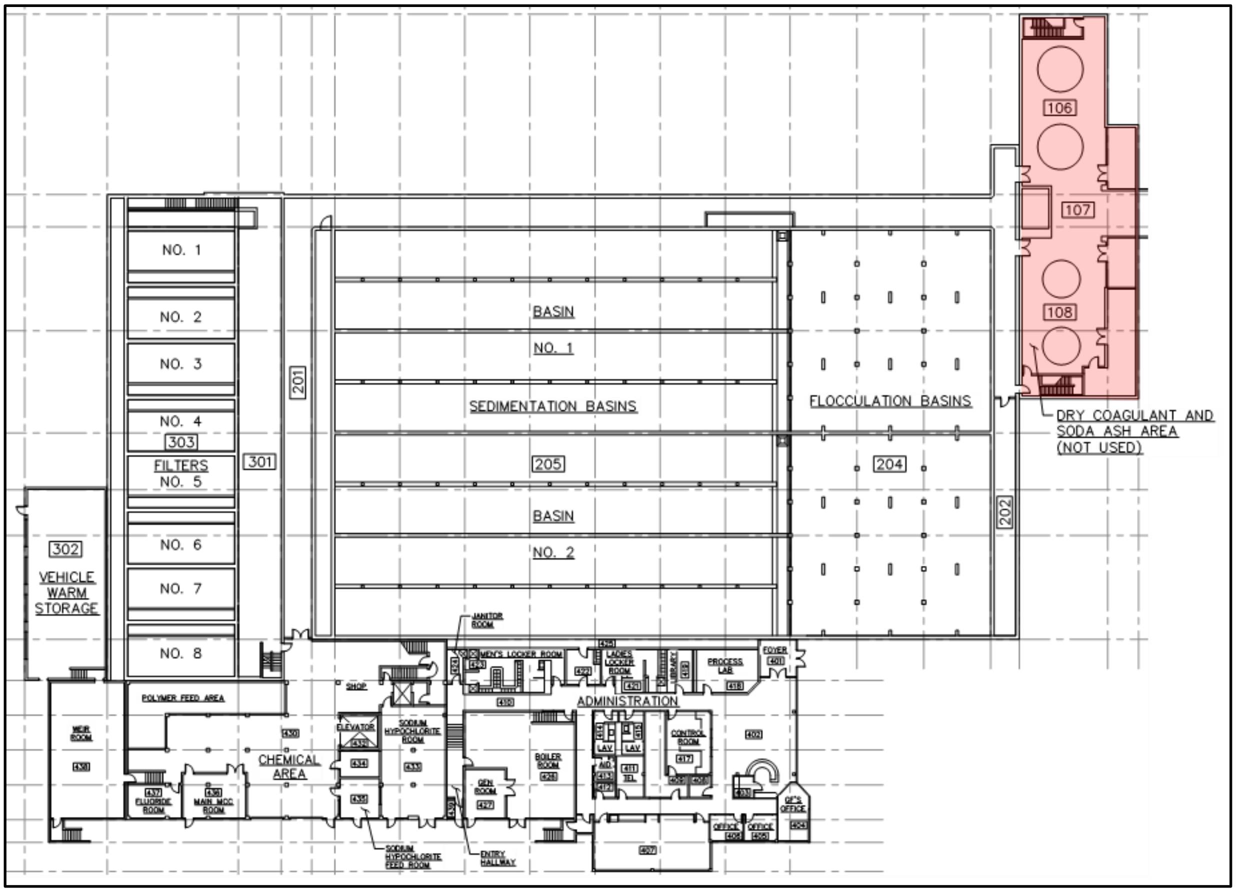

Figure 4-41
Area of existing unused ferric chloride and soda ash equipment.
Ferric Chloride was stored in the larger two silos and soda ash was stored in the smaller two silos adjacent to the flocculation basins.

4.14.1 Existing Facilities and Infrastructure

The Soda Ash system is no longer in use and consists of two storage silos with dust collectors, two solution tanks with mixers, and two volumetric dry feeders. Each storage silo has a slide gate, rotary valve, and two flexible connections. The storage tanks have feed connection locations for bulk delivery and from a loading hopper assembly with dust collector, bag loader, hopper and blower. The soda ash system has two feed pumps, piping, and associated valves and instrumentation. Utility water is connected to the piping in several locations. The Soda ash has discharge connections to the plant influent and filter effluent. The soda ash silos and equipment are supported by structural frames and accessed by associated access ladders, handrails and platforms. Structural modifications to the building would be required depending on future use of the area, but the large floor openings could be blocked by handrails until future use of the area was determined.

The Ferric Chloride system is no longer in use and consists of two storage silos with dust collectors, two solution tanks with mixers, and two gravimetric dry feeders. Each storage tank has a slide gate, rotary valve, and two flexible connections. The storage silos have feed connection locations for bulk delivery and from a loading hopper assembly with dust collector, bag loader, hopper and blower. The ferric chloride system has three feed pumps, piping, and associated valves and instrumentation. Utility water is connected to the piping in several locations. The ferric chloride has a discharge connection to the plant influent. The ferric chloride silos and equipment are supported by structural frames and accessed by associated access ladders, handrails and platforms. Structural modifications to the building would be required depending on future use of the area, but the large floor openings could be blocked by handrails until future use of the area was determined. Figure 4-42 shows one of the two ferric chloride silos.

Figure 4-42
One of two ferric chloride silos with structural supports and floor opening.

A small powder activated carbon system remains installed in an active utilidor space. This equipment has been abandoned in place for many years.

4.14.2 Asset Management Planning Considerations

A copy of the entire Asset Management Plan is included in Appendix B, which includes a description of the formal asset management methodology used for the EWTF. No assets were found to have a *moderate*, *major* or *catastrophic* risk rating level. The risk matrix shown in Table 4-62 is excerpted directly from the Asset Management Plan. In accordance with the governing AWWU Risk Response policy, these moderate risk assets should be addressed through capital and/or operational recommendations developed as part of this Facility planning effort.

Table 4-62: Soda Ash/Ferric Chloride (Legacy System) - Summary of Asset Management Output

GENERAL		LIKELIHOOD OF FAILURE (LoF) (40%)	CONSEQUENCE OF FAILURE (CoF) (60%)						RISK
			15%	25%	25%	20%	15%		
Process Area	Asset	Condition Assessment Rating (LoF Score)	Social - Customers & Repultation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded
Ferric Chloride	Super Bag Loader	3	2	2	2	3	3	2	2
Ferric Chloride	Loading Hopper	3	2	2	2	3	3	2	2
Ferric Chloride	Loading Hopper	3	2	2	2	3	3	2	2
Ferric Chloride	Loading Hopper (at hopper outlet)	3	2	2	2	3	3	2	2
Ferric Chloride	Transfer Blower	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo (North)	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Dry Feeder	0	1	1	1	1	1	1	N/A
Ferric Chloride	Solution Tank	3	2	2	2	3	3	2	2
Ferric Chloride	Solution Tank	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo (South)	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Storage Silo	3	2	2	2	3	3	2	2
Ferric Chloride	Dry Feeder	0	1	1	1	1	1	1	N/A
Ferric Chloride	Solution Tank	3	2	2	2	3	3	2	2
Ferric Chloride	Solution Tank	3	2	2	2	3	3	2	2
Ferric Chloride	Feed Pump (originally was progressive cavity)	0	1	1	1	1	1	1	N/A
Ferric Chloride	Feed Pump (originally was progressive cavity)	0	1	1	1	1	1	1	N/A
Ferric Chloride	Feed Pump (originally was progressive cavity)	0	1	1	1	1	1	1	N/A
Soda Ash	Super Bag Loader	3	2	2	2	3	3	2	2
Soda Ash	Loading Hopper	3	2	2	2	3	3	2	2
Soda Ash	Loading Hopper	3	2	2	2	3	3	2	2
Soda Ash	Loading Hopper (at hopper outlet)	3	2	2	2	3	3	2	2
Soda Ash	Transfer BLower	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo (North)	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Dry Feeder	0	1	1	1	1	1	1	N/A
Soda Ash	Solution Tank	3	2	2	2	3	3	2	2
Soda Ash	Solution Tank	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo (South)	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Storage Silo	3	2	2	2	3	3	2	2
Soda Ash	Dry Feeder	0	1	1	1	1	1	1	N/A
Soda Ash	Solution Tank	3	2	2	2	3	3	2	2
Soda Ash	Solution Tank	3	2	2	2	3	3	2	2
Soda Ash	Feed Pump (originally was progressive cavity)	0	1	1	1	1	1	1	N/A
Soda Ash	Feed Pump (originally was progressive cavity)	0	1	1	1	1	1	1	N/A

4.14.3 Assessment

The existing soda ash and ferric chloride systems are not in use and will degrade and become a safety hazard over time. Removal of the equipment and related electrical and I&C systems would free up space within the facility and free up I/O control points. Structural modifications to the building should be minimized until future use of the areas is determined. Guard rail and other safety devices would need to be installed in the interim to maintain a safe working environment.

In order to determine the cost of the system removal and area modifications, a more detailed assessment is necessary. At a minimum, a hazardous materials survey is recommended during a subsequent planning or design phase to establish safe demolition requirements. For the purpose of this report, it is anticipated that each system, SA1 and FC1, would require approximately $1M or more to completely remove the items and provide safety features, including the recommended hazardous materials survey. Because of the substantial cost associated with potential removal of hazardous materials, and the lack of immediate need for the space currently occupied by these silos, it is recommended that ultimate removal be deferred until a future time. This assessment should be updated when space needs or equipment condition changes.

Both SA1 and FC1 have a **LOW** Relative Need since immediately failure of the equipment is not likely though eventually these items do need to be removed. A more thorough condition assessment should be performed to determine the extent and rate of any degradation that may be occurring.

Removal of the existing powder activated carbon (PAC) system will free up access and eliminate a protentional safety hazard for AWWU personnel. Since the system is no longer in use, its demolition will not impact finished water production or quality at the EWTF.

4.14.4 Alternatives Assessment

No alternatives were identified for the recommended actions.

4.14.5 Summary of Recommendations

The soda ash, ferric chloride, and PAC systems are no longer used. All associated unused equipment, storage, piping, valves, electrical/I&C related items, structural supports, access platforms and ladders should be removed for the PAC system. Removal of soda ash and ferric chloride is not recommended at this time. Because of the substantial cost associated with potential removal of hazardous materials, and the lack of immediate need for the space currently occupied by these silos, it is recommended that ultimate removal be deferred until a future time. This assessment should be updated when space needs or equipment condition changes.

Table 4-63: Existing Dry Soda Ash and Ferric Chloride Systems Summary of Recommendations

ID	Description	Rationale	Relative Need
SA1	Remove soda ash equipment, piping, storage silos, and Electrical/I&C related items	Facility Betterment	Low
FC1	Remove ferric chloride equipment, piping, storage silos, and Electrical/I&C related items	Facility Betterment	Low
PAC1	Remove powder activated carbon system and appurtenances.	Facility Betterment	Low

Table 4-64 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-64: Energy Recovery Station - Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs.)
SA1	Not recommended at this time							
FC1	Not recommended at this time							
PAC1	$26,000	Low	$2,000	$1,000	$5,200	$34,000	$0	N/A

Because the total project cost derived for planning purposes is below $500k, Recommendation PAC1 is subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.14.6 Special Considerations for Implementation

Plant operations will be minimally affected by removal of this equipment, as it is not in use. Piping connections to plant influent and filter effluent, and utility water connections to the systems should be capped.

4.15 General Chemical System Items

In addition to the specific chemical system assessments, the overall systems related to the chemicals were assessed. Two systems were identified as a concern, the chemical piping and the emergency eyewash and shower system.

4.15.1 Existing Facilities and Infrastructure

The chemical systems convey chemical product from the individual storage and feed systems to various application points in the treatment process through individual pipes. These pipes do not have containment outside of the chemical storage areas. The amount of uncontained chemical piping (not including underground piping) has been estimated as follows:

- Poly aluminum chloride: 350 ft.
- Polymers: 700 ft.
- Fluoride: 50 ft.
- Sodium Hypochlorite: 1,300 ft.

Throughout the facility, and mostly in chemical storage and feed areas, eye wash stations and shower stations have been installed for staff use should someone come in contact with a hazardous chemical. There are approximately 14 eyewash stations and 5 shower stations. A number of these stations are in the ferric chloride and soda ash silo areas.

4.15.2 Asset Management Planning Considerations

There are no asset management considerations explicitly associated with general chemical system items; instead all assets associated with each chemical system at the EWTF are addressed within their respective unit process of this Facility Plan.

4.15.3 Assessment

Chemical Piping Hazard Assessment (GC1)

Given that there are approximately 2,400 ft. of chemical piping within the facility, conveying hazardous materials, it is recommended that a hazard analysis be performed to determine the extent of double walled/containment piping needed, and for which chemicals. Double walled piping, along with supports and hangers, can range for $75 to $200 per linear foot, and therefore should be assessed before the work is designed and executed. The cost of the double walled piping is dependent on many factors such as extent of pipe hangers and supports, type of double walled system, core drilling of walls, and other construction items. Therefore, no cost estimate has been provided at this time since a hazard analysis needs to be conducted along with a detailed conceptual design.

GC1 has a **LOW** Relative Need.

Install Emergency Eyewash Showers (GC2)

A number of the existing eye wash stations are "temporary" and need to be replaced with plumbed equipment to meet ANSI Z358 and OSHA requirements. The water source for the plumbed stations needs to have tepid water for a minimum of 15 minutes, which requires a moderately heated water system. There are various methods for providing tepid water, but one of the more cost-effective system uses a hot water heater set for a moderate temperature.

It is estimated that approximate six new Emergency Eyewash/Shower Stations need to be installed and plumbed with tepid water.

Table 4-65 provides a summary of economic considerations with possible O&M costs savings for installing new emergency eyewash showers – note that more developed 'project' costs for recommendations suitable for capital planning purposes are developed at the end of this section and are used in Section 5 – Summary of Recommendations. O&M costs that are anticipated to be the same as the existing costs have not been included below. Note that the below table does not represent any O&M cost associated with recurring testing of such emergency eyewash showers, which are required periodically.

Table 4-65: GC2 Install Emergency Eyewash Showers - Cost Impact Summary

Item	Criteria	Cost
Construction Cost Component	Replace and add six new EEWSs including tepid water system	$150,000
Approximate Operation & Maintenance Labor Cost Savings	Reduced O&M requirements	NA
Energy Cost Savings	Same as existing	NA
Maintenance Parts Savings	Miscellaneous parts requirements for Existing	NA
Simple Pay Back Period	Construction cost contribution divided by Savings	NA

GC2 has a **HIGH** Relative Need to provide safe and code compliant emergency eyewash/shower stations throughout the facility in areas where chemical handling is regularly performed as well as likely places where maintenance on the chemical systems will likely be performed.

4.15.4 Alternatives Assessment

Numerous alternatives are available for the chemical piping containment system (GC1), such as premanufactured double walled piping systems with leak and location detectors versus a system of clear PVC/CPVC with internal tubing for chemical conveyance.

For the emergency eyewash and shower stations (GC2), there are numerous brands and types of stations. These stations could also include instrumentation to alert the operator's station and sound a local horn. Also, there are different types of tepid water systems, including hot water heaters, point of use heaters and hot water piping with blending valves. For planning purposes, a unit cost of $25k (each) was used, matching AWWU cost information from similar, permanent eyewash and shower stations at the Asplund WWTF.

4.15.5 Summary of Recommendations

The recommendations for the general chemical system items are summarized in the following table.

Table 4-66: General Chemical System Summary of Recommendations

ID	Description	Rationale	Relative Need
GC1	Chemical piping hazard analysis for determine need and extent of double walled piping	Safety	Low
GC2	Installation of Emergency Eyewash Shower Stations and tepid water systems	Safety	High

Table 4-67 derives a planning level 'project' cost for the above recommendations, which is recommended for capital planning purposes and is used in Section 5 of this Facility Plan – Plant-Wide Summary of Recommendations.

Table 4-67: General Chemical System – Planning Level Costs

ID	Construction Cost ($)	Complexity	Design Cost ($)	ESDC	Soft Costs @ 20% of Constr.	Total 'Project' Planning Cost	O&M Savings	Payback (yrs.)
GC1	Double walled piping evaluation - Engineering Effort Only							
GC2	$150,000 (i.e. $25k each for six location)	Medium	$20,000	$12,000	$30,000	$212,000	$0	N/A

Because the total project cost derived for planning purposes is below $500k, Recommendation GC2 is subject to a Business Case Evaluation (BCE)-0 per AWWU's draft BCE guidance document dated August 2016. Appendix A includes the complete set of BCE-0 and BCE-1 documents associated with the recommendations developed in this Facility Plan.

4.15.6 Special Considerations for Implementation

Installation of new chemical piping will require that the new systems are piped alongside the existing systems with plant shutdowns for tying into existing metering pump piping and application point injectors.

Installation of new emergency eyewash showers should not impact plant operations except for the short periods when plumbing piping needs to be tied in with the existing plumbing.

Section 5

Summary of Integrated Recommendations

This section presents an integrated summary of all facility-wide recommendations developed in Sections 1 through 4 of this Facility Plan.

5.1 Summary of Recommendations

Table 5-1, beginning on page 5-3 includes a high-level summary of each recommendation made for each non-process discipline and for each unit treatment process. A location where additional information can be found within the Facility Plan is also provided for convenience.

5.2 EWTF Infrastructure Project Groupings

The following project groupings have been identified in Table 5-1 in the column labeled 'Capital Project or Other':

- *Capital – Safety* indicates projects whose primary driver is related to improving the working environment for AWWU staff, or enhancing the safety of AWWU staff and visitors to the EWTF. These upgrades are generally very high priority and therefore are slated to begin in the first year of the total planning horizon.

- *Capital – Extended Performance (Ext Perf)* indicates projects whose primary driver is related to extending the life of the existing facility (e.g. mitigating potential concrete corrosion). These upgrades are generally lower priority and thus are largely deferred until the second half of the ten-year facility planning horizon.

- *Capital – Reliability* indicates projects whose primary driver is related to improving the reliability of existing network, communications and electrical service infrastructure. These upgrades are recommended to be deferred until 2020-21 as they are relatively large expenditures and are a slightly lower priority than items that are being accelerated (such as those related to safety).

- *Capital – Enhanced Monitoring* indicates projects whose primary driver is related to enhancing the function of existing equipment to better utilize its functionality and/or increase AWWU's ability to monitor and/or control its operation. These are items that impact a large quantity of locations within the plant (MCCs and UPS) and would be best scheduled to follow the more basic network and electrical upgrades included in the 'Reliability' capital grouping above.

- *Capital – Reduced Operations & Maintenance* is NOT USED as a capital grouping in this Facility Plan as a new capital grouping related to specific unit treatment processes as been introduced.

- *Capital – Building Performance (Bldg Perf)* indicates projects whose primary driver is related to increasing the efficiency of the EWTF (e.g. boiler replacement).

- *Capital – Facility Betterment* indicates projects whose primary driver is related to removal of legacy equipment that is no longer in use and impacts available space/access/available IO/etc. for other systems that are in use. Equipment to be removed for the betterment of the facility includes soda ash, ferric chloride, and powdered activated carbon.

- *Capital – Process* indicates projects that will improve process/mechanical infrastructure throughout the facility. These are generally lower priority upgrades and can be done at any time; they are largely grouped together to allow a single construction contract to address all improvements and are deferred until the second half of the facility planning horizon to limit annual planned expenditures.

- *Capital – Civil/Sitework* indicates projects that are related to exterior site work (e.g. asphalt improvements); these are grouped together because they are weather dependent efforts whose timing needs to be considered when including them with other planned capital improvements.

- *Other-Engineering* indicates engineering efforts that may identify future opportunities an/or benefits to AWWU, but do not include immediate recommendations for capital outlays over this planning horizon.

- *Other-O&M i*ndicates O&M efforts that can likely be accomplished by AWWU staff during regular O&M activities without the need for a capital project or services contract outlay.

Table 5-1: Summary of Recommended Upgrades

ID	Location in Plant	Description	Rationale	Capital Project or Other	Relative Need	Complexity	Total 'Project' Planning Cost	Payback (yrs)	Location in Document
Architectural									
ARCH1	Exterior	Clean Exterior Wall Panels	Aesthetics and decreased long-term wear	Other - O&M	Low	Low	N/A	N/A	Section 2.2.6
ARCH2	Multiple	Roof Replacements	Improved building service life	Capital - Ext Perf	Medium	Low	$ 110,000	N/A	Section 2.2.6
ARCH3	Roof	Roof Access - Add Guardrails	Worker safety/code compliance	Capital - Safety	High	Low	$ 21,000	N/A	Section 2.2.6
ARCH4	Multiple	Door Hardware Improvements	Worker safety/code compliance	Capital - Safety	Medium	Low	$ 83,000	N/A	Section 2.2.6
ARCH5	Multiple	Replace Interior Finishes	Improved worker comfort/safety and aesthetics	Capital - Safety	Low	Low	$ 14,000	N/A	Section 2.2.6
ARCH6	Filtration	Filter Basin Guardrails / Ladders	Worker safety/code compliance	Capital - Safety	High	Low	$ 90,000	N/A	Section 2.2.6
ARCH7	Multiple	Rated Wall Penetrations	Worker safety/code compliance	Capital - Safety	High	Low	$ 14,000	N/A	Section 2.2.6
ARCH8	Intake	Intake Structure Ladder Access	Worker safety/code compliance	Capital - Safety	Medium	Low	$ 21,000	N/A	Section 2.2.6
Structural									
STRUCT1	Utilidor	Utilidor Repair	Mitigate Concrete Degradation	Capital - Ext Perf	Medium	Medium	$ 207,000	N/A	Section 2.3.6
STRUCT2	Headworks	Repair Headworks Tank Cracks	Mitigate Concrete Degradation	Capital - Ext Perf	Medium	Medium	$ 207,000	N/A	Section 2.3.6
STRUCT3	Floc/Sed	Floc/Sed Basin Floor Cracks & Riser Box Seal	Avoid premature Rebar Failure	Capital - Ext Perf	Low	Low	$ 207,000	N/A	Section 2.3.6
STRUCT4	Utilidor	Service Gallery Wall Cracks	Avoid premature Rebar Failure	Capital - Ext Perf	Low	Low	$ 69,000	N/A	Section 2.3.6
STRUCT5	Chemicals	Coat/Protect Chemical Storage Rebar	Avoid premature Rebar Failure	Capital - Ext Perf	Low	Low	$ 3,000	N/A	Section 2.3.6
STRUCT6	Lobby	Repair Lobby Major Floor Crack	Worker/Visitor Safety	Capital - Safety	Low	Low	$ 28,000	N/A	Section 2.3.6
STRUCT7	Eff Vault	Effluent Vault Stair Repair	Clear Egress/Worker Safety	Capital - Safety	Low	Low	$ 21,000	N/A	Section 2.3.6
STRUCT8	Intake	Remove Intake Structure Calcium Build-Up	Avoid Future/Potential Equipment Disruption	Capital - Ext Perf	Low	Low	$ 55,000	N/A	Section 2.3.6
Civil									
CIVIL1	Offsite	Lake Diversion Condition Assessment	Mitigate concrete degradation	Other - Engineering	High	High	N/A	N/A	Section 2.4.6
CIVIL2	Offsite	P-4 Transmission Pipeline Condition Assessment	Mitigate concrete degradation	Other - Engineering	High	High	N/A	N/A	Section 2.4.6
CIVIL3	Exterior	Clearwell Underdrain Piping Assessment Program	Avoid premature rebar failure	Other - Engineering	Low	Low	N/A	N/A	Section 2.4.6
CIVIL4	Exterior	Repair Perimeter Fence	Safety/Security	Capital - Civil	Low	Low	$ 10,000	N/A	Section 2.4.6
CIVIL5	Exterior	Repair Cracking and Heaving Asphalt	Personnel/Visitor Safety	Capital - Civil	Low	Low	$ 55,000	N/A	Section 2.4.6
CIVIL6	Exterior	Repair Lagoon Roads	Personnel/Visitor Safety	Capital - Civil	Low	Low	$ 21,000	N/A	Section 2.4.6
Electrical									
ELEC1	Exterior	Plant Primary Service Upgrade	Increased power reliability/resiliency	Capital - Reliability	Medium	High	$ 2,760,000	N/A	Section 2.5.6
ELEC2	Intake	Intake Facility Service Upgrade	Increased power reliability/resiliency	Capital - Reliability	Medium	High	$ 483,000	N/A	Section 2.5.6
ELEC3	Portal	Portal Facility Service Upgrade	Increased power reliability/resiliency	Capital - Reliability	Medium	High	$ 345,000	N/A	Section 2.5.6

ID	Location in Plant	Description	Rationale	Capital Project or Other	Relative Need	Complexity	Total 'Project' Planning Cost	Payback (yrs)	Location in Document
ELEC4	Multiple	Plant MCC Distribution Upgrades	Additional functionality; enhanced monitoring capabilities	Capital - Enhanced Monitoring	Low	Medium	$ 5,200,000	N/A	Section 2.5.6
ELEC5	Multiple	Plant Light Fixtures Upgrade	Increased efficiency	Capital - Bldg Perf	Low	Low	$ 311,000	N/A	Section 2.5.6
ELEC6	All	Plant Fire Alarm System	Worker/Visitor Safety	Capital - Reliability	Medium	Low	$ 276,000	N/A	Section 2.5.6
ELEC7	All	Plant Public Address System	Worker/Visitor Safety	Capital - Reliability	Medium	Low	$ 138,000	N/A	Section 2.5.6
ELEC8	Filtration	Additional CCTV Coverage	Worker Safety, enhanced monitoring	Other - already being done by AWWU O&M	Medium	Low	N/A	N/A	Section 2.5.6
ELEC9	Multiple	Uninterruptible Power Supply Upgrades	Improved monitoring, maintenance, reliability	Capital - Enhanced Monitoring	Medium	Low	$ 345,000	N/A	Section 2.5.6
ELEC10	Exterior	Outdoor Lighting & Cabinet Controls	Safety/Security	Capital - Safety	Medium	Low	$ 110,000	N/A	Section 2.5.6
General Network Infrastructure									
NET1	Multiple	Perform general network and communications upgrades (*prior* to related Electrical and I&C upgrades)	Age/functionality of existing network infrastructure	Capital - Reliability	High	Medium	$ 2,100,000	N/A	Section 2.5.6
Building Mechanical									
HV1	Boiler	Boiler Replacement	Higher efficiency, increased reliability	Capital - Bldg Perf	Medium	Medium	$ 552,000	N/A	Section 2.6.6
HV2	Boiler	Duct Furnace Fan & Heaters Replacement	Worker safety, age of equipment	Capital - Bldg Perf	Medium	Low	$ 83,000	N/A	Section 2.6.6
HV3	Loading	Loading Area Snowmelt System	Enhanced worker safety; replaces failed system	Capital - Bldg Perf	Low	Low	$ 35,000	N/A	Section 2.6.6
HV4	Fluoride	Fluoride Ventilation System Upgrade	Worker safety/code compliance	Capital - Safety	High	High	N/A (incl. with upgrade ID FL1)	N/A	Section 2.6.6
HV5	Domestic Water System	Replace domestic water system	Higher efficiency, increased reliability	Capital - Bldg Perf	High	High	$ 110,000.00	N/A	Section 2.6.6
Energy Recover Station									
ER1	ERS	Replace electrical actuators on five motorized valves (two needle valves, two isolation valves, one sleeve valve) on incoming raw water	Reliability, Improved Controls, Reduce Needed Operator Attention	Capital - Process	Medium	Low	$ 140,000	6	Section 4.2.5
ER2	ERS	Replace Control Panel (while maintaining UL Listing) and provide new and improved SCADA interface functionality for remote operations and monitoring of ERS	Increased functionality, improved reliability	Capital - Process	High	High	$ 600,000	14	Section 4.2.5
Raw Water									
RW1	Pipeline	Reinstall seismic restraints on 42-inch diameter pipeline	Reliability, Improved Controls, Reduce Needed Operator Attention	Other - O&M	High	Very Low	N/A	N/A	Section 4.3.5

CDM Smith

ID	Location in Plant	Description	Rationale	Capital Project or Other	Relative Need	Complexity	Total 'Project' Planning Cost	Payback (yrs)	Location in Document
RW2	Flash Mix	Perform condition assessment of flash mix coagulant mixer	Reliability, Critical Treatment Process	Other - Engineering	High	Very Low	N/A	N/A	Section 4.3.5
RW3	Flash Mix	Replace PRV on high pressure flash mix feed water system	Reliability, Critical Treatment Process	Capital - Process	High	Low	$ 30,000	6	Section 4.3.5
Flocculation									
N/A									
Sedimentation									
SED1	Sed	Refurbishment of guide rail in North Sedimentation Basin	Reliability; Failure of items causing additional damage	Capital - Process	High	Very Low	$ 18,000	N/A	Section 4.5.4
SED2	Sed	Monitoring and replacement of 4 longitudinal collector drives and 2 cross collector drives	Reliability; Failure causing short time impact to production	Capital - Process	Low	Low	$ 117,000	N/A	Section 4.5.4
SED3	Sed	Addition of three new valves + motorized actuators for sedimentation basin drain valves	Reliability (time consuming to actuate); also increases overall safety with more robust tank drainage	Capital - Process	Low	Low	$ 80,000	tbd	Section 4.5.4
SED4	Sed	CCTV monitoring of sedimentation drain pipes and other pipes exiting the sedimentation basins	Alleviates concerns for piping with high potential to accumulate deposits	Other - O&M	Low	Low	N/A	N/A	Section 4.5.4
Filtration									
FLT1	Filtration	Evaluation of filter media and possible follow-up actions	Reliability; Water Quality	Completed (Appendix E)	High	N/A	N/A	N/A	Section 4.6.5
FLT2	Filtration	Review and modification of SOP for Filter Backwashing Procedures	Water Quality, Ability to startup dry filters	Other - O&M	Low	N/A	N/A	N/A	Section 4.6.5
FLT3	Filtration	Replace eight turbidimeters	Reliability; Operability	Capital - Process	High	Low	$ 150,000	N/A	Section 4.6.5
Clearwell and Effluent Vault									
CW1	Clearwell	New actuator/gear box above clearwell, stem and torque tube for two 66" Influent valves and two 54" Effluent valves	Reliability; Operability	Capital - Process	High	Low	$ 177,000	N/A	Section 4.7.4
CW2	Clearwell	New 12-inch valves, actuator/gear box above clearwell, stem and torque tube for four 12" drain valves	Reliability (Mitigation of Corrosion Damage); Operability	Capital - Process	High	Low	$ 139,000	N/A	Section 4.7.4
CW3	Clearwell	Formalize SOP for disinfection process prior to returning clearwell to service (during routine clearwell maintenance/inspection)	Safety	Other - Engineering	Low	Very Low	N/A	N/A	Section 4.7.4

ID	Location in Plant	Description	Rationale	Capital Project or Other	Relative Need	Complexity	Total 'Project' Planning Cost	Payback (yrs)	Location in Document
CW4	Eff Vault	Replace stem, provide stem support, and locate nut above for final effluent valve	Reliability - Operability	Other - O&M	Low	Very Low	N/A	N/A	Secion 4.7.3
CW5	Eff Vault	Replace vacuum relief rupture disks, obtain spare disks, and clean vent tubes	Reliability	Capital - Process	Medium	Low	$ 32,000	N/A	Section 4.7.4
CW6	Clearwell & Eff Vault	Include provisions to avoid unsecure clearwell/effluent stem and other penetrations (non-alarming)	Safety	Capital - Safety	High	Low	$ 17,000	N/A	Section 4.7.4
Waste Washwater									
N/A									
Residuals Management									
RM1	Lagoons	Replacement of two lagoon decant pumps	Reliability; Maintaining Plant Production	Capital - Process	High	High	$ 164,000	9	Section 4.9.5
RM2	Exterior	Installation of flow sensor switch in waste washwater pipe with programming by AWWU	Reliability; Plant Maintenance Prevention	Capital - Process	Low	Low	$ 30,000	N/A	Section 4.9.5
Polymer									
N/A									
Poly Aluminum Chloride									
PACl1	PACL	Replace two existing metering pumps with three new pumps	Reliability, improved chemical use	Capital - Process	Low	High	$ 129,000	18	Section 4.11.5
PACl2	PACL	Add Tank(s) for tote transfer and use	Improved Operations	Capital - Reduced O&M	Low	Low	$ 68,000	8	Section 4.11.5
Fluoride									
FL1	Fluoride	Replace Fluoride System with new Dry System	Safety, Improved Control, Improved Water Quality, Improved Operations	Capital - Safety	High	High	$ 904,000	27	Section 4.12.5
On-Site Hypochlorite Generation									
CL1	Hypo	Replace On-Site Hypo Generation (OSHG) System	Reliability; Improved Operations; Safety	Capital - Safety	High	High	$ 1,408,000	N/A	Section 4.13.5
CL2	Hypo	Modify bulk salt loading system	Safety	Capital - Safety	High	Low	$ 48,000	N/A	Section 4.13.5
Legacy Systems (Soda Ash/Ferric Sulfate/Activated Carbon)									
SA1	Silos	Consider removal of soda ash equipment, piping, storage silos, and Electrical/I&C related items during next Facility Planning horizon or if space needs become paramount	Facility Betterment	Other-Engineering	Low	N/A	N/A	N/A	Section 4.14.5
FC1	Silos	Consider removal of ferric chloride equipment, piping, storage silos, and Electrical/I&C related items during next Facility Planning horizon or if space needs become paramount	Facility Betterment	Other - Engineering	Low	N/A	N/A	N/A	Section 4.14.5

CDM Smith

ID	Location in Plant	Description	Rationale	Capital Project or Other	Relative Need	Complexity	Total 'Project' Planning Cost	Payback (yrs)	Location in Document
PAC1	Near filter-to-waste	Remove legacy powdered activated carbon (PAC) equipment to better protect filter-to-waste equipment	Facility Betterment	Capital - Facility Betterment	Low	Low	$ 34,000	N/A	Section 4.14.5
General Chemical System									
GC1	Multiple	Chemical piping hazard analysis for determine need and extent of double walled piping	Safety	Other - Engineering	Low	N/A	N/A	N/A	Section 4.15.5
GC2	Multiple	Installation of Emergency Eyewash Shower Stations and tepid water systems	Safety	Capital - Safety	High	Medium	$ 212,000	N/A	Section 4.15.5

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5.3 Recommended Capital Project Cost Phasing

Tables 5-2 through 5-10 show a recommended phased implementation for each of the capital project groupings identified above over the ten-year planning horizon.

Table 5-2: Safety – Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ARCH3	Roof Access - Add Guardrails	$ 21,000	$5,250	$15,750	$0	$0	$0	$0	$0	$0	$0	$0
ARCH4	Door Hardware Improvements	$ 83,000	$20,750	$62,250	$0	$0	$0	$0	$0	$0	$0	$0
ARCH5	Replace Interior Finishes	$ 14,000	$3,500	$10,500	$0	$0	$0	$0	$0	$0	$0	$0
ARCH6	Filter Basin Guardrails / Ladders	$ 90,000	$22,500	$67,500	$0	$0	$0	$0	$0	$0	$0	$0
ARCH7	Rated Wall Penetrations	$ 14,000	$3,500	$10,500	$0	$0	$0	$0	$0	$0	$0	$0
ARCH8	Intake Structure Ladder Access	$ 21,000	$5,250	$15,750	$0	$0	$0	$0	$0	$0	$0	$0
STRUCT6	Repair Lobby Major Floor Crack	$ 28,000	$7,000	$21,000	$0	$0	$0	$0	$0	$7,000	$21,000	$0
STRUCT7	Effluent Vault Stair Repair	$ 21,000	$5,250	$15,750	$0	$0	$0	$0	$0	$0	$0	$0
ELEC10	Outdoor Lighting & Cabinet Controls	$ 110,000	$27,500	$82,500								
CW6	Security provisions for celarwell & Effluent vault penetrations (valve stems, etc.)	$ 17,000	$0	$17,000	$0	$0	$0	$0	$0	$0	$0	$0
FL1	Replace Fluoride System with new Dry System	$ 904,000	$226,000	$678,000	$0	$0	$0	$0	$0	$0	$0	$0
CL1	Replace On-Site Hypo Generation (OSHG) System	$ 1,408,000	$352,000	$1,056,000	$0	$0	$0	$0	$0	$0	$0	$0
CL2	Modify bulk salt loading system	$ 48,000	$12,000	$36,000	$0	$0	$0	$0	$0	$0	$0	$0
GC2	Installation of Emergency Eyewash Shower Stations and tepid water systems	$ 212,000	$53,000	$159,000	$0	$0	$0	$0	$0	$0	$0	$0

Table 5-3: Extended Performance - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ARCH2	Roof Replacements	$ 110,000	$0	$0	$0	$0	$0	$0	$27,500	$82,500	$0	$0
STRUCT1	Utilidor Repair	$ 207,000	$0	$0	$0	$0	$0	$0	$51,750	$155,250	$0	$0
STRUCT2	Cracks	$ 207,000	$0	$0	$0	$0	$0	$0	$0	$51,750	$155,250	$0
STRUCT3	Floc/Sed Basin Floor Cracks & Riser Box Seal	$ 207,000	$0	$0	$0	$0	$0	$51,750	$155,250	$0	$0	$0
STRUCT4	Service Gallery Wall Cracks	$ 69,000	$0	$0	$0	$0	$0	$0	$0	$0	$17,250	$51,750
STRUCT5	Coat/Protect Chemical Storage Rebar	$ 3,000	$750	$2,250	$0	$0	$0	$0	$0	$0	$0	$0
STRUCT8	Remove Intake Structure Calcium Build-Up	$ 55,000	$0	$0	$0	$0	$0	$0	$13,750	$41,250	$0	$0

Table 5-4: Reliability - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ELEC1	Plant Primary Service Upgrade	$ 2,760,000	$690,000	$2,070,000	$0	$0	$0	$0	$0	$0	$0	$0
ELEC2	Intake Facility Service Upgrade	$ 483,000	$120,750	$362,250	$0	$0	$0	$0	$0	$0	$0	$0
ELEC3	Portal Facility Service Upgrade	$ 345,000	$86,250	$258,750	$0	$0	$0	$0	$0	$0	$0	$0
ELEC6	Plant Fire Alarm System	$ 276,000	$0	$0	$0	$0	$69,000	$207,000	$0	$0	$0	$0
ELEC7	Plant Public Address System	$ 138,000	$0	$0	$0	$0	$34,500	$103,500	$0	$0	$0	$0
NET1	Network infrastructure upgrades	$ 2,100,000	$0	$0	$525,000	$1,575,000	$0	$0	$0	$0	$0	$0

Table 5-5: Enhanced Monitoring - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ELEC4	Plant MCC Distribution Upgrades	$ 5,200,000	$0	$0	$0	$0	$1,300,000	$3,900,000	$0	$0	$0	$0
ELEC9	Uninterruptible Power Supply Upgrades	$ 345,000	$0	$0	$0	$0	$86,250	$258,750	$0	$0	$0	$0

Table 5-6: Reduced O&M - Recommended Capital Expenditure Phasing Year 1 – Year 10 – NOT USED

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
NOT USED												

Table 5-7: Building Performance - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ELEC5	Plant Light Fixtures Upgrade	$ 311,000	$0	$0	$0	$0	$0	$0	$0	$0	$77,750	$233,250
HV1	Boiler Replacement	$ 552,000	$0	$0	$138,000	$414,000	$0	$0	$0	$0	$0	$0
HV2	Duct Furnace Fan & Heaters Replacement	$ 83,000	$0	$0	$20,750	$62,250	$0	$0	$0	$0	$0	$0
HV3	Loading Area Snowmelt System	$ 35,000	$0	$0	$8,750	$26,250	$0	$0	$0	$0	$0	$0
HV3	Loading Area Snowmelt System	$ 110,000	$0	$0	$27,500	$82,500	$0	$0	$0	$0	$0	$0

Table 5-8: Facility Betterment - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
PAC1	Remove powdered activated carbon from immediate vicinity of filter-to-waste equipment	$ 34,000	$0	$8,500	$25,500	$0	$0	$0	$0	$0	$0	$0

Table 5-9: Process - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
ER1	Replace electrical actuators on five total valves serving incoming raw water (two needle valves, two isolation valves, one sleeve valve)	$ 140,000	$0	$0	$0	$0	$0	$35,000	$105,000	$0	$0	$0
ER2	Replace Control Panel and provide new and improved SCADA interface functionality for remote operations and monitoring of ERS	$ 600,000	$0	$0	$0	$0	$0	$150,000	$450,000	$0	$0	$0
RW3	Replace PRV on high pressure flash mix feed water system	$ 30,000	$0	$0	$0	$0	$0	$7,500	$22,500	$0	$0	$0
SED1	Guide Rail Refurbishment - North Sed Basin	$ 18,000	$0	$0	$0	$0	$0	$4,500	$13,500	$0	$0	$0
SED2	Monitoring and replacement of 4 longitudinal collector drives and 2 cross collector drives	$ 117,000	$0	$0	$0	$0	$0	$29,250	$87,750	$0	$0	$0
SED3	Addition of three motorized actuators for sedimentation basin drain valves	$ 80,000	$0	$0	$0	$0	$0	$20,000	$60,000	$0	$0	$0
FLT3	Replace eight turbidimeters	$ 150,000	$37,500	$112,500	$0	$0	$0	$0	$0	$0	$0	$0
CW1	New actuator/gear box above clearwell, stem and torque tube for two 66" Influent valves and two 54" Effluent valves	$ 177,000	$0	$0	$0	$0	$0	$44,250	$132,750	$0	$0	$0

Table 5-9: Process - Recommended Capital Expenditure Phasing Year 1 – Year 10 (Continued)

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CW2	New 12-inch valves, actuator/gear box above clearwell, stem and torque tube for four 12” drain valves	$ 139,000	$0	$0	$0	$0	$0	$34,750	$104,250	$0	$0	$0
CW5	Replace vacuum relief rupture disks, obtain spare disks, and clean vent tubes	$ 32,000	$0	$0	$0	$0	$0	$8,000	$24,000	$0	$0	$0
RM1	Replacement two lagoon decant pumps	$ 164,000	$0	$0	$0	$0	$0	$41,000	$123,000	$0	$0	$0
RM2	Installation of flow sensor switch in waste washwater pipe with programming by AWWU	$ 30,000	$0	$0	$0	$0	$0	$7,500	$22,500	$0	$0	$0
PACl1	Replace two existing metering pumps with three new pumps	$ 129,000	$0	$0	$0	$0	$0	$32,250	$96,750	$0	$0	$0
PACl2	Add Tank(s) for tote transfer and use	$ 68,000	$17,000	$51,000	$0	$0	$0	$0	$0	$0	$0	$0

Table 5-10: Civil Sitework - Recommended Capital Expenditure Phasing Year 1 – Year 10

ID	Description	Total 'Project' Planning Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
CIVIL4	Repair Perimeter Fence	$ 10,000	$2,500	$7,500	$0	$0	$0	$0	$0	$0	$0	$0
CIVIL5	Repair Cracking and Heaving Asphalt	$ 55,000	$13,750	$41,250	$0	$0	$0	$0	$0	$0	$0	$0
CIVIL5	Repair Cracking and Heaving Asphalt	$ 21,000	$5,250	$15,750	$0	$0	$0	$0	$0	$0	$0	$0

Table 5-11 shows a total recommended capital expenditure for each year through the end of the facility planning horizon. This includes all recommendations presented in Tables 5-2 through 5-10 with an overall goal of limiting the largest annual recommended capital expenditures to a range of $3M to $5M. The total recommended capital improvements over the full ten-year facility planning horizon is approximately $20M, for an average of just over $2M per year.

Table 5-11: Recommended Capital Phasing over 10-Year Planning Horizon – Summary

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	10-Year Planning Horizon Total
$1,717,250	$5,177,250	$745,500	$2,160,000	$1,489,750	$4,935,000	$1,462,750	$255,250	$271,250	$285,000	$18,499,000

Appendix A

Business Case Evaluations

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BCE-1

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Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Replace OSHG System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$1,408,000.00	***CIB Years:***	
Date:	10/25/2017	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other: _________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the replacement of the OSHG system. The existing OSHG equipment was installed in 2000, resulting in parts being difficult to obtain. Plant staff is not satisfied with the suppliers' service of the equipment. Brine tanks are past their useful life, and overall operational improvements are needed to increase safety. Similar equipment installed at the Ship Creek WTP experienced a serious safety incident in 2009.

Define the Problem to be Solved:

The sodium hypochlorite generation system is difficult to service and maintain, and presents an immediate potential safety hazard. Sodium hypochlorite is critical for water treatment. Replacement with a newer, safer, more reliable system is recommended.

Description of Possible Solutions:

Proposed solution is to replace existing Sodium hypochlorite onsite generation system equipment and most accessory equipment including rectifiers, heat exchangers and brine tanks. Alternate solution is bulk delivery of Sodium hypochlorite.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***
Sodium hypochlorite is critical for water treatment, as it is used for water disinfection. The WTP is out of compliance and treated water poses a safety risk to customers if sodium hypochlorite is not available for water treatment. Onsite generation of sodium hypochlorite is preferred over bulk delivery because redundant equipment has greater reliability than dependency on bulk delivery. It is critical that equipment can be maintained and repaired without delay. There are safety concerns with the existing style of equipment. In addition to selecting a newer and safer model of equipment, additional safety features like venting to the outdoors should be added to this system.

Expected Benefits* of the Proposed Project:
Installing a new model of OSHG system will increase safety and reliability of the system. Updating to current equipment will result in more reliable servicing and maintenance of equipment. The existing model with horizontal cylinder hypochlorite generators resulted in a serious safety incident at the Ship Creek WTF in 2009; a model with vertical cylinder hypochlorite generators could prevent a similar incident occurring at the Eklutna WTF. In addition, adding outdoor venting of the system will increase safety in operations. Producing Sodium hypochlorite onsite has the added environmental benefit of reduced truck trips to deliver sodium hypochlorite to the facility.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Replacement of the OSHG system will have costs for planning, design, demolition, disposal, and replacement of equipment, associated piping, valves and instrumentation, and I&C system. Extended plant shutdown will not be required as the system can be replaced incrementally. Replacement with a newer and more reliable system is expected to result in reduced maintenance hours. Power, chemical consumption and replacement parts for the new system are expected to be comparable to the current system.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	3-200 ppd OSHG systems, 3 rectifiers, 3 Control Panels, 1 blower Control Panel, 1 master Control Panel, 6 blowers, 7 cartridge filters, 1 water softener, 2 heat exchangers, 1 acid cleaning system, 2 brine tanks and associated housekeeping pad, 1 feed pump and associated piping, valves and instrumentation.

Description of Assets to be Replaced (age, type/size of pipe etc.):	Existing assets to be replaced: ClorTec Sodium Hypochlorite Onsite Generation system, comprised of three units (installed in 2000) which generates 560 lb/day of 0.8% sodium hypochlorite, three associated PLCs, three rectifiers, two 3,000 gallon Polyethylene Brine Storage tanks (approx. 16 years old). The brine tank housekeeping pad is to be replaced when new tanks are installed. Equipment supporting the OSHG system will be replaced. This includes the existing water softener and blower, which were installed at the same time as the OSHG system. Associated piping, valves and instrumentation will be replaced.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	
Anticipated Year of BCE-2:					

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPLACE OSHG SYSTEM **PSID#:** CL1 **Plan Years:**

Project Score: 6.25

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☑ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available. **4**	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☑ **3.86** Low risk of a serious injury **4**	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☑ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality. **1**	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	3.86	**0.00**	**0.66**	**0.00**	**3.80**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Plant Primary Service Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$2,760,000.00	***CIB Years:***	
Date:	11/2/2017	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☒ Other: Power reliability/resiliency

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves integrating a plant primary service upgrade. This includes full replacement of the medium voltage (above 600 volt) equipment (switch cabinet, transformers, feeders) and 480 volt service feeder. It is preferable from a maintenance standpoint and more typical for the serving utility (Matanuska Electric Association, MEA) to own and maintain all of the medium voltage system. The only exception may be the 4.16 kV feeder from the step-up transformer to the ERS power equipment. Full replacement of the 480 volt service switchgear (SBD) is recommended. This project would provide increase power reliability and resiliency to the plant.

Define the Problem to be Solved:

Power is distributed throughout the facility from the main switchboard (SBD) at 480 volt, 3-phase to MCCs and panelboards. Full replacement of the 480 volt SBD is recommended.

Description of Possible Solutions:

No alternatives were identified or evaluated for the Plant Electrical Service Upgrade. Typical alternatives would include manufacturer make and model preferences that would be more thoroughly evaluated and determined during design. Full replacement of medium voltage equipment, 480 volt service feeder, 4.16 kV feeder from the step-up transformer to the ERS power equipment, and 480 volt service switchgear (SBD) is recommended.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***
Plant primary electrical service is original to plant construction in the mid-1980s. Replacing the primary service would coincide with other plant-wide electrical upgrades.

Expected Benefits* of the Proposed Project:
The benefits of implementing a plant primary service upgrade would be increased power reliability and resiliency.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs associated with implementing a plant primary service upgrade include engineering design, equipment procurement, construction and startup/integration.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Full replacement of medium voltage equipment, 480 volt service feeder, 4.16 kV feeder from the step-up transformer to the ERS power equipment, and 480 volt service switchgear (SBD).

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	
Anticipated Year of BCE-2:					

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: PLANT PRIMARY SERVICE UPGRADE **PSID#:** ELEC1 **Plan Years:**

Project Score: 5.64

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☑ 9.65 Medium risk of a serious injury **10**	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. **2**	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☑ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality. **1**	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☑ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☑ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. **1**	5 ☑ 1 Project does not enhance social equity. **1**
n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	9.65	**0.00**	**0.66**	**0.33**	**0.38**	**0.00**	**2.48**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Plant MCC Distribution Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$5,200,000.00	***CIB Years:***	
Date:	11/2/2017	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other: ________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the implementation of a Plant MCC Distribution Upgrade. The existing MCCs are all original from the mid-1980s construction and the equipment is vulnerable to prolonged outage due to age and lack of readily available replacement components. Additionally, since the plant SCADA upgrade in 2003, there is limited compatibility between the MCCs and SCADA. A programmatic upgrade of the existing MCCs to Intelligent MCCs would increase reliability of the system. It would also provide additional functionality, allowing for additional device parameters available for adjustment, status, monitoring, and trending through the Plant SCADA System. This would allow for more efficient plant operation and better predictive/preventative maintenance plantwide.

Define the Problem to be Solved:

Power is distributed throughout the facility from the main switchboard (SBD) at 480 volt 3-phase to MCCs and panelboards. In the main facility, the North and South electrical rooms house two MCCs each. The Lagoon Pump Station Building and the Waste Washwater Pump Station each and the Effluent Vault Building each house one MCC. The existing MCCs are all original from the mid-1980s construction, and the equipment is vulnerable to prolonged outage due to age and lack of readily available replacement components. Further, the facility-wide SCADA upgrade in 2003 provided for a non-standard, discrete, hardwired interface between the existing MCC controls and the PLC based SCADA system. As a result, the existing MCC equipment is not capable of communicating with SCADA using modern protocols and this results in less functionality and information available to the system. A programmatic upgrade of the existing MCCs to

Intelligent MCCs with individual starters, drives, and feeder circuit breakers interconnected using a fieldbus network (e.g., DeviceNet) and networked to the Plant SCADA System would provide additional functionality and device parameters available for adjustment, status, monitoring, and trending through the Plant SCADA System. Intelligent MCCs would allow additional data to be monitored, collected and trended enabling better proactive/predictive maintenance of starters and drives and mechanically driven process equipment as well as providing a better understanding of the nature of the motor starter and drive issues for operators and maintenance technicians.

Description of Possible Solutions:

No alternatives have been identified or evaluated for the MCC upgrade to Intelligent MCCs. Typical alternatives would include manufacturer make and model preferences that would be more thoroughly evaluated and determined during design. Replacement of MCCs with Intelligent MCCs is recommended.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Existing MCCs are original from mid-1980s construction, and are vulnerable to prolonged outage due to age and lack of readily available replacement components. Replacing the MCCs would increase reliability of the MCCs and result in more readily available replacement components. Replacing the existing MCCs with Intelligent MCCs is recommended whenever an existing MCC is replaced because it is approaching the end of its expected service life or requires significant modification because of plant process modifications. In particular for EWTF, since the SCADA upgrade in 2003, the existing MCCs have limited compatibility with the upgraded SCADA system. The existing MCC equipment is not capable of communicating with SCADA using modern protocols and this results in less functionality and information available to the system. Intelligent MCCs would allow additional data to be monitored, collected and trended enabling better proactive/predictive maintenance of starters and drives and mechanically driven process equipment as well as providing a better understanding of the nature of the motor starter and drive issues for operators and maintenance technicians.

Expected Benefits* of the Proposed Project:

Much of the cost of procuring, implementing and configuring the Intelligent MCCs would be offset by the simplified wiring required between the MCC starters, drives and power monitors and Plant SCADA System. All devices within Intelligent MCCs will communicate to the Plant SCADA System through a single network cable instead of multiple hard wires for each starter and drive, resulting in significantly reduced installation cost for conduit and wire. New, intelligent MCCs would have increased reliability and functionality allowing for improved monitoring and date collection plantwide.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs associated with upgrading the existing MCCs to Intelligent MCCs are engineering design, equipment procurement, construction, and plant integration/startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of existing MCCs with new, Intelligent MCCs.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	
Anticipated Year of BCE-2:					

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: PLANT MCC DISTRIBUTION UPGRADE **PSID#:** ELEC4 **Plan Years:**

Project Score: 5.64

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. **2**
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☑ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality. **1**	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☑ **0.965** Risk can affect quality of public service, employee stress **1**	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☑ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.97	**0.00**	**0.66**	**0.33**	**0.38**	**0.00**	**2.48**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Replace Fluoride System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$904,000.00	***CIB Years:***	
Date:	10/26/2017	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other: _________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the existing dry fluoride system with a new dry fluoride system. The original dry fluoride system was installed in 1988. Updated equipment would provide increased operator safety and higher fluoride feed accuracy. The new system would be coordinated with the new fluoride feed system at the Ship Creek WTF.

Define the Problem to be Solved:

Fluoride is required at the EWTF to provide a finished water concentration of 0.7 mg/l as recommended for drinking water by the U.S. Department of Health and Human Services. The existing system is almost 30 years old and system failure would result regulatory non-compliance. Greater bag handling safety to minimize dust exposure, and increased fluoride feeding accuracy are the goals of replacing the dry fluoride system.

Description of Possible Solutions:

Fluoride can be fed at WTFs in three forms; dry sodium fluorosilicate (current system), dry sodium fluoride, and liquid sodium hydrofluorosilicic acid. A dry system is desired for safety reasons. Chemical selection should be coordinated with Ship Creek.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*
The existing dry fluoride system has been in operation since 1988. The bag loading system requires the operator to manually open and dump 50-lb bags of fluoride into the hopper, resulting in exposure to fluoride dust. Additionally, the existing system does not provide accurate or precise dosing of fluoride to the finished water. The CDC limits fluoride dosing to no greater than 0.7 mg/l. Because there is an upper limit on fluoride dosing, high equipment accuracy is required. Greater equipment precision reduces the need for operators to check, adjust and tune the equipment.

Expected Benefits* of the Proposed Project:
Replacing the existing dry fluoride system with a new system would result significantly lower the likelihood of equipment failure which would result in finished water that is not in compliance with drinking water regulations. New equipment would increase fluoride feed precision and accuracy. Upgrading the bag loading system to a glove-box style system would result in reduced fluoride dust exposure to operators.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Implementation of the new dry fluoride system will have costs associated with planning, engineering design, demolition and disposal of old equipment, costs of new equipment and construction. This equipment does not have any redundancy, so increased planning during construction will be required. Replacement with a newer and more reliable system is expected to result in reduced maintenance hours and maintenance part replacement costs. Power and chemical consumption for the new system are expected to be comparable to the current system.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Glove-box style bag loader, dust collector, gravimetric dry feeder, slide gate, solution tank, solution tank mixer, associated I&C
Description of Assets to be Replaced (age, type/size of pipe etc.):	Bag loader, dust collector, gravimetric dry feeder, slide gate, solution tank, solution tank mixer, associated I&C

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	

Anticipated Year of BCE-2:	

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPLACE FLUORIDE SYSTEM **PSID#:** FL1 **Plan Years:**

Project Score: 6.77

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☑ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset. **3**	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☑ **3.86** Low risk of a serious injury **4**	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☑ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error. **2**	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. **2**
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☑ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☑ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	3.86	**0.00**	**3.30**	**0.00**	**1.52**	**0.00**	**2.48**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☑ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☑ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.32	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Boiler Replacement
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$552,000.00	***CIB Years:***	
Date:	10/26/2017	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other: ________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the two existing boilers that provide area heat and heat to the snowmelt system. The boilers were originally installed in 1987. Boilers have an expected life of approximately 25-30 years. These boilers are nearing the end of their useful life, and repairs have recently been necessary to repair burner controls. These boilers should be replaced with a new model prior to failure.

Define the Problem to be Solved:

The existing Cleaver Books Scotch marine fire-tube Boilers have a useful life of 30 years. The boilers provide space heating to the Eklutna WTF. The boilers have been regularly inspected and do not show signs of tube sheet leaks, which would require major repair or replacement on short notice. However, burner controls have recently needed repair.

Description of Possible Solutions:

The existing boilers can be run to failure, or continually inspected for tube sheet leaks. The boilers should be replaced with new Cleaver Books condensing boilers (Model CFC-E-700-2000-125hw) with new stacks, including seismic anchoring and startup services.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***
The existing boilers are nearing the end of their useful life. Planning for their replacement prior to failure will result in a smoother transition to the new equipment, without having to expedite planning, design, ordering and installation of new equipment. The existing boilers have not had major leakages, but equipment failures could start to occur at the age of the current boilers. Equipment leakages will result in major repairs that have to be expedited, resulting in some equipment downtime and higher costs for repairs.

Expected Benefits* of the Proposed Project:
Because the boilers are nearing 30 years old, replacing them before failure would result in a much smoother transition to the new equipment, without interruption in boiler service. Replacing the boilers before major mechanical issues or failure would avoid expedited design, ordering, shipping and installation. Newer model boilers will result in more reliable service in the long term, fewer maintenance issues and equipment with higher thermal efficiency. These boilers provide heat for area heating in some process areas in the main plant building, and also heat for the snowmelt system for the service entrance at the lower level.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Replacing the boilers would have costs associated with planning, engineering design, demolition and disposal of existing boilers, and replacement with new boilers, stacks, and associated I&C. Newer boilers would have significantly higher thermal efficiency than the existing boilers. Replacement using higher efficiency units would save energy costs over continuing to operate the existing boilers. Running the existing boilers to failure would result in the same costs, increased because the process would have to be expedited. Significant repair costs can be avoided if boilers are replaced prior to equipment failures.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Cleaver Books condensing boilers (Model CFC-E-700-2000-125hw) with new stacks, including seismic anchoring
Description of Assets to be Replaced (age, type/size of pipe etc.):	Cleaver Books Scotch marine fire-tube Boilers and existing stacks

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	

Anticipated Year of BCE-2:	

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: BOILER REPLACEMENT **PSID#:** HV1 **Plan Years:**

Project Score: 4.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☑ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems. 1	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☑ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. 1	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.76**	**0.00**	**1.24**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

Anchorage Water and Wastewater Utility	**BCE-1 Report** (for Projects over the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Plant-Wide Network Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$2,100,000.00	***CIB Years:***	
Date:	1/18/2018	***Prepared by:***	
Project Manager/Lead:		***Mgr. Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☒Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☐Other: ________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves consolidating the various SCADA and communications networks at the EWTF to provide a common backbone, and thus provide an integrated platform to facilitate all other plant-wide electrical improvements recommended in the facility plan (especially programmatic installation of intelligent MCCs.

Define the Problem to be Solved:

The existing network within the EWTF consists of a patch work of installed networks serving industrial control, administration and site security/public address IP applications and connected into a single undifferentiated network. Each network using numerous different communications protocols.

Description of Possible Solutions:

Alternatives have not been evaluated at this time

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

The existing system lacks the network security and efficiency of a network with virtual or physical separation between the application types. The most important being the industrial control network upgrade to meet modern standards of security for facilities with a critical mission requirement. It is recommended that a new plant-wide network be

provided with secure separation between the three distinct network types: industrial control, administration and camera/access/public address applications.

Expected Benefits* of the Proposed Project:
The network design that is currently being developed for other AWWU facilities would define this standard and would realize similar benefits to those realized at other AWWU facilities.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs primarily include engineering design, equipment procurement, construction, and plant integration/startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Full replacement of the plant-wide communications network is recommended at this time

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date:***	
Anticipated Year of BCE-2:					

(Attach supporting materials hereafter)

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: PLANTWIDE COMMUNICATIONS NETWORKS **PSID#:** NET1 **Plan Years:**

Project Score: 7.25

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
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n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	3.86	0.00	0.00	0.00	1.52	0.00	2.48	0.80	0.00	0.45	0.00	1.00	1.00

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BCE-0

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

BCE-0 Report
(for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Clean Exterior Wall Panels
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$7,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☐Risk Related (asset deterioration or consequence mitigation) ☒Other: Aesthetics, long term wear

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves cleaning exterior wall panels of the chalky patches that are visible around the perimeter of all the structures located on the main Eklutna facility campus. Cleaning these discolored patched would improve aesthetics and improve long term wear of the building exterior.

Define the Problem to be Solved & Project Scope/ Description:

The exterior wall panels of the building have irregular, chalky discoloration patches, of which the cause is unknown. These discoloration patches are very noticeable and distract from building aesthetics. It is recommended that all EWTF campus buildings' preformed insulated metal wall panels be cleaned per panel manufacturer recommendations.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Cleaning the discoloration patches from the buildings' exterior wall panels would improve building aesthetics and potentially extend the long term life of the exterior panels.

Expected Benefits* of the Proposed Project:

Panel cleaning would potentially extend the long term life of the exterior panels, as well as improving building aesthetics.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs of cleaning the discoloration from the exterior panels of the buildings include mostly labor and some cleaning supplies.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Clean Exterior Wall Panels **PSID#:** ARCH1 **Plan Years:** **Project Score:** 1.00

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
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	0.97	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. **1**	5 ☐ 1 Project does not enhance social equity.
n/a	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☑ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**1.00**	**0.00**

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Anchorage Water and Wastewater Utility	# BCE-0 Report **(for Projects under the BCE Threshold)**

Summary Information:			
Project Number:		***Project Name:***	Roof Replacements
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$110,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the existing roofs on the Wastewater Pump Station (WWPS), Effluent vault building and Lagoon pump station building. These roofs are showing significant deterioration and should be replaced to extend the long term life of the buildings.

Define the Problem to be Solved & Project Scope/ Description:

Three building have an inverted roof membrane assembly (IRMA) in which the roofing membrane is located below the layers of roofing insulation and concrete pavers. On the EWTF and ERS buildings, IRMA roof types were replaced with new EPDM roofs in the early 2000s and have performed well. The remaining IRMA roofs are showing extreme signs of deterioration, including moss, and tree sprouts which could further deteriorate the structures. The buildings with IRMA roofs should be provided with new EPDM roof assemblies similar to the rest of the EWTF to extend the life of these buildings. These are the WWPS (Area = 21 feet X 37 feet), Effluent vault building (Area = 9 feet X 27 feet) and the Lagoon pump station building (Area = 23 feet X 38 feet).

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The existing IRMA type roofs on the WWPS, Effluent vault and Lagoon pump station buildings are showing extreme signs of deterioration. They should be provided with new EPDM roof assemblies similar to the rest of the EWTF to extend the life of the buildings.

Expected Benefits* of the Proposed Project:
The new EPDM roof assemblies on other ETWF buildings are performing well since the early 2000s. Replacing the three remaining IRMA roofs with new EPDM roof assemblies would extend the long term life of these buildings and prevent further damage to the buildings caused by deterioration of the existing roofs.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs involved in replacing the roofs of the WWPS, Effluent Vault Building, and Lagoon Pump Station Building involve engineering design and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	New EPDM roofs on the following buildings: WWPS (Area = 21 feet X 37 feet), Effluent Vault Building (Area = 9 feet X 27 feet), and Lagoon Pump Station Building (Area = 23 feet X 38 feet).
Description of Assets to be Replaced (age, type/size of pipe etc.):	Existing IRMA type roofs on the WWPS, Effluent Vault and Lagoon Pump Station Buildings.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Roof Replacements **PSID#:** ARCH2 **Plan Years:**

Project Score: 2.62

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☑ **1.93** Low risk of minor injury **2**	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☑ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☐ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	1.93	**0.00**	**0.33**	**0.00**	**0.00**	**0.00**	**0.62**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Roof Access - Add Guardrails
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$21,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☒Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves bringing roof access points up to current codes to increase roof access safety. Current building codes do not allow roof access openings to be located within 10 feet of the roof edge without guard protection. By installing guardrails at all three roof access openings of the primary coagulant towers and the ERS building, roof access safety will be improved while meeting code compliance.

Define the Problem to be Solved & Project Scope/ Description:

If roof access openings are located within 10 feet of the roof edge, they must be protected with guardrails measuring 42 inches in height and extending not less than 30 inches beyond the edge of the access opening. There are roof access points as follows: the primary coagulant towers (north and south access points), and the ERS building. These access points are by interior ladder to roof access hatches, that are in the corner of the roof plane, within a foot of the roof parapet. The three existing roof access points do not have any existing guardrail protection, so code compliant guardrails should be installed. Guardrails should extend vertically 42 inches above roof level and extend beyond each side of the roof hatch opening not less than 30 inches.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The three current roof access points need guardrails to be brought up to building code compliance and increase roof access safety.

Expected Benefits* of the Proposed Project:
Installing guardrails around the existing three roof access points will increase roof access safety and bring the roof access points up to current building code compliance.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs of the new guardrails installed at the three roof access points include engineering design and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	New guardrails installed at the three roof access points, two at the primary coagulant towers and one at the ERS building. The guardrails should extend 42 inches above roof level and extend beyond each side of each roof hatch opening not less than 30 inches.
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Roof Access - Add Guardrails **PSID#:** ARCH3 **Plan Years:**

Project Score: 2.08

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☑ 9.65 Medium risk of a serious injury (10)	50 ☑ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations (8)	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☑ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. (1)	5 ☑ 1 Project does not enhance social equity. (1)
n/a	0 ☐ 0 Impacts do not apply.	0 ☐ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☐ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☑ 0 Project not examined in Strategic Plan or Utility-wide plan.
	9.65	7.95	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility		**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Door Hardware Improvements
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$83,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☒Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

The purpose of this project is to bring doors up to full functionality and current building codes by making necessary hardware replacements and upgrades. The EWTF facility has 62 doors that have listed fire ratings from 20-minute to 90-minute ratings per 1986 record drawings from original facility construction. Interior doors receive high use and have degraded over thirty years of operation. Inspection of the doors noted various deficiencies that should be corrected for worker safety and code compliance.

Define the Problem to be Solved & Project Scope/ Description:

Upgrades to existing doors consist of either full replacement, modifying door hardware, or providing/replacing smoke gasketing at rated doors. Eleven doors need full replacement including door, frame and hardware due to binding, rusting, inoperability and/or infiltration. Seven doors should receive door hardware replacement for proper operation. Four doors should have upgraded hardware with panic/fire exit hardware with proper smoke gasketing. Panic hardware is required on electrical room doors with equipment rated 1,200 amperes or more and over 6 feet wide that contains overcurrent devices, switching devices, or control devices. Six doors need new smoke gasketing. Twenty doors need removal of manual door stops to allow doors to function as rated openings. These doors are part of the rated corridor opening and are required to be automatic closing doors and not manually held open.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The EWTF is over 30 years old. Interior doors receive high use and are the elements that have seen the highest level of degradation compared to other architectural features. The doors have been inspected and have noted deficiencies. Door elements that are not

operating properly or not operating as a fire rated door should be repaired and/or replaced in order to maintain proper operation for worker safety.

Expected Benefits* of the Proposed Project:
Interior door hardware must be fully and easily operational, and should meet all current building codes, for worker safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of door hardware improvements include engineering design, hardware procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Complete replacement (door, frame, hardware) for 11 doors, replacement of just hardware for 7 doors, replacement of standard hardware with panic door hardware and smoke gasketing for 4 doors, replacement or new smoke gasketing for 6 doors.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Door Hardware Improvements **PSID#:** ARCH4 **Plan Years:**

Project Score: 2.00

	A	B	C	D
Weighting Factor	19.3%	15.9%	6.6%	6.6%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☑ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations **8**	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.
IV	10 ☑ **1.93** Low risk of minor injury **2**	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient
n/a	0 ☐ **0** Impacts do not apply.	0 ☐ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact
	1.93	**7.95**	**0.00**	**0.00**

	E	F	G	H
Weighting Factor	7.6%	4.4%	12.4%	1.6%
	Reliability Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**
I	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.
II	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.
III	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.
IV	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.
V	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.
	0.00	**0.00**	**0.00**	**0.00**

	I	J	K	L	M
Weighting Factor	16.7%	8.9%	0.0%	0.0%	0.0%
	Financial Benefit (5 year NPV) (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Replace Interior Finishes
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$14,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☐ Risk Related (asset deterioration or consequence mitigation) ☒ Other: Aesthetics

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement of interior finishes that are showing extreme wear, cracking, staining and peeling paint such as original carpeting, rubber base, acoustical ceiling tiles and gypsum board ceiling. These building elements have performed well over the years but are due for replacement to improve worker and visitor comfort and safety and improve facility aesthetics.

Define the Problem to be Solved & Project Scope/ Description:

Recommended interior finish replacements include replacement of all original carpet including rubber base with new, replacement of rubber base in rooms with vinyl flooring, replacement of damaged and stained acoustical ceiling tiles, and repair to damaged gypsum board ceiling in plans room.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Interior finishes have performed well over the years but are showing degradation, extreme wear, cracking and peeling paint. Maintaining the facility helps identify potential points of leakage, promotes worker and visitor safety and comfort, and enhances facility aesthetics.

Expected Benefits* of the Proposed Project:

Replacing extremely worn and failing items will improve worker and visitor safety and comfort and improve facility aesthetics.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of replacing noted interior finishes include design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace all remaining original carpet (including rubber base) with new; replace rubber base in rooms with existing vinyl flooring; replace damaged and stained acoustical ceiling tiles; repair damage to gypsum board ceiling in plans room.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Replace Interior Finishes **PSID#:** ARCH5 **Plan Years:**

Project Score: 1.00

	A	B	C	D
Weighting Factor	19.3%	15.9%	6.6%	6.6%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult
V	5 ☑ **0.965** Risk can affect quality of public service, employee stress **1**	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient
n/a	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact
	0.97	**0.00**	**0.00**	**0.00**

	E	F	G	H
Weighting Factor	7.6%	4.4%	12.4%	1.6%
	Reliability Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**
I	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.
II	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.
III	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.
IV	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.
V	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.
	0.00	**0.00**	**0.00**	**0.00**

	I	J	K	L	M
Weighting Factor	16.7%	8.9%	0.0%	0.0%	0.0%
	Financial Benefit (5 year NPV) (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☐ **1** Project does not enhance social equity.
n/a	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☑ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**1.00**	**0.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Filter Basin Guardrails / Ladders
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$90,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves modifying existing guardrails around filter basins to provide gate access to walkway between basins 2-3, 4-5, and 6-7 at both ends of the walkway and include ladders at each location.

Define the Problem to be Solved & Project Scope/ Description:

Existing guardrails currently located around the eight filter basins do not allow full perimeter maintenance access of each individual basin. Guardrails currently encompass the perimeter of basins 1, 2-3, 4-5, 6-7, and 8. Since the railings around the perimeter of basins 2-3, 4-5, and 6-7 are continuous with no gate between (Figure 2-8), AWWU staff is required to climb over the top of the railing onto a walkway between the basins while tied off to a safety cable that runs parallel above the walkway. To provide a safer and more-efficient means of filter basin access, the utility has requested that guardrails be added on both sides of the walkway between basins 2-3, 4-5, and 6-7 so each filter basin is encompassed with its own guardrail. In addition, to provide access to the bottom of each filter, aluminum ladders are to be provided on the west side of each filter basin. An existing gate is located on the west side of each basin guardrail, and aluminum ladders are to be located at each gate for access into the bottom of the basin (similar in style to the ladders that currently exist in the sedimentation basins) with bottom elevation slightly above the operating surface.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Currently, filter basin access requires tying off to a safety cable and climbing over a guardrail in order to access basin walkways. It is unknown when the safety tie-off cable was installed and if it has been properly tested.

Expected Benefits* of the Proposed Project:
Increased worker safety and more efficient means of accessing the filter basins.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs include engineering design, procurement of materials, and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Modify existing guardrails around filter basins to provide gate access to walkway between basins 2-3, 4-5, and 6-7 at both ends of the walkway and include ladders at each location
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Filter Basin Guardrails **PSID#:** ARCH6 **Plan Years:**

Project Score: 1.00

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☑ **0.965** Risk can affect quality of public service, employee stress **1**	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☐ **1** Project does not enhance social equity.
n/a	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☑ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.97	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**0.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Rated Wall Penetrations
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$14,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves providing protection of all interior wall penetrations in rated wall assemblies with approved firestop system. Various pipe penetrations installed over the years due to plant upgrades do not appear to be fire-stopped. It is recommended that all penetrations through rated wall assemblies be protected by an approved penetration firestop system installed and tested in accordance with the building code.

Define the Problem to be Solved & Project Scope/ Description:

Record drawings from facility construction in 1986 indicate various walls throughout the facility as being either one-hour occupancy separation walls, one-hour fire walls for separation of fire areas, or two-hour shaft enclosures. Rating integrity is to be maintained through penetrations of conduit or piping. Various upgrades have occurred over the years, which required wall penetrations that appear to have not been properly firestopped in accordance with building code. These wall penetrations should be protected by an approved penetration firestop system installed and tested in accordance with the building code.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Bringing all wall penetrations up to building code by installing approved penetration firestop systems would increase worker safety and comply with current building codes.

Expected Benefits* of the Proposed Project:
Installing code compliant firestop systems in all wall penetrations would increase worker safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of installing code compliant firestop systems includes engineering design, procurement of materials and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	New firestop systems for wall penetrations
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner Date: 3/13/2018

Project: Rated Wall Penetrations **PSID#:** ARCH7 **Plan Years:** **Project Score:** 1.08

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☑ 15.9 Compliance order or regulation that requires immediate action. 16	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☑ 3.86 Low risk of a serious injury 4	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☐ 0 Impacts do not apply.	0 ☐ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.
	3.86	15.90	0.00	0.00	0.00	0.00	0.00

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☑ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☐ 1 Project does not enhance social equity.
n/a	0 ☐ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☑ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.08	0.00	0.00	0.00	1.00	0.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Intake Structure Ladder Access
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$21,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves adding side extensions and slip-resistant ladder rung material to an access ladder that extends 16 feet to the bottom sump level of the vault. The ladder does not have adequate side extensions for personnel to grasp, and is in a humid environment which causes the rungs to be slippery. Adding these functional features to this ladder will increase worker safety and prevent injury.

Define the Problem to be Solved & Project Scope/ Description:

An access ladder to the bottom sump level of the vault shaft extends 16 feet to the bottom sump level. Access from the lower landing grating to the top rung of this ladder is not safe as the ladder does not have adequate side extensions for personnel to grasp while traversing between the landing and the ladder rungs. The vault bottom's environment is also higher in humidity, which causes the rungs to be slippery. This project provides ladder rail extensions on both sides of the existing ladder at the lower level of the vault shaft extending a minimum of 42 inches above the adjacent grating. Also, this project adds slip-resistant abrasive material on all rungs to increase foot traction.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Adding proper safety features to the ladder will increase worker safety and prevent injury.

Expected Benefits* of the Proposed Project:
Adding ladder rail extensions and slip-resistant abrasive material to ladder rungs will increase worker safety and bring the ladder into code compliance.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs of adding rail extensions to the existing ladder at the lower level of the vault shaft, as well as adding slip-resistant abrasive material on all rungs, include engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	New ladder rail extensions on both sides of existing ladder at lower level of the vault shaft, and new slip-resistant abrasive material on all rungs.
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Intake Structure Ladder Access **PSID#:** ARCH8 **Plan Years:**

Project Score: 2.08

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☑ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations **8**	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☑ **3.86** Low risk of a serious injury **4**	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☐ **0** Impacts do not apply.	0 ☐ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	3.86	**7.95**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☑ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☐ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☑ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.08	**0.00**	**0.00**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** **(for Projects under the BCE Threshold)**

Summary Information:			
Project Number:		***Project Name:***	Utilidor Repair
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$207,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

- [x] Master Plan
- [ ] O&M / Efficiency
- [ ] Regulatory
- [ ] Strategic Initiative or Strategic Plan Project
- [ ] Programmatic
- [ ] Capacity / Growth
- [ ] ADOT MOA Emergency Fund
- [x] Risk Related (asset deterioration or consequence mitigation)
- [ ] Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves repairing structural wear to the Eklutna WTF Utilidor. In May of 2016, a registered PE performed a visual inspection of the Utilidor and noted areas where structural repairs are needed. The asphalt over the utilidor is badly cracked, the underside of the concrete roof is wet in multiple locations, and the sealant at both ends of the utilidor is leaking. This project would provide repair and replace asphalt, seal cracks, replace sealant and provide drainage to mitigate concrete degradation of the Utilidor.

Define the Problem to be Solved & Project Scope/ Description:

The Utilidor from the Energy Recovery Station (ERS) to the Headworks has several areas needing structural repair. The Asphalt over the utilidor is cracked and needs replacement. The underside of the concrete roof is wet in multiple locations. The sealant at both ends of the utilidor is leaking. A registered PE provided the following recommendations in May of 2016: Seal cracks in utilidor lid and walls between the ERS and the Headworks. Repair the asphalt over the utilidor and provide drainage. Replace the sealant at each end of the utilidor.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This project would mitigate concrete degradation of the Utilidor between the ERS and the Headworks.

Expected Benefits* of the Proposed Project:
Mitigation of concrete degradation of the Utilidor between the ERS and the Headworks.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed structural repairs to the Utilidor between the ERS and Headworks includes engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Repair to Utilidor cracks

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: UTILIDOR REPAIR **PSID#:** STRUCT1 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. 1	5 ☑ **1** Project does not enhance social equity. 1
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Repair Headworks Tank Cracks
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$207,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves repairing Headworks tank cracks. In May of 2016, a registered PE performed a visual inspection of the Headworks tank and noted areas where structural repairs are needed. It was recommended to seal the cracks in the Headworks tank where there is leaking. The cracks are located near the doors on both sides of the west wall of the headworks. This repair would mitigate concrete degradation of the Headworks tank.

Define the Problem to be Solved & Project Scope/ Description:

A registered PE visually inspected the Headworks tank in May of 2016 and noted leaking cracks near the doors on both sides of the west wall of the headworks. Recommendation was made to seal these cracks to mitigate concrete degradation.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

This project would mitigate concrete degradation of the Headworks tank.

Expected Benefits* of the Proposed Project:

Mitigation of concrete degradation of the Headworks tank.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed structural repairs to the Headworks tank include engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Repair to Headworks Tank Cracks

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPAIR HEADWORKS TANK CRACKS **PSID#:** STRUCT2 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Floc/Sed Basin Floor Cracks
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$207,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves making structural repairs to the Eklutna WTF Flocculation/Sedimentation Basin. In May of 2016, a registered PE performed a visual inspection of the Floc/Sed basin and noted areas where structural repairs are needed. Noted areas needing repair were the cracks in the Eklutna Flocculation/Sedimentation Basin Floor slabs and sealant needing repair between the two halves of the structure in the sedimentation basin. These repairs are recommended to prevent premature rebar failure in the Floc/Sed Basin.

Define the Problem to be Solved & Project Scope/ Description:

The Floc/Sed Basin has cracks in the floor slabs that need to be repaired. The sealant between the two halves of the structure in the sedimentation basin also needs repair.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This project would mitigate premature rebar failure in the Flocculation/Sedimentation Basins.

Expected Benefits* of the Proposed Project:

Mitigation of premature rebar failure in the Flocculation/Sedimentation Basins.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed structural repairs to the Flocculation/Sedimentation Basins include engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Repair to Floc/Sed Basin Floor Cracks

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: FLOC SED BASIN FLOOR CRACKS **PSID#:** STRUCT3 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Service Gallery Wall Cracks
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$69,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves repairing structural cracks in the Eklutna WTF Service Gallery Wall. In May of 2016, a registered PE performed a visual inspection of the Service Gallery Wall and noted areas where structural repairs are needed. Cracks were noted in the wall. These cracks should be repaired to avoid premature rebar failure.

Define the Problem to be Solved & Project Scope/ Description:

The service gallery wall has cracks that should be repaired to prevent premature rebar failure.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

This project would mitigate premature rebar failure in the service gallery wall.

Expected Benefits* of the Proposed Project:

Mitigation of premature rebar failure in the service gallery wall.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed crack repairs in the service gallery wall includes engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: STRUCTURE GALLERY WALL CRACKS **PSID#:** STRUCT4 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**

	A	B	C	D	E
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**

	F	G	H	I
I	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the
II	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.
III	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.
IV	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.
V	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.
n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.
	0.00	**0.00**	**0.00**	**0.00**

	J	K	L	M
I	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.45	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Coat Chem Storage Rebar
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$3,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves coating exposed rebar in the chemical storage area. In May of 2016, a registered PE performed a visual inspection of the chemical storage area and noted areas of exposed rebar. This exposed rebar should be coated to avoid premature rebar failure.

Define the Problem to be Solved & Project Scope/ Description:

The exposed rebar in the chemical storage area should be coated to avoid premature rebar failure.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This project would mitigate premature rebar failure in the chemical storage area.

Expected Benefits* of the Proposed Project:

Mitigation of premature rebar failure in the chemical storage area.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed exposed rebar coating in the chemical storage area includes engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: SERVICE GALLERY WALL CRACKS **PSID#:** STRUCT5 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Repair Lobby Major Floor Crack
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$28,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

- [x] Master Plan
- [ ] O&M / Efficiency
- [ ] Regulatory
- [ ] Strategic Initiative or Strategic Plan Project
- [ ] Programmatic
- [ ] Capacity / Growth
- [ ] ADOT MOA Emergency Fund
- [x] Risk Related (asset deterioration or consequence mitigation)
- [ ] Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves repairing a structural crack in the Eklutna WTF Lobby floor. In May of 2016, a registered PE performed a visual inspection of the Lobby floor and noted major crack under the tile. This crack should be repaired to enhance worker and visitor safety.

Define the Problem to be Solved & Project Scope/ Description:

The major floor crack in the lobby should be repaired to enhance worker and visitor safety.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

A major floor crack presents a tripping hazard to workers and visitors and should be repaired.

Expected Benefits* of the Proposed Project:

Mitigation of tripping hazard in the lobby, which is an area of potentially high traffic in the plant.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed crack repair in the lobby floor includes engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Tile replacement in the lobby

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPAIR LOBBY MAJOR FLOOR CRACK **PSID#:** STRUCT6 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Effluent Vault Stair Repair
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$21,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (**asset deterioration** or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves making structural repairs to the Eklutna WTF Effluent Vault stairs. In May of 2016, a registered PE performed a visual inspection of the Effluent vault and noted areas where structural repairs are needed. Structural repairs will improve worker safety by clearing stair egress.

Define the Problem to be Solved & Project Scope/ Description:

In the Effluent Vault, the handrail base plates encroach on stair clear width and the stair stringer flanges are cut by water piping.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Repairs to the Effluent Vault stairs will clear stair egress and improve worker safety.

Expected Benefits* of the Proposed Project:

Improvement to worker safety by clearing stair egress.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs of completing needed structural repairs to the Effluent Vault stairs include engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Effluent Vault Stair Repair

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: EFFLUENT VAULT STAIR REPAIR **PSID#:** STRUCT7 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Remove Intake Str. Ca Buildup
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$55,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves removing calcium build-up from the base of the Eklutna WTF intake structure. In May of 2016, a registered PE performed a visual inspection of the intake structure and noted significant calcium buildup at the base, sump, and weeping through the walls. These calcium deposits should be removed to avoid potential future equipment disruption.

Define the Problem to be Solved & Project Scope/ Description:

The intake structure has calcium buildup at the base of the structure, filling up the sump and weeping through the walls. The calcium deposits should be removed to prevent potential future equipment disruption.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Removing the calcium deposits from the intake structure will prevent potential future equipment disruptions due to excess calcium deposit buildup.

Expected Benefits* of the Proposed Project:

Prevention of potential future equipment disruptions due to excess calcium deposit buildup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of completing needed calcium deposit buildup removal in the intake structure include planning and labor to remove deposits.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REMOVE INTAKE CA BUILDUP **PSID#:** STRUCT8 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Repair Perimeter Fence
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$10,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves repairing the perimeter fence around the facility. The entire perimeter fence was inspected on May 3, 2016 and found to be damaged in five locations due mostly to fallen trees. A total of approximately 120 feet of fence is in need of repair. Repairing the facility perimeter fence would increase the security of the EWTF.

Define the Problem to be Solved & Project Scope/ Description:

Approximately 120 feet of the perimeter fence around the EWTF is damaged due to fallen trees. These partially collapsed, damaged sections of fence should be replaced with new fence.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Having an intact perimeter fence around the facility is important for site security and safety.

Expected Benefits* of the Proposed Project:

Repairing damaged sections of the EWTF perimeter fence would increase site security and safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of repairing the EWTF perimeter fence include engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New / Existing / Both
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of approximately 120 feet of damaged perimeter fence

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPAIR PERIMETER FENCE **PSID#:** CIVIL4 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Repair Cracking, Heavy Asphalt
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$55,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

- [x] Master Plan
- [ ] O&M / Efficiency
- [ ] Regulatory
- [ ] Strategic Initiative or Strategic Plan Project
- [ ] Programmatic
- [ ] Capacity / Growth
- [ ] ADOT MOA Emergency Fund
- [x] Risk Related (asset deterioration or consequence mitigation)
- [ ] Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement of asphalt near the maintenance garage entrance and nearby parking stalls that is approximately 150 feet by 75 feet in area. This asphalt is cracked and partially heaved. The area presents a potential safety hazard to plant staff and visitors and the damaged asphalt should be replaced.

Define the Problem to be Solved & Project Scope/ Description:

The paved roads and parking areas were inspected on May 3, 2016. Generally, the paved roads and parking areas are in good condition except for an area near the maintenance garage entrance and nearby parking stalls. An area of asphalt that is approximately 150 feet by 75 feet was cracked and partially heaved and needs removal and replacement.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Areas of asphalt that are cracked and heaved in areas of car and foot traffic and parking should be replaced with new asphalt. Replacing the asphalt increases staff and visitor safety.

Expected Benefits* of the Proposed Project:

Replacing damaged, cracked and heaving asphalt in car/foot traffic and parking areas increases safety for staff and visitors.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs associated with replacing asphalt near the maintenance garage entrance and nearby parking stalls that is approximately 150 feet by 75 feet in area are engineering design, material procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of an area of asphalt approximately 150 feet by 75 feet

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPAIR CRACKING AND HEAVY ASPHALT **PSID#:** CIVIL5 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Repair Lagoon Road
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$21,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves removing failing asphalt and patching the remaining subgrade with leveling course (D-1) gravel for the existing lagoon road (approx. 2,000 LF)

Define the Problem to be Solved & Project Scope/ Description:

The asphalt covered single land roads (2,000 LF) that access and surround the lagoons is deteriorating and vegetation and brush is growing through the surface.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Continued use will result in further deterioration

Expected Benefits* of the Proposed Project:

Improved safety and access conditions long-term

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs are limited to demolition and new gravel installation.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Approximately 2,000LF of asphalt road serving the lagoons

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPAIR CRACKING AND HEAVY ASPHALT **PSID#:** CIVIL5 **Plan Years:**

Project Score: 2.45

	A	B	C	D
Weighting Factor	19.3%	15.9%	6.6%	6.6%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact
	0.00	**0.00**	**0.00**	**0.00**

	E	F	G	H
Weighting Factor	7.6%	4.4%	12.4%	1.6%
	Reliability Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**
I	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.
II	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.
III	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.
IV	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.
V	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.
	0.00	**0.00**	**0.00**	**0.00**

	I	J	K	L	M
Weighting Factor	16.7%	8.9%	0.0%	0.0%	0.0%
	Financial Benefit (5 year NPV) (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Intake Facility Service Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$483,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☒Other: Increased power reliability

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves upgrading electrical service to the intake facility, including full replacement of the power service and distribution equipment, and a new permanent standby generation system. Upgrading the electrical service to the intake facility would increase power reliability and resiliency to the intake facility.

Define the Problem to be Solved & Project Scope/ Description:

The intake structure has a manual generator connection and portable genset located adjacent to the building. A pad-mounted utility service from a Matanuska Electric Association (MEA) service transformer supplies the structure, stepping down the medium voltage to 240/120 volt, 1-phase at the facility. Replacement of all electrical service and distribution equipment, and addition of a new permanent standby generation system is recommended.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The intake facility's electrical service and distribution equipment are mostly original from the mid-1980s construction, and nearing the end of the manufacturer's useful life. Replacing the electrical power service and distribution equipment and adding a new permanent standby generation system would increase power reliability and resiliency to the intake facility.

Expected Benefits* of the Proposed Project:
The benefits of upgrading electrical service to the intake facility are increased power reliability and resiliency at the intake facility.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs of upgrading power to the intake facility include engineering design, equipment procurement, construction and startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Addition of a new permanent standby generation system
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of all electrical service and distribution equipment

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Intake Facility Service Upgrade **PSID#:** ELEC2 **Plan Years:**

Project Score: 9.91

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☑ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset. 7	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☑ 3.3 Intermittent service to customers; poor communications with customers 3	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☑ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error. 2	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. 2	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☑ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	6.60	3.30	1.52	0.00	2.48	0.16	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Portal Facility Service Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$345,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☒Other: Increased power reliability

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves upgrading electrical service to the portal facility, including full replacement of the power service and distribution equipment, and a new permanent standby generation system. Upgrading the electrical service to the intake facility would increase power reliability and resiliency to the intake facility.

Define the Problem to be Solved & Project Scope/ Description:

The portal building has a manual connection for a portable standby generator in addition to the utility service. The utility service from Matanuska Electric Association (MEA) consists of a pole mounted transformer stepping down the medium voltage to the 240/120 volt, 1-phase facility voltage. The 200 ampere rated meter and main service equipment appears to have been installed as a construction temporary on the utility service pole and never relocated to the building for the final installation. Replacement of all electrical service and distribution equipment, and addition of a new permanent standby generation system is recommended.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The portal facility's electrical service and distribution equipment are mostly original from the mid-1980s construction, and nearing the end of the manufacturer's useful life. Replacing the electrical power service and distribution equipment and adding a new permanent standby generation system would increase power reliability and resiliency to the portal facility.

Expected Benefits* of the Proposed Project:
The benefits of upgrading electrical service to the portal facility are increased power reliability and resiliency at the portal facility.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs of upgrading power to the portal facility include engineering design, equipment procurement, construction and startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Addition of a new permanent standby generation system
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of all electrical service and distribution equipment

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Portal Facility Service Upgrade **PSID#:** ELEC3 **Plan Years:**

Project Score: 8.05

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☑ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset. **7**	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure and the potential for interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☑ **3.3** Intermittent service to customers; poor communications with customers **3**	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☑ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error. **2**	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**6.60**	**3.30**	**1.52**	**0.00**	**0.62**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☑ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.16	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Plant Light Fixtures Upgrade
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$311,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☐Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement of existing interior and exterior lighting with LED fixtures for improved energy conservation and maintenance. Modern LED fixtures offer higher efficiency over the existing fixtures and provide 2-3 times increase in the operational lifetime of the equipment.

Define the Problem to be Solved & Project Scope/ Description:

The majority of the spaces within the main facility and outbuildings use linear fluorescent fixtures and appear to be mostly original from the mid-1980s construction. The fixtures use T12 40W lamps with magnetic ballasts, controlled by local switches at the entry/exits to the spaces. Lighting in the Flocculation Basins, Sedimentation Basins and Filtration areas use High Pressure Sodium (HPS) fixtures, controlled by lighting contactors and pushbutton stations located at common entry/exit points. The majority of the building mounted exterior lighting uses HPS type fixtures. The facility roadway and site lighting is provided by pole mounted HPS “cobra head” type fixtures with mast arms. All fixtures appear to be from the original mid-1980s construction and should be replaced with LED fixtures. Emergency lighting is not addressed by this project.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Modern LED replacements to linear fluorescents and HPS fixtures are commonly used in water treatment facilities today. This fixture type provides a higher efficiency than the existing and offers 2-3 times increase in the operational lifetime of the equipment.

Expected Benefits* of the Proposed Project:
Replacing the existing interior fluorescent and HPS type fixtures and exterior HPS type fixtures with modern LED lighting would provide higher energy efficiency and offer 2-3 times increase in the operational lifetime of the equipment.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs of replacing interior and exterior lighting fixtures with modern LED lighting are engineering design, equipment procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of all existing interior and exterior lighting fixtures (fluorescent and HPS) with new LED fixtures.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Plant Light Fixtures **PSID#:** ELEC5 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☑ **0.965** Risk can affect quality of public service, employee stress **1**	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.97	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Plant Fire Alarm System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$276,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or **consequence mitigation**) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement of the fire alarm system. The fire alarm system is original to the mid-1980s construction and is near the end of the manufacturer's recommended useful life. It is not compliant with current codes with regards to panel type, device spacing and functionality and should be replaced to enhance worker and visitor safety.

Define the Problem to be Solved & Project Scope/ Description:

The fire alarm system consists of a non-addressable control panel, and initiating and annunciating devices covering six zones throughout the main facility building. The control panel is manufactured by Kidde Systems and is near the end of the manufacturer's recommended useful life. The entire system should be replaced with a new, code-compliant system.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

The fire alarm system appears to be original from the mid-1980s construction and is near the end of the manufacturer's recommended useful life. It is not compliant with current codes with regards to panel type, device spacing and functionality. Replacement of the system would enhance worker and visitor safety.

Expected Benefits* of the Proposed Project:

Replacing the existing fire alarm system which is out of code and near the end of its useful life would enhance worker and visitor safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of replacing the fire alarm system include engineering design, equipment procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of the entire fire alarm system including the non-addressable control panel, and initiating and annunciating devices covering six zones throughout the main facility building. Depending on code requirements new equipment may be added in addition to the equipment replaced.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Plant Fire Alarm System **PSID#:** ELEC6 **Plan Years:**

Project Score: 3.69

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☑ 9.65 Medium risk of a serious injury 10	50 ☑ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations 8	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☑ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. 1
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.
	9.65	7.95	0.00	0.00	0.00	0.00	1.24

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Plant Public Address System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$138,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the plant public address/paging system. The system is original from the mid-1980s construction and facility staff have indicated that the system is not functioning properly and has been an ongoing maintenance issue. Replacement of the system is important for worker and visitor safety.

Define the Problem to be Solved & Project Scope/ Description:

The plant public address/paging system headend components are manufactured by Valcom and appear to be original from the mid-1980s construction. The system consists of a connection to the telephone system, page control unit, power supply(s) and paging speakers located throughout the facility. Replacement of the entire system is recommended.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The plant public address/paging system is near the end of the manufacturer's recommended useful life. The facility staff have indicated that the system is not functioning properly and has been an ongoing maintenance issue.

Expected Benefits* of the Proposed Project:

Replacing the plant public address/paging system would improve worker and visitor safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs associated with replacing the plant public address/paging system are engineering design, equipment procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace plant public address/paging system headend components, connection to the telephone system, page control unit, power supply(s) and paging speakers located throughout the facility.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner | Date: 3/13/2018

Project: Plant Public Address System | **PSID#:** ELEC7 | **Plan Years:** | **Project Score:** 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Uninterruptable Power Upgrades
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$345,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☐ Risk Related (asset deterioration or consequence mitigation) ☒ Other: Monitoring, maint., reliability

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the implementation of uninterruptible power supply (UPS) upgrades. AWWU staff have reported that small portable UPSs serving several vendor control panels have been unreliable in power outages. Replacing the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs is recommended. The upgrades would provide improved monitoring, maintenance and reliability.

Define the Problem to be Solved & Project Scope/ Description:

There are several distributed uninterrupted power supply (UPS) units throughout the facility. After power outages, there have been instances of UPSs not charged for carrying through the outage. Some units have been replaced in the main building, but other areas/buildings are still served by distributed stand-alone UPSs. Based on AWWU staff experience with unreliability and lack of status monitoring capability of the small portable plug-in (consumer off the shelf) style UPSs serving critical loads such as vendor controls, a "stationary type" (e.g., Liebert UPS presently installed in the Administration Building), should be installed in each remote building and hard-wired UPS circuits be wired to the existing UPS loads. The "stationary UPSs" would be installed in the electrical room serving each building, where space and clearance requirements allow. Replacing the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs is recommended.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Several standalone UPS units throughout the facility do not have central monitoring capability and there have been instances of these UPSs not charged for carrying through outages. Larger industrial/commercial type stationary UPSs are more reliable and

provide the ability for remote monitoring than the existing stand-alone plug-in consumer type UPSs. Providing control panels with UPS power from a more reliable source with improve operator ability to focus on water process by reducing the potential for need to address problems with UPSs when process equipment is needed during a power outage.

Expected Benefits* of the Proposed Project:
Replacing the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs would improve operator ability to focus on water process by reducing the potential for need to address problems with UPSs when process equipment is needed during a power outage.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs associated with replacing the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs are engineering design, procurement of equipment, construction and startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of the existing stand-alone plug-in consumer type UPSs serving control panels with one or more larger stationary industrial/commercial type UPSs

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project:	Uninterruptible Power Supply Upgrades	PSID#: ELEC9	Plan Years:	Project Score: 10.67

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☑ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. **8**	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☑ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.33**	**0.00**	**7.60**	**0.00**	**0.62**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Uninterruptable Power Upgrades
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$110,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☒Other: Monitoring, maint., reliability

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

The facility roadway and site lighting is provided by pole mounted HPS "cobra head" type fixtures with mast arms.

Define the Problem to be Solved & Project Scope/ Description:

The majority of building mounted exterior lighting uses HPS type fixtures. All fixtures appear to be from the original mid-1980s construction.
Modern LED replacements to linear fluorescents and HPS fixtures are commonly used in treatment facilities today.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This fixture type provides a higher efficiency than the existing and offers a significant (2-3 times) increase in the operational lifetime of the equipment.

Expected Benefits* of the Proposed Project:

Higher efficiency

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs associated with this upgrade are engineering design, procurement of equipment, construction and startup.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Exterior lighting fixtures and cabinets

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: EXTERIOR LIGHTING **PSID#:** ELEC10 **Plan Years:**

Project Score: 2.83

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☑ **9.65** Medium risk of a serious injury **10**	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	9.65	**0.00**	**0.00**	**0.00**	**0.38**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Duct Furnace Fan and Heater Replacement
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$83,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

Define the Problem to be Solved & Project Scope/ Description:

In particular, gas fired equipment using air heat exchangers such as unit heaters and duct furnaces are susceptible to cracking of the heat exchangers, leading to flue gasses entering the occupied spaces. AWWU has replaced unit heaters in the floc/sed basin area recently, but a number of gas-fired heater are still original. Three gas-fired unit heaters in the ERS should be replaced, as they are original to the plant construction. Additionally, hydronic unit heaters in the truck bay have been problematic with issues occurring with controls and motors

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Replace duct furnaces 1-AHU-1 and 1-AHU-2 with similar units and replace three gas fired unit heaters in the ERS upper and lower levels. Also replace two hydronic unit heaters and associated controls in the truck bay

Expected Benefits* of the Proposed Project:

Replacing the two duct furnace fans before failure would prevent the introduction of flue gases into the plant. Additional benefits for other heater replacements are improved energy efficiency.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs associated with this upgrade include engineering design, fan procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of two flue duct fans for 1-AHU-1 and 1-AHU-2 with the same style units; replacement of three gas fired unit heaters in the ERS upper and lower levels; replacement of two hydronic unit heaters and associated controls in the truck bay.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: CT FURNACE FAN AND HEATERS REPLACEME **PSID#:** HV2 **Plan Years:**

Project Score: 4.07

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☑ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. **1**
V	5 ☑ **0.965** Risk can affect quality of public service, employee stress **1**	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.97	**0.00**	**0.00**	**0.00**	**0.38**	**0.00**	**1.24**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Loading Area Snowmelt System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$35,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement the snowmelt system at the lower level at the entries to the disinfection chemical area, creating a safety hazard for personnel delivering disinfection chemicals. Replacement of the system would restore the failed system and the safety aspect that such a system provides. Extension of the area covered by the system from the base of the stairs to the upper level to the westernmost overhead door would also reduce the potential for both personnel slip and fall incidents and the possibility of a vehicle sliding into and damaging the building.

Define the Problem to be Solved & Project Scope/ Description:

Replace the snowmelt system along the south edge of the lower level of the treatment building, extending it from the base of the exterior stairs to the upper level to just west of the westernmost overhead door. Snowmelt area to extend 8’-6” south of the building for a length of approximately 93 feet for a total area of approximately 790 square feet. Remove the existing pavement, install insulation, PEX tubing, and replace the pavement with concrete. Install a new heat exchanger to heat glycol solution using heating water from the boiler system and new duplex pumps to circulate the glycol solution through the under slab tubing. Provide a snow sensor near the southern edge of the slab and controls for the system to maintain a snow-free area ratio of at least 50% at all times.

Justification for the Project *(include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Replacing and expanding the failed snowmelt system enhances worker safety, possibly preventing slip and fall incidents and reducing the possibility of a vehicle sliding into and damaging the building.

Expected Benefits* of the Proposed Project:
Increasing personnel safety, reducing likelihood of slip and fall incidents and reducing the likelihood of a vehicle sliding into the building are the benefits of replacing and expanding the failed snowmelt system.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs associated with replacing the snowmelt system include engineering design, procurement of materials and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Expansion of the existing snowmelt system by 93 additional square feet of total new area. Install a new snow sensor.
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace approximately 697 square feet of existing snowmelt system including pavement, insulation, PEX tubing, and replacement of pavement with new concrete. Replace heat exchanger and new duplex pumps to circulate glycol.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPLACE SNOWMELT SYSTEM **PSID#:** HV3 **Plan Years:**

Project Score: 11.29

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☑ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. **8**	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☑ **9.65** Medium risk of a serious injury **10**	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☑ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. **1**	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	9.65	**0.00**	**0.00**	**0.00**	**7.60**	**0.00**	**1.24**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Domestic Water System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$110,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

N/A

Define the Problem to be Solved & Project Scope/ Description:

Domestic water, utility water and domestic hot water systems are in need of replacement due to corrosion. The extent of the work required is in the lower level chemical feed and process area (south of Grid H), lower level mechanical room, upper level process area (south of Grid H) and the operations area. ROM estimates of pipe sizes and lengths are as follows: 4-inch – 500 linear feet, 3-inch – 70 LF, 2-1/2-inch – 65 LF, 2-inch – 240 LF, 1-1/2-inch and smaller – 675 LF. Piping runs in process and mechanical areas are generally overhead exposed, and in the operations area, are generally above dropped ceiling and in piping chases

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Water systems, particularly hot water, domestic water and utility water have been attacked by the aggressive water, causing numerous leaks. Patches and pipe sections have been replaced, but leaks are still occurring. The domestic hot water in the admin/operating area has been replace with PEX piping.

Expected Benefits* of the Proposed Project:

Water piping systems are deteriorated and should be replaced with piping materials resistant to corrosion. The existing piping systems are constructed of a combination of copper, galvanized steel and some recently installed PEX piping. Corrosion resistant piping materials are available, such as Aquatherm's PPR (polypropylene random) piping system, which is available in the sizes used in the plant. It is a rigid piping system suitable for both cold and hot water systems and is also available with a faser composite layer to resist thermal expansion and flexibility normally seen with other plastic piping material. PPR is joined using a heat fusion joint that produces leak-free joints.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs associated with replacing the domestic water system with non-corrosive polypropylene plastic piping include engineering design, procurement of materials and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Expansion of the existing snowmelt system by 93 additional square feet of total new area. Install a new snow sensor.
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace approximately 697 square feet of existing snowmelt system including pavement, insulation, PEX tubing, and replacement of pavement with new concrete. Replace heat exchanger and new duplex pumps to circulate glycol.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner | Date: 3/13/2018

Project: REPLACE DOMESTIC WATER SYSTEM | **PSID#:** HV5 | **Plan Years:** | **Project Score:** 11.29

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☑ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. **8**	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☑ **9.65** Medium risk of a serious injury **10**	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☑ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. **1**
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	9.65	**0.00**	**0.00**	**0.00**	**7.60**	**0.00**	**1.24**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Modify Bulk Salt Loading System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$48,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

The purpose of this project is to modify the bulk salt loading system into the storage hopper for the onsite sodium hypochlorite system. The current system requires operations staff to situate a heavy bag over the system opening, which is strenuous, awkward and presents a potential falling hazard through the opening. Addition of a bag loading system would increase worker safety by guarding the opening and assisting with the bag handling. Depending on the system selected, there would be potential savings in O&M hours.

Define the Problem to be Solved & Project Scope/ Description:

There are multiple options for improving the ease and safety of unloading heavy bulk salt bags into the bulk salt loading system. The best choice depends on the actual clearance in the area of the bulk salt loading. Acrison has a supersack bag loader for lifting and dumping 1-ton salt supersacks. The supersack bag loader would require approximately 18' of clearance from the floor. Floor-mounted and wall-mounted jib cranes of varying capacities are available as well. The most viable choice could be determined when capacity and clearance requirements are determined.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

There are safety concerns associated with the existing salt loading system, which is strenuous, awkward and presents a potential falling hazard through the opening. A new bulk salt loading system would protect the opening and provide assistance with heavy bag lifting.

Expected Benefits* of the Proposed Project:
Improving the bulk salt loading system by adding a bag loader or a jib crane would improve worker safety, prevent injury and potentially reduce O&M hours if a supersack loading system could be installed.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs of implementing a new bulk salt loading system into the storage hopper of the onsite sodium hypochlorite generation system include engineering design, equipment procurement and construction.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	One new bulk bag loader or jib crane over the bulk salt loading opening.
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: MODIFY BULK LOADING SYSTEM **PSID#:** CL2 **Plan Years:**

Project Score: 2.61

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☑ **9.65** Medium risk of a serious injury **10**	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☑ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	9.65	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☑ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.16	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	CW Influent and Effluent Valve
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$177,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project
☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund
☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves actuator modifications for the two 66-inch diameter clearwell inlet valves and the two 54-inch diameter clearwell outlet valves. The valves show corrosion, although they have substantive remaining service life. These valves are critical to plant operation and maintenance. Making improvements to the long valve actuator shafts would reduce likelihood of failure and further increase service life of the valves.

Define the Problem to be Solved & Project Scope/ Description:

The valves should be inspected to determine the extent of corrosion, and the viability of replacing the actuators with above grade actuators without a lengthy shutdown should be determined. Modifications to the two 66-inch diameter clearwell inlet valves and the two 54-inch diameter clearwell outlet valves include replacing the valve stems, mounting the valve stems in torque tubes, replacing the actuator/gear reducers and locating the actuator/gear reducers at grade above the clearwell.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This project would increase plant reliability by mitigating corrosion damage to the clearwell influent and effluent valves. Operation of the clearwell influent and effluent valves is vital to plant operation and maintenance. Making improvements to the long valve actuator shafts and relocating the gear boxes would reduce likelihood of failure and further increase service life of the valves.

Expected Benefits* of the Proposed Project:
This project would result in increased reliability of the clearwell influent and effluent valves, and prevention of valve stem failure. Failure of these valves could result in interrupted water supply.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The cost of implementing the actuator modifications to the clearwell influent and effluent valves includes engineering design, procurement and construction costs of valve modifications.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Addition of four torque tubes to four valve stems
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of four valve stems and four valve gear boxes

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: FLUENT AND EFFLUENT VALVE ACTUATOR M **PSID#:** CW1 **Plan Years:**

Project Score: 3.07

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. 1	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☐ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	CW 12-inch Drain Valves
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$139,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves valve and actuator replacements and modifications for the clearwell 12-inch butterfly drain valves. These valves and actuator components show significant corrosion and wear. These valves are critical to plant operation and maintenance, and failure could result in interruption to water supply.

Define the Problem to be Solved & Project Scope/ Description:

The clearwell drain valves have gear reducer boxes under water and have significant stem corrosion and torque damage. Valves, stems and gear boxes should be replaced. Gear boxes should be relocated at grade above the clearwell so that they are not submerged in water, increasing accessibility and decreasing future corrosion. Valve stems should be mounted in torque tubes to increase reliability and life of the valve stems and actuators.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

This project would increase plant reliability by mitigating corrosion damage to the clearwell drain valves. Operation of the clearwell drain valves is vital to plant operation and maintenance. Making improvements to the long valve actuator shafts and relocating the gear boxes would increase valve operability, reduce likelihood of failure and further increase service life of the valves.

Expected Benefits* of the Proposed Project:
This project would result in increased operability and reliability of the clearwell drain valves, and decreased likelihood of valve stem failure. Failure of these valves could result in interrupted water supply.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs of clearwell drain valve work include engineering design, procurement, and installation costs of new valves, valve stems and gear boxes.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New / Existing / Both
New Assets to be Created:	Addition of valve stem torque tubes for Clearwell butterfly valves
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replacement of two 12-inch butterfly valves, and valve stems, and actuator/gear boxes for two 12-inch butterfly valves.

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: Clearwell Drain Valves **PSID#:** CW2 **Plan Years:**

Project Score: 3.07

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints mostly in-house work items are handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. 1	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Relocate CW Hypo Inject Points
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$9,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☐ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☒ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves relocation of the sodium hypochlorite injection points in the clearwell away from valves and appurtenances. Injection points are currently located near the clearwell drain valves which is contributing to valve corrosion. New injection points would be selected to mitigate future corrosion of the valves and metal components of the clearwell.

Define the Problem to be Solved & Project Scope/ Description:

The sodium hypochlorite injection points in the clearwell are currently located adjacent to the clearwell drain valves, causing corrosion to these valves and their appurtenances. The sodium hypochlorite injection points should be located away from these valves and any other metal components in the clearwell.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Relocation of the sodium hypochlorite injection points in the clearwell away from any valves and appurtenances will mitigate future corrosion damage and increase reliability of clearwell operation.

Expected Benefits* of the Proposed Project:

Relocating the sodium hypochlorite injection points in the clearwell would mitigate future corrosion of the clearwell drain valves. The new injection points would be located to maximize dispersion of the chemical while mitigating corrosion of valves and metal components in the clearwell.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs of relocating the sodium hypochlorite injection points in the clearwell include engineering design including selection of new location of feed points to provide adequate dispersion of the chemical while mitigating corrosion of valves metals in the clearwell, and construction activities of relocating the feed points. Future savings would be realized in mitigating future corrosion of valves in the clearwell.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	New piping to relocate sodium hypochlorite injection points

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: earwell Hypochlorite Injection Point Modificatio **PSID#:** CW3 **Plan Years:** **Project Score:** 3.07

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. 1	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.62**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	CW Relief Rupture Disks
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$32,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the clearwell vacuum relief rupture disks, obtaining spare disks, and cleaning the vent tubes. The clearwell vacuum relief rupture disks are 30 years old and should be replaced to maintain reliability of the clearwell.

Define the Problem to be Solved & Project Scope/ Description:

The existing clearwell vacuum rupture disks are 30 years old and should be replaced. Three rupture disks should be fabricated; one for testing (to confirm the rupture pressure), one to be installed, and one to be stored by AWWU on site as a spare. A CCTV inspection of the vent tubes should be coordinated during replacement.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The existing clearwell vacuum rupture disks are 30 years old and should be replaced. The valves protect the clearwell structure from experiencing excess vacuum which could lead to structural damage. Damage to the clearwell would cause interruption to the water supply.

Expected Benefits* of the Proposed Project:

Replacing the clearwell vacuum rupture disks is important in maintaining the reliability of clearwell operation.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
The costs of replacing the clearwell vacuum relief rupture disks, obtaining spare disks and cleaning the vent tubes include engineering design, procurement, and construction activities.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	The existing 30 year old clearwell vacuum relief rupture disks will be replaced with three clearwell vacuum relief rupture disks (test, duty, spare)

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: \ND EFFLUENT VACUUM RELIEF AND VENT TU **PSID#:** CW5 **Plan Years:**

Project Score: 3.07

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.62**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Clearwell Access & Security
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$17,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This upgrade involves unsecured penetrations to the clearwell that houses finished water prior to entering the distribution system and being routed to AWWU customers.

Define the Problem to be Solved & Project Scope/ Description:

There are multiple locations where actuators and/or gearboxes are located on/in the clearwell (i.e. with direct access to finished water prior to entering AWWU's distribution system). The current configuration generally includes an unsecured aluminum plate/box and a swing plate, which function admirably for the safety of AWWU staff in terms of eliminating potential access/tripping hazards; however, they result in a series of unsecured access points that should be eliminated

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Improved security and protection of the public welfare.

Expected Benefits* of the Proposed Project:

Improved security and protection of the public welfare

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
An allowance to supply the requisite hardware of $12,000 (construction cost component) is included as a recommended capital expenditure, derived from an allowance of $2k per location for a total of six locations. Additional costs include minimal design, services during construction, and soft costs to implement the project as a capital upgrade.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	For the locations associated with the EWTF clearwell, a manual means of securing these access points, such as a hard key/lock arrangement is most appropriate

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: RWELL AND EFFLUENT VACUUM ACCESS/SEC **PSID#:** CW6 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☑ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset. 7	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☑ 9.65 Medium risk of a serious injury 10	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	9.65	0.00	6.60	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Replace Five Motorized Actuators
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$140,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:_________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the replacement of two turbine generator feed needle valve AUMA motorized actuators along with similar electric motor actuators for two isolation valves and one operating sleeve valve (bypass). The existing motorized actuators were installed in 1988 and are not reliable without consistent manual operation. The actuators are not compatible with the existing plant control system and SCADA. The plant utilizes Rotork electrical motorized operators throughout the plant. Replacing these actuators with Rotork actuators would increase plant reliability.

Define the Problem to be Solved & Project Scope/ Description:

Replace five electric motorized actuators with new Rotork motorized actuators.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

New actuators would increase plant reliability, provide actuators consistent with others throughout the plant that are compatible with the plant control/SCADA system, and reduce operations and maintenance time.

Expected Benefits* of the Proposed Project:

New actuators would increase plant reliability due to unknown generator problems that might be caused by improper operation of the valves.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
This project has costs associated with the planning, design and installation of the new Rotork electric actuators, purchasing of the actuators, and related electrical and I&C work. New actuators are expected to result in reduced operations time currently used to manually operate the actuators. Maintenance cost savings is estimated at $22,500/year. The anticipated payback period of replacing the actuators is 6 years. The actuators serving the needle valves can be programmed prior to installation, and the generator bypass can be used during installation, to minimize impact to plant operations.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Five electric motorized actuators that were originally installed in 1988 (replace with Rotork)

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPLACE FIVE MOTORIZED ACTUATORS **PSID#:** ER1 **Plan Years:**

Project Score: 12.12

	A	B	C	D	E
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☑ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. 8
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.
	0.00	0.00	0.00	0.00	7.60

	F	G	H	I
Weighting Factor	4.4%	12.4%	1.6%	16.7%
	Coordination with Outside Entities Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)
I	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the
II	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.
III	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.
IV	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☑ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. 1	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.
V	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☑ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost. 1
n/a	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.
	0.00	1.24	0.00	0.84

	J	K	L	M
Weighting Factor	8.9%	0.0%	0.0%	0.0%
	Strategic Importance	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and low-free/low-cost recreation.
III	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV> $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and low-free/low-cost recreation.
IV	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** **(for Projects under the BCE Threshold)**

Summary Information:			
Project Number:		***Project Name:***	Replace ERS Control Panel
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$600,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:________________

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involved replacing the existing ERS control panel with a new control panel (UL listed) and integrating the new control panel with the plant SCADA system. The existing ERS control panel is over 30 years old with an anticipated life of approximately 40 years. Replacing the panel before the end of its useful life would increase functionality and reduce expected replacement costs that would be incurred if it were replaced after failure.

Define the Problem to be Solved & Project Scope/ Description:

The ERS control panel is nearing the end of its useful life. The interface between the existing ERS Generator control panel and the plant SCADA system is not functional. The generator cannot be remotely started or adjusted. The generator is brought online manually. The procedure for bringing the generator online is not sufficiently straightforward to allow all operators to execute the operation. The control panel should be replaced before it reaches the point of failure.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Installing a new ERS control panel before an unexpected failure would avoid incurred increase in electrical energy costs due to the ERS being out of service, and increased costs of an expedited effort to design/procure/install the new panel if the existing panel failed.

Expected Benefits* of the Proposed Project:
Expected benefits of replacing the existing ERS control panel include improved reliability, ability to remotely operate the generator including setting the generator flow setpoint, installation of a modern operation interface touch control panel, integration with plant SCADA, and faster synchronization with an electronic governor and Allen-Bradley PLC.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Replacing the existing ERS control panel with a new panel has costs associated with the engineering, procurement, delivery, installation, integration and testing of a new control panel. There are also some increased electrical energy costs when the ERS is out of service. Savings would be realized from completing this project before the existing control panel fails. Additional savings in maintenance and labor costs of $36,000/year are also expected. The expected payback period of replacing the ERS control panel is 17 years when the cost of purchasing power during installation and start-up ($20k per month for approximately 4 months) is included in the lifecycle cost. The generator bypass can be used during installation to minimize impact to plant operations.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace existing ERS Control Panel with New ERS Control Panel (UL listed per AWWU requirements)

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REAPLCE ERS CONTROL PANEL **PSID#:** ER2 **Plan Years:**

Project Score: 11.29

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☑ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. **8**	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☑ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. **1**	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**7.60**	**0.00**	**1.24**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Filtered Effluent Turbidimeters
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$150,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the replacement of eight (8) filtered water turbidimeters.

Define the Problem to be Solved & Project Scope/ Description:

The reliability of each of eight (8) filtered water turbidimeters has been degrading in recent years. To arrive at a uniform and consistent measure of filtered water turbidity, it is recommended that a plant-wide turbidimeter replacement be undertaken. This would include replacement of the instruments as well as system integration work to re-map inputs/outputs to the SCADA system accordingly

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Increased reliability in water quality being produced at the EWTF ad serving AWWU customers

Expected Benefits* of the Proposed Project:

Increased reliability in water quality being produced at the EWTF ad serving AWWU customers

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs include engineering, procurement and installation, including electrical work. No direct operational savings are anticipated.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Eight new filtered water turbidimeters
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: REPLACE EIGHT TURBIDIMETERS **PSID#:** FLT3 **Plan Years:**

Project Score: 10.67

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 [ ] 19.3 High expectation of a serious injury, or life-threatening potential.	100 [ ] 15.9 Compliance order or regulation that requires immediate action.	100 [ ] 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 [ ] 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 [x] 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available. **8**	100 [ ] 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 [ ] 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 [ ] 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 [ ] 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 [ ] 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 [ ] 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 [ ] 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 [ ] 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 [ ] 9.65 Medium risk of a serious injury	50 [ ] 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 [ ] 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 [ ] 3.3 Intermittent service to customers; poor communications with customers	50 [ ] 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 [ ] 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 [ ] 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 [ ] 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 [ ] 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 [ ] 4.45 High priority for AWWU Board and endorsed by the MOA.	50 [ ] 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 [ ] 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 [ ] 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 [ ] 3.86 Low risk of a serious injury	20 [ ] 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 [ ] 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 [ ] 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 [ ] 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 [ ] 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 [ ] 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 [ ] 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 [ ] 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 [ ] 1.78 High priority for AWWU Board.	20 [ ] 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 [ ] 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 [ ] 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 [ ] 1.93 Low risk of minor injury	10 [ ] 1.59 Potential regulation anticipated in next 5-10 years.	10 [ ] 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 [ ] 0.66 Workarounds replace technological innovations making work flow difficult	10 [ ] 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 [ ] 0.44 The project may be needed. An outside entity has a like-project.	10 [ ] 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 [ ] 0.16 Project will eliminate an outmoded practice.	10 [ ] 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 [ ] 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 [ ] 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 [ ] 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 [ ] 1 Project will eliminate an outmoded practice.
V	5 [x] 0.965 Risk can affect quality of public service, employee stress **1**	5 [x] 0.795 Potential regulation anticipated in >10 years. **1**	5 [ ] 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 [ ] 0.33 Little impact on customer; mostly in-house work items are inefficient	5 [ ] 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 [ ] 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 [x] 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**	5 [ ] 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 [ ] 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 [x] 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 [ ] 1 No benefit or Cost to Alaskans can be demonstrated	5 [x] 1 Project does not enhance Ecological Performance. **1**	5 [x] 1 Project does not enhance social equity. **1**
n/a	0 [ ] 0 Impacts do not apply.	0 [ ] 0 Impacts do not apply	0 [x] 0 Impacts do not apply.	0 [x] 0 No impact	0 [ ] 0 Impacts do not apply.	0 [x] 0 Impacts do not apply.	0 [x] 0 Impacts do not apply.	0 [x] 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 [x] 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 [ ] 0 Project not named in Strategic Plan or Utility-wide plan.	0 [x] 0 A Net Cost to Alaskans can be demonstrated.	0 [ ] 0 Project harms ecological performance	0 [ ] 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.97	0.80	0.00	0.00	7.60	0.00	0.62	0.00	0.00	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Emergency Eyewash
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$212,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing approximately six "temporary" emergency eye wash stations with permanent, code compliant installations. Eye wash stations should be replaced with plumbed equipment to meet ANSI Z358 and OSHA requirements. The water source must have tepid water for a minimum of 15 minutes, which requires a moderately heated water system.

Define the Problem to be Solved & Project Scope/ Description:

The plant has approximately six emergency eyewash stations that are temporary in nature as they are not permanently plumbed and not code compliant. This project replaces the temporary eyewash stations with permanently plumbed eyewash stations that meet ANSI Z358 and OSHA requirements and provide tepid water for a minimum of 15 minutes. There are various methods for providing tepid water, but one of the more cost-effective systems uses a hot water heater set for a moderate temperature.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The plant must provide safe and code compliant emergency eyewash/shower stations throughout the facility in areas where chemical handling is regularly performed as well as likely places where maintenance on the chemical systems will likely be performed.

Expected Benefits* of the Proposed Project:

Replacing temporary emergency eye wash stations with permanent, code complaint installations will increase operator safety at the plant.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs associated with installing about six new, permanent emergency eye wash/shower stations include engineering design, equipment procurement and construction. Costs are based roughly on unit pricing obtained for a recent AWWU project (Asplund) for similar equipment.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Approximately six new emergency eye wash/shower stations
Description of Assets to be Replaced (age, type/size of pipe etc.):	About six existing temporary eye wash stations

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: INSTALL EMERGENCY EYEWASH SHOWERS **PSID#:** GC2 **Plan Years:**

Project Score: 2.83

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☑ **15.9** Compliance order or regulation that requires immediate action. **16**	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☑ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**15.90**	**0.00**	**0.00**	**0.38**	**0.00**	**0.00**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** **(for Projects under the BCE Threshold)**

Summary Information:

Project Number:		***Project Name:***	Remove Powder Activated Carbon System
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$34,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☐Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the removal of an abandoned chemical system in a trafficked area of the EWTF.

Define the Problem to be Solved & Project Scope/ Description:

Abandoned equipment causes potential access hazards and impedes operators' movement.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Increased mobility of operations staff

Expected Benefits* of the Proposed Project:

Increased mobility of operations staff

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs are exclusively associated with equipment demolition

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: EMOVE POWDER ACTIVATED CARBON SYSTE **PSID#:** PAC1 **Plan Years:**

Project Score: 2.00

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☐ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☑ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Replace PACl Pumps
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$129,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☐Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the replacement of two existing polyaluminum chloride (PACl) pumps with three new PACl pumps. The existing two pumps have had problematic operation and have had to be sent back to the supplier multiple times for maintenance. The additional of a third pump would add redundancy and reliability as a backup pump.

Define the Problem to be Solved & Project Scope/ Description:

The operation of the existing two Blue White peristaltic PACl pumps has been problematic, with a difficult interface and multiple pump failures requiring the pumps to be sent to the manufacturer for maintenance. Improved PACl pump operation is needed, with improvements in the interface, ease of operation and calibration.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Coagulation is a vital process for water treatment, so a reliable PACl metering pump system is required. Maintenance of pump operation has been challenging and improvements are needed for reliability.

Expected Benefits* of the Proposed Project:

Improved reliability of the PACl metering system, ease of operation, O&M labor cost savings. The existing Watson Marlow metering pumps used at the plant for metering sodium hypochlorite have proven to be reliable and easy to operate.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Replacing two PACl metering pumps with three new PACl metering pumps would have costs associated with engineering design, pump procurement, construction and startup, and associated electrical and I&C work. Expected O&M savings of $7,000/year results in an approximate payback period of 18 years.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Addition of a third PACl metering pump
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace two existing Blue White PACl peristaltic metering pumps with new PACL metering pumps (prefer Watson Marlow)

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: **REPLACE PACL PUMPS** PSID#: **PACL2** Plan Years:

Project Score: 3.28

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☑ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost. 1	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☐ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.84**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** **(for Projects under the BCE Threshold)**

Summary Information:			
Project Number:		***Project Name:***	Add PACl Tank
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$68,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒ Master Plan ☒ O&M / Efficiency ☐ Regulatory ☐ Strategic Initiative or Strategic Plan Project

☐ Programmatic ☐ Capacity / Growth ☐ ADOT MOA Emergency Fund

☐ Risk Related (asset deterioration or consequence mitigation) ☐ Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the addition polyaluminum chloride (PACl) storage tank volume. PACl cannot be delivered in bulk in this region, so 270 gallon totes are delivered at 15 totes per shipment. With small existing storage tanks, AWWU operations staff must frequently transfer tote material into the tanks. Approximately 3,000 gallons of added PACl storage from a larger tank (or tanks) would provide additional flexibility for tote transfer and result in more efficient use of staff time.

Define the Problem to be Solved & Project Scope/ Description:

Plant staff currently have to make frequent trips to transfer PACl totes into small 650 gallon storage tanks. Adding 3,000 gallons of PACl storage by adding one 3,000 gallon tank or three 1,000 gallon tanks would result in more efficient use of staff time by reducing the frequency of these tote transfer trips.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Adding PACl storage would save O&M hours by reducing the frequency of PACl tote transfer into storage tanks, and increasing flexibility for tote transfer.

Expected Benefits* of the Proposed Project:

Increased flexibility for plant staff, savings of O&M hours.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
The costs associated with add one or more PACl storage tanks are engineering design, procurement of tank or tanks and construction. $9,000 in expected annual labor hours savings results in an expected payback period of 8 years.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	3,000 gallons of PACl storage; either one 3,000 gallon tank or three 1,000 gallon tanks
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		Approval (Yes/No):		Date	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: ADD BULK PCL STORAGE TANK **PSID#:** PACL2 **Plan Years:**

Project Score: 3.28

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	Environment & Regulation Consequence of failure	Critical Assets Consequence of failure	Customer Needs Consequence of failure	Reliability Consequence of failure	Coordination with Outside Entities Consequence of failure	Maintenance Requirements Consequence of failure	Excellence thru Innovation	Financial Benefit (5 year NPV) (CBA Required)	Strategic Importance	External NPV (50 Year NPV)	Ecological Performance	Social Equity
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☐ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☐ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☑ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost. 1	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.45	0.00	1.00	1.00

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	CW Influent and Effluent Valve
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$164,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project

☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund

☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing two of the three lagoon decant pumps, used to convey decant water to the head of the plant. These two pumps are approximately 30 years old and are not functioning well, requiring parts and labor to keep them operational. Failure of the pumps would reduce the plant's treatment capacity.

Define the Problem to be Solved & Project Scope/ Description:

Replace the two vertical turbine lagoon decant pumps that are 30 years old with new vertical turbine pumps of the same capacity (maintain the newer third pump). The pumps can be replaced one at a time allowing two duty pumps to remain functional.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

Two of the three lagoon decant pumps are 30 years old, and have required parts and labor to keep them operational. Failure of these pumps could affect plant treatment capacity.

Expected Benefits* of the Proposed Project:

Maintain plant production, increase reliability of pumps, reduce time spent maintaining pumps to keep them operational, reduction in spare parts replacement requirements.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Replacing the two lagoon decant pumps would have costs associated with engineering design, pump procurement, construction and startup. Projected savings from replacing the two pumps are $10,000 annually on parts replacement and $9,000 per year in labor, resulting in a payback period of 9 years.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace two existing 30 year old vertical turbine lagoon decant return pumps with two new pumps

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: PLACEMENT OF TWO LAGOON DECANT PUM **PSID#:** RM1 **Plan Years:**

Project Score: 7.44

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☑ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth **1**	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☑ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error. **2**	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. **2**
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☐ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**1.32**	**0.00**	**1.52**	**0.00**	**2.48**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☑ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☑ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☑ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☑ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost. **1**	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.16	**0.84**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	WWW Flow Sensor Switch
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$30,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves installing a new flow switch in existing lagoon piping to prevent backup of waste washwater in the piping. AWWU identified the possibility of a backup of waste washwater through sludge piping into the sedimentation basins if the waste washwater pipe to the lagoons becomes plugged. This has not historically occurred, but has been identified as a possible occurrence and would have substantial negative impact.

Define the Problem to be Solved & Project Scope/ Description:

Installation of a thermal dispersion type low flow switch (FSL) in existing lagoon piping, with programming of the instrument done by AWWU.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

AWWU identified that if sludge were to plug the existing lagoon piping, backwash water would backup into the sedimentation basins, having substantial negative impact. This FSL would alarm and terminate backwash if a backwash was occurring and no flow was sensed in the pipeline. Installing a FSL in the line is the most straightforward and cost effective solution to this potential issue, with little impact to the facility or production.

Expected Benefits* of the Proposed Project:
This project proactively prevents backup of waste washwater into the sedimentation basins.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Installing a FSL in the lagoon piping has costs associated with engineering design, instrument procurement, and construction. AWWU would provide programming for the FSL, for cost savings.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	New thermal dispersion type low flow switch
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: TALLATION OF FLOW METER SWTICH IN WW F **PSID#:** RM2 **Plan Years:**

Project Score: 2.45

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 **19.3** High expectation of a serious injury, or life-threatening potential.	100 **15.9** Compliance order or regulation that requires immediate action.	100 **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 **9.65** Medium risk of a serious injury	50 **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 **3.3** Intermittent service to customers; poor communications with customers	50 **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 **4.45** High priority for AWWU Board and endorsed by the MOA.	50 **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 **3.86** Low risk of a serious injury	20 **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 **1.78** High priority for AWWU Board.	20 **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 **1.93** Low risk of minor injury	10 **1.59** Potential regulation anticipated in next 5-10 years.	10 **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 **0.66** Workarounds replace technological innovations making work flow difficult	10 **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 **0.44** The project may be needed. An outside entity has a like-project.	10 **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.	10 **0.16** Project will eliminate an outmoded practice.	10 **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 **1** Project will eliminate an outmoded practice.
V	5 **0.965** Risk can affect quality of public service, employee stress	5 **0.795** Potential regulation anticipated in >10 years.	5 **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 **0.33** Little impact on customer; mostly in-house work items are inefficient	5 **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 (checked) **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 **1** No benefit or Cost to Alaskans can be demonstrated	5 (checked) **1** Project does not enhance Ecological Performance. **1**	5 (checked) **1** Project does not enhance social equity. **1**
n/a	0 (checked) **0** Impacts do not apply. **####**	0 (checked) **0** Impacts do not apply	0 (checked) **0** Impacts do not apply.	0 (checked) **0** No impact	0 (checked) **0** Impacts do not apply.	0 (checked) **0** Impacts do not apply.	0 (checked) **0** Impacts do not apply.	0 (checked) **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 (checked) **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 **0** Project not named in Strategic Plan or Utility-wide plan.	0 (checked) **0** A Net Cost to Alaskans can be demonstrated.	0 **0** Project harms ecological performance	0 **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	BCE-0 Report (for Projects under the BCE Threshold)

Summary Information:			
Project Number:		***Project Name:***	Replace PRV on Flash Mix
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$30,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacing the Pressure Reducing Valve on the feed water pipeline of the high-pressure flash mix system. This valve is nearing the end of its useful life and has had reliability issues. Because of the critical nature of the coagulant mixing system this valve should be replaced prior to complete failure.

Define the Problem to be Solved & Project Scope/ Description:

Replace the Pressure Reducing Valve on the feed water pipeline of the high-pressure flash mix system with a new pressure reducing valve. The existing valve is nearing the end of its useful life, and should be replaced prior to failure. Several different valve manufacturers manufacture a valve appropriate for this application. A new valve should be procured and installed prior to failure of the existing valve.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Failure of this PRV valve could impact water quality and production that might arise from a failed coagulant feed mixer. This valve is nearing the end of its useful life and has started to have operations issues.

Expected Benefits* of the Proposed Project:

The benefit of replacing the PRV is to increase reliability in plant operations.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Replacing the PRV on the water feed line of the high-pressure flash mix system has costs associated with design, valve selection, procurement, installation and startup. A very brief plant shutdown to install the new PRV is required. Installing a new valve prior to failure of the existing valve would also result in cost savings due to the expedited procurement and installation of the valve that would be required if it were replaced after and sudden failure. Expected maintenance savings include $3,000/year in annual parts/maintenance and $2,000 of labor per year. The expected payback period for replacing the valve is 6 years.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace one existing high-pressure water feed line Pressure Reducing Valve on raw water flash mix system with new PRV

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: FLASH MIX FEED WATER PRV REPLACEMENT **PSID#:** RW3 **Plan Years:**

Project Score: 4.52

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ 19.3 High expectation of a serious injury, or life-threatening potential.	100 ☐ 15.9 Compliance order or regulation that requires immediate action.	100 ☐ 6.6 Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ 6.6 Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ 7.6 Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ 4.4 Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ 12.4 High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ 1.6 Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ 16.7 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ 8.9 Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ 1 Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ 9.65 Medium risk of a serious injury	50 ☐ 7.95 Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ 3.3 Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ 3.3 Intermittent service to customers; poor communications with customers	50 ☐ 3.8 Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ 2.2 There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ 6.2 High risk of system failure and the potential for interruption of service, damage to property or equipment.	50 ☐ 0.8 Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ 8.35 Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ 4.45 High priority for AWWU Board and endorsed by the MOA.	50 ☐ 1 Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ 1 Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ 1 Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ 3.86 Low risk of a serious injury	20 ☐ 3.18 Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ 1.32 Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ 1.32 Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ 1.52 Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ 0.88 There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ 2.48 Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ 0.32 Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ 3.34 Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ 1.78 High priority for AWWU Board.	20 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ 1 Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ 1 Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ 1.93 Low risk of minor injury	10 ☐ 1.59 Potential regulation anticipated in next 5-10 years.	10 ☑ 0.66 Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality. 1	10 ☐ 0.66 Workarounds replace technological innovations making work flow difficult	10 ☐ 0.76 System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ 0.44 The project may be needed. An outside entity has a like-project.	10 ☑ 1.24 System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. 1	10 ☐ 0.16 Project will eliminate an outmoded practice.	10 ☐ 1.67 Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ 0.89 Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ 1 Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ 1 Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ 1 Project will eliminate an outmoded practice.
V	5 ☐ 0.965 Risk can affect quality of public service, employee stress	5 ☐ 0.795 Potential regulation anticipated in >10 years.	5 ☐ 0.33 Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ 0.33 Little impact on customer; mostly in-house work items are inefficient	5 ☐ 0.38 System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ 0.22 Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ 0.62 Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ 0.08 Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☑ 0.835 Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost. 1	5 ☑ 0.45 Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ 1 No benefit or Cost to Alaskans can be demonstrated	5 ☑ 1 Project does not enhance Ecological Performance. 1	5 ☑ 1 Project does not enhance social equity. 1
n/a	0 ☑ 0 Impacts do not apply. ####	0 ☑ 0 Impacts do not apply	0 ☑ 0 Impacts do not apply.	0 ☑ 0 No impact	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Impacts do not apply.	0 ☑ 0 Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ 0 No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ 0 Project not named in Strategic Plan or Utility-wide plan.	0 ☑ 0 A Net Cost to Alaskans can be demonstrated.	0 ☐ 0 Project harms ecological performance	0 ☐ 0 Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.66**	**0.00**	**0.00**	**0.00**	**1.24**	**0.00**	**0.84**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** **(for Projects under the BCE Threshold)**

Summary Information:

Project Number:		***Project Name:***	Replacement of Wear Plates
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$18,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

In an evaluation of the sedimentation basins conducted by AWWU between March 2014 and April 2014, the north sedimentation basin's lower wear shoe and a portion of the lower stationary guide rail were found to be in poor condition needing replacement "within the year." The evaluation concluded that other assets were in fair to excellent condition.

Define the Problem to be Solved & Project Scope/ Description:

A field inspection conducted during this Facility Planning effort identified only a limited run of the lower stationary guide rail for the North basin that requires refurbishment as opposed to replacing the entire lower stationary guide plate – it was found to be in a recessed condition when compared to analogous hardware along the rest of the basin length. It was further determined that construction of a artificially raised section of guiderail could be accomplished with minimal disruption (i.e. downtime) by use of a "puddle weld" technique.

Justification for the Project ***(include Levels of Service affected, alignment with Strategic Plans, & associated risks):***

It is recommended that the 20-foot section of guide rail that was found to be recessed below grade be refurbished with a strap and puddle weld to artificially raise the existing infrastructure to be even with analogous hardware in the balance of the basin. This type of construction will not require concrete demolition as originally thought.

Expected Benefits* of the Proposed Project:

Increased life of equipment

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Costs* of the Proposed Project:
Costs are primarily associated with field welding to raise recessed sections of the lower stationary guide rail. There are no expected savings or reduction in O&M other than prevention of sudden failure which could result in increased costs of equipment replacement due to having it done in an expedited manner.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: VEAR PLATES AND GUIDE RAIL REPLACEMEN **PSID#:** SED1 **Plan Years:**

Project Score: 4.40

	A	B	C	D	E	F	G	H	I	J	K	L	M
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure	**Excellence thru Innovation**	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☑ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life. **1**	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☑ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.00**	**0.33**	**0.38**	**0.00**	**1.24**	**0.00**	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Replacement of Sed Basin Drives
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$117,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☐O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves replacement of four longitudinal and two cross collector sedimentation basin chain drives. These units are nearing the end of their useful life and are starting to show wear. Failure of the drives would cause short term impact to production. The drives are currently functional, but will likely need replacement in the near future, and they are vital to the sludge process.

Define the Problem to be Solved & Project Scope/ Description:

Four longitudinal and two cross collector sedimentation basin chain drives are nearing the end of their useful life and starting to show wear. These drives should be replaced in-kind.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

The four longitudinal and two cross collector chain drives are critical to the sludge process and failure would result in short term impact to production and need for immediate replacement. The drives are nearing the end of their useful life and will likely need replacement in the near future, as they are starting to show wear.

Expected Benefits* of the Proposed Project:

Replacing the four longitudinal and two cross collector chain drives in the sedimentation basins prior to equipment failure ensures continued reliability in system operation.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs associated with replacing the four longitudinal and two cross collector chain drives are engineering, procurement and installation of the drives. The drives should be replaced in kind, so minimal design is required. Installation of the drives requires short term shutdown. The drives are accessible from the top deck of the sedimentation basins. There are no expected operations and maintenance savings other than prevention of an unexpected basin shutdown due to equipment failure.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	N/A
Description of Assets to be Replaced (age, type/size of pipe etc.):	Replace four longitudinal and two cross collector sedimentation basin chain drives with new, in-kind drives

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: COLLECTOR DRIVE REPLACEMENTS **PSID#:** SED2 **Plan Years:**

Project Score: 5.31

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☑ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth **1**	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☑ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area. **2**
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☐ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☐ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer.
n/a	0 ☑ **0** Impacts do not apply. ####	0 ☑ **0** Impacts do not apply	0 ☐ **0** Impacts do not apply.	0 ☑ **0** No impact	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.
	0.00	**0.00**	**1.32**	**0.00**	**0.38**	**0.00**	**2.48**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☑ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance in **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☑ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Anchorage Water and Wastewater Utility	**BCE-0 Report** (for Projects under the BCE Threshold)

Summary Information:

Project Number:		***Project Name:***	Sed Basin Drain Valve Actuators
Utility:	Water	***Project Location:***	Eklutna WTF
Department:		***Division:***	
Estimated Total Cost:	$80,000.00	***CIB Years:***	
Project Manager/Lead:		***Phone#:***	

Project Origin:

☒Master Plan ☒O&M / Efficiency ☐Regulatory ☐Strategic Initiative or Strategic Plan Project
☐Programmatic ☐Capacity / Growth ☐ ADOT MOA Emergency Fund
☒Risk Related (asset deterioration or consequence mitigation) ☐Other:

Detailed Information:

Public Use Description (will be used in Public Facing Applications such as CIP mapping Info):

This project involves the addition of motorized actuators to the three valves used to drain the Sedimentation Basins. Manual operation of these 10-inch valves is a two-person job within a valve pit and presents a potential risk of injury. Installing motorized valves would increase operator safety and reduce operator hours required for valve operation.

Define the Problem to be Solved & Project Scope/ Description:

Add motorized actuators to the three sedimentation basin drain valves, and local push button stations for open and close operation. Review area for possible flooding in valve pits where electrical equipment would be installed. Addition of motorized actuators may require removal of the valves which would need to be coordinated with any planned basin down time.

***Justification for the Project** (include Levels of Service affected, alignment with Strategic Plans, & associated risks):*

Adding electric actuators to the three sedimentation basin drain valves reduces risk of operator injury. Manual operation of these 10-inch valves is a two-person job within a valve pit. Operation to apply adequate torque to the manual operator is awkward and presents a potential risk of injury.

Expected Benefits* of the Proposed Project:

Adding electric actuators to the sedimentation drain valves would increase operator safety.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs <u>if available</u>

Costs* of the Proposed Project:
Costs of adding Rotork motorized actuators to three sedimentation basin drain valves include engineering, procurement of valves and push button stations, and installation of valves, including electrical work. Operations of Labor savings of $4,300/year are expected, for a payback period of 19 years. Additionally, savings could be realized from preventing injury due to the two-person operation of the existing manual handwheels using a wrench inside a valve pit.

* Include Triple Bottom Line (TBL) elements of Capital, Social, and Environmental benefits/costs if available

Customers Served by Improvement:	New and Existing
New Assets to be Created:	Three new electric valve actuators and push button stations.
Description of Assets to be Replaced (age, type/size of pipe etc.):	N/A

For Manager Use Only:					
Manager:		***Approval (Yes/No):***		***Date***	

AWWU Capital Project Prioritization

Prepared By: L. Miner

Date: 3/13/2018

Project: ______ PSID#: ______ Plan Years: ______

Project Score: 3.78

	A	B	C	D	E	F	G
Weighting Factor	19.3%	15.9%	6.6%	6.6%	7.6%	4.4%	12.4%
	Safety & Security Consequence of failure	**Environment & Regulation** Consequence of failure	**Critical Assets** Consequence of failure	**Customer Needs** Consequence of failure	**Reliability** Consequence of failure	**Coordination with Outside Entities** Consequence of failure	**Maintenance Requirements** Consequence of failure
I	100 ☐ **19.3** High expectation of a serious injury, or life-threatening potential.	100 ☐ **15.9** Compliance order or regulation that requires immediate action.	100 ☐ **6.6** Major deficiency affecting a large population of end-users. There is no possibility of a work-around without asset.	100 ☐ **6.6** Complete disruption of services; Inaccurate billing; customer communication to Utility completely inoperable	100 ☐ **7.6** Current system (equipment) is not reliable, exhibits problems on a daily basis and no immediate fix (correction) is available.	100 ☐ **4.4** Window of opportunity for project is limited to project timeline being driven by an outside entity and there is immediate demonstrated need. Intangible benefits can be realized by coordinating schedules to coincide and	100 ☐ **12.4** High risk of major system failure that would cause interruption of service, or damage to property or equipment.
II	50 ☐ **9.65** Medium risk of a serious injury	50 ☐ **7.95** Regulation that requires compliance in near future 1-5 years OR Anticipated regulation with major implications for AWWU Operations	50 ☐ **3.3** Major deficiency affecting a small population of end-users. There is no possibility of a work-around without asset.	50 ☐ **3.3** Intermittent service to customers; poor communications with customers	50 ☐ **3.8** Current system (configuration) is complex which leads to human errors, or is aging and exhibits problems on a weekly basis and no immediate correction is available.	50 ☐ **2.2** There is an immediate and demonstrated need for the project and an outside entity has a like-project. Another opportunity is improbable.	50 ☐ **6.2** High risk of system failure and the potential for interruption of service, or damage to property or equipment.
III	20 ☐ **3.86** Low risk of a serious injury	20 ☐ **3.18** Anticipated regulation (regulation in the current legislative/regulator process)	20 ☐ **1.32** Major deficiency with possibility of affecting a large population of end-users. Work-around possible with heavy burden on Utility resources. Asset is at or exceeds service capacity and does not allow for growth	20 ☐ **1.32** Service is adequate, but could use improvements. Complaints handled but in less than efficient manner.	20 ☐ **1.52** Current system exhibits problems on a monthly basis - a work around is available but is difficult to learn and is prone to human error.	20 ☐ **0.88** There is a demonstrated long-term need for the project and an outside entity has a like-project. Intangible benefits can be realized by coordinating schedules to coincide.	20 ☐ **2.48** Risk of subsystem failure and the potential for interruption of service, damage to property or equipment in a limited area.
IV	10 ☐ **1.93** Low risk of minor injury	10 ☐ **1.59** Potential regulation anticipated in next 5-10 years.	10 ☐ **0.66** Moderate deficiency affecting a population of end-users where work-around is possible, however it is inconvenient and limits functionality.	10 ☐ **0.66** Workarounds replace technological innovations making work flow difficult	10 ☐ **0.76** System produces reliable results, technology is old and difficult or expensive to maintain. A system failure would result in undetected problems.	10 ☐ **0.44** The project may be needed. An outside entity has a like-project.	10 ☐ **1.24** System or subsystem is not supported by a vendor and it is reaching the end of its predicted useful life.
V	5 ☐ **0.965** Risk can affect quality of public service, employee stress	5 ☐ **0.795** Potential regulation anticipated in >10 years.	5 ☐ **0.33** Minor deficiency affecting a population of end-users. Annoying, however, no significant adverse impact. A long-term work-around is possible.	5 ☑ **0.33** Little impact on customer; mostly in-house work items are inefficient	5 ☑ **0.38** System technology is aging, support and/or parts are not readily available; infrequent failures are possible.	5 ☐ **0.22** Though we have not determined need, an outside entity has a like-project and has invited us to take advantage of their efforts.	5 ☑ **0.62** Risk of subsystem failure and the potential for interruption of service to one customer, or damage to property or equipment of one customer. **1**
n/a	0 ☑ **0** Impacts do not apply. **####**	0 ☑ **0** Impacts do not apply	0 ☑ **0** Impacts do not apply.	0 ☐ **0** No impact	0 ☐ **0** Impacts do not apply.	0 ☑ **0** Impacts do not apply.	0 ☐ **0** Impacts do not apply.
	0.00	**0.00**	**0.00**	**0.33**	**0.38**	**0.00**	**0.62**

	H	I	J	K	L	M
Weighting Factor	1.6%	16.7%	8.9%	0.0%	0.0%	0.0%
	Excellence thru Innovation	**Financial Benefit (5 year NPV)** (CBA Required)	**Strategic Importance**	**External NPV (50 Year NPV)**	**Ecological Performance**	**Social Equity**
I	100 ☐ **1.6** Provides opportunity to employ state-of-the-art technology with benefits proven through application elsewhere.	100 ☐ **16.7** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $1,000,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost > $1,000,00 in higher costs over the	100 ☐ **8.9** Specifically identified as an Achievement in current AWWU Strategic Plan, or high priority element of Utility-wide plan.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV>$10,000,000 over the next fifty years.	100 ☐ **1** Project will significantly enhance Social Equity Performance in all **three** areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
II	50 ☐ **0.8** Project will advance the state-of-the-art with probable consequential benefits identified.	50 ☐ **8.35** Project's implementation will result in demonstrable enhanced revenues/cost reductions > $150,000 over the next five years above the cost of the project. Alternatively, failure of un-maintained system would cost < $1,000,000 or > $150,000 over the next five years in higher costs.	50 ☐ **4.45** High priority for AWWU Board and endorsed by the MOA.	50 ☐ **1** Project's implementation will result in demonstrable benefits to Alaskans with a PV> $5,000,000 over the next fifty years.	50 ☐ **1** Project will significantly enhance Ecological Performance in **two** of three: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	50 ☐ **1** Project will significantly enhance Social Equity Performance in **two** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
III	20 ☐ **0.32** Project will advance the state-of-the-art without significant consequential benefits.	20 ☐ **3.34** Project's costs are repaid (through lower costs or enhanced revenues) within 1st year of completion: "Year 1 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs in Year 1.	20 ☐ **1.78** High priority for AWWU Board.	20 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $1,000,000 over the enxt fifty years.	20 ☐ **1** Project will significantly enhance Ecological Performance in **one** of three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	20 ☐ **1** Project will significantly enhance Social Equity Performance **one** of three areas: Economic evelopment, low-income HH assistance and free/low-cost recreation.
IV	10 ☐ **0.16** Project will eliminate an outmoded practice.	10 ☐ **1.67** Project's costs are repaid (through lower costs or enhanced revenues) within 5 years of completion: "Year 5 break even". Alternatively, failure of un-maintained system would cost what the proposed project costs through Year 5.	10 ☐ **0.89** Project supports 1 or more Achievements in current AWWU Strategic Plan, or is identified in a Utility-wide plan.	10 ☐ **1** Project's Implementation will result in demonstrable benefits to Alaskans with a PV > $0 over the enxt fifty years.	10 ☐ **1** Project will insignificantly enhance Ecological Performance in all three areas: reduction of Greenhouse Gas emissions, conservation/restoration of habitat or the improvement in water quality.	10 ☐ **1** Project will eliminate an outmoded practice.
V	5 ☐ **0.08** Project will advance AWWU facilities and/or practices to current industry best practices.	5 ☐ **0.835** Between 50% and 100% of project's costs will be repaid within first five years of completion through either enhanced revenues or lower costs. Alternatively, failure of un-maintained system would cost up to 50% and 100% of project's cost.	5 ☑ **0.45** Project supports 1 or more Goals listed in current AWWU Strategic Plan	5 ☐ **1** No benefit or Cost to Alaskans can be demonstrated	5 ☑ **1** Project does not enhance Ecological Performance. **1**	5 ☑ **1** Project does not enhance social equity. **1**
n/a	0 ☑ **0** Project does not enhance AWWU facilities or practices to current industry standards.	0 ☑ **0** No partial offset of project costs (through lower costs or enhanced revenues) can be demonstrated.	0 ☐ **0** Project not named in Strategic Plan or Utility-wide plan.	0 ☑ **0** A Net Cost to Alaskans can be demonstrated.	0 ☐ **0** Project harms ecological performance	0 ☐ **0** Project not examined in Strategic Plan or Utility-wide plan.
	0.00	**0.00**	**0.45**	**0.00**	**1.00**	**1.00**

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Appendix B

Eklutna Asset Management Plan

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Final

Anchorage Water and Wastewater Utility

Eklutna Water Treatment Facility Asset Management Plan

October 2017

CDM Smith

14432 SE Eastgate Way, Ste 100
Bellevue, Washington 98007
Mike Hyland, P.E., BCEE, PMP
Senior Project Manager
425-519-8333

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Executive Summary

ES.1 Eklutna Water Treatment Facility Overall Risk Profile

A process-based asset/component inventory was developed for the Eklutna Water Treatment Facility (EWTF) along with a quantitative framework to evaluate both the Likelihood of Failure (LoF) and Consequence of Failure (CoF) for each asset/component. Together, the LoF and CoF scores were used to provide an evaluation of risk for each asset/component to the continued operation of the EWTF. In total, 365 assets/components were identified. No assets at the EWTF were found to constitute either a *catastrophic* risk or a *major* risk.

The LoF for each asset/component was determined by evaluating its condition, typically through direct visual inspection. Since the EWTF has undergone recent upgrades, the overall condition of the facility is good with 90 percent of assets ranked as being in 'fair' or better condition. Sixty-six assets were in 'excellent' condition. Five assets, three of which are part of the turbine generator, were scored as 'unknown' due mainly to the need for a specialist to evaluate the LoF score. The fourth asset, the Lake Diversion Tunnel, should also be inspected by a specialist and the score re-evaluated, which is the subject of a separate engineering effort planned for 2018. The fifth asset, the raw water pipe (P-4), was rated 'unknown' due to the previous discontinuance of corrosion station readings. At the time of this writing, corrosion station readings/monitoring were being resumed by AWWU and are expected to be available in the coming months. With those readings resumed, the LoF score will likely drop.

Each CoF score was determined based on five criteria, which evaluated the impacts related to social, safety/security, environment/regulatory, reliability, and availability of spare parts/manufacturer support. Two assets received a score of 4: the finished water effluent vault and the fluoride ventilation system. The effluent vault's CoF score reflects high consequences related to customer impact and reputation, as well as reliability concerns (in particular seismic vulnerability). The ventilation system's rating reflects a high safety and security rating (5 out of 5), which represents 25 percent of the total CoF score.

The CoF and LoF scores were combined to derive an overall Risk score for each asset/component in the inventory, except for nine assets which have been 'abandoned in place.' Table ES-1 summarizes the distribution of the 356 assets/components from the EWTF inventory across the Risk levels described in the AWWU Risk Management Policy (Board Resolution No. 2011-10, included as **Appendix A**).

The complete inventory of assets/components showing their LoF and CoF scores is included in **Appendix B**. Sections 2 through 11 of this Asset Management Plan summarize the inventory and risk evaluations across each process.

Table ES.1 Distribution of Assets/Components across Risk Levels for the EWTF

Risk Level	Description and Mitigation Requirements	Quantity
5	Catastrophic Risk. Requires immediate action within 60 days.	0
4	Major Risk. Conduct thorough condition assessment and mitigate risk within 1 year.	0
3	Moderate Risk. Conduct condition assessment. Risk must be mitigated by most cost-effective method within 1-2 years.	26
2	Minor Risk. Risk must be mitigated by most cost-effective method within 2-5 years.	257
1	Insignificant Risk. No immediate action is necessary. Replacement will be scheduled in accordance with optimal life cycle cost.	66

ES.2 Recommended Risk Mitigations

For each of the 26 *moderate* risk assets, recommendations are developed throughout this Asset Management Plan to proactively mitigate the current risk level. The recommendations generally fall into one of the following classifications:

- Implementing upgrades already being recommended (with other drivers/rationales) in the corresponding Facility Plan document. For example, eight of the 26 *moderate* risk items identified for the EWTF are associated with the fluoride system. Rather than develop individual risk mitigation actions for each of these eight assets, a single over-arching recommendation to implement the recommendation detailed in the Facility Plan to completely replace this system is included herein.

- Formalizing and/or enhancing condition assessment efforts for those assets that were found to have particularly high consequences of failure. It is most prudent to be vigilant about the trend of condition assessment information for these assets (to the extent it can be practically obtained).

- Revisiting LoF and CoF scores for assets associated with a particular system or process if a major activity is planned now or in the future (when an opportunity arises to refine the information presented herein but the current risk rating does not warrant a separate undertaking to do so).

Section 1

Introduction

1.1 Eklutna Treatment Plant Overview

The Anchorage Water and Wastewater Utility (AWWU) provides potable water to the majority of the Municipality of Anchorage and adjacent areas including Eagle River and the Northern Communities. AWWU can generate potable water at the following facilities:

- Eklutna Water Treatment Facility (EWTF)
- Ship Creek Water Treatment Facility (SCWTF)
- Groundwater Wells in the Anchorage Bowl

The EWTF is located approximately 25 miles Northeast of downtown Anchorage. The EWTF was originally constructed in the mid-1980s and has undergone significant upgrades in recent years including a programmatic SCADA upgrade and a recent filter-to-waste project. It is a conventional filtration plant providing potable finished water to customers immediately downstream of the facility.

Figure 1.1 depicts the overall process flow for the EWTF. Generally, the major processes include:

- Energy Recovery Station
- Raw Water
- Flocculation
- Sedimentation
- Filtration
- Clear Well Storage & Effluent Vault
- Chemical Feed Systems (polymer, poly aluminum chloride, on-site hypochlorite generation, fluoride, soda ash/ ferric sulfate (no longer in use)
- Waste Washwater
- Residuals Management
- Site and Building (e.g. electrical and building mechanical systems that support the facility as a whole)

Figure 1.2 provides an overview of how these processes are physically arranged on the EWTF site.

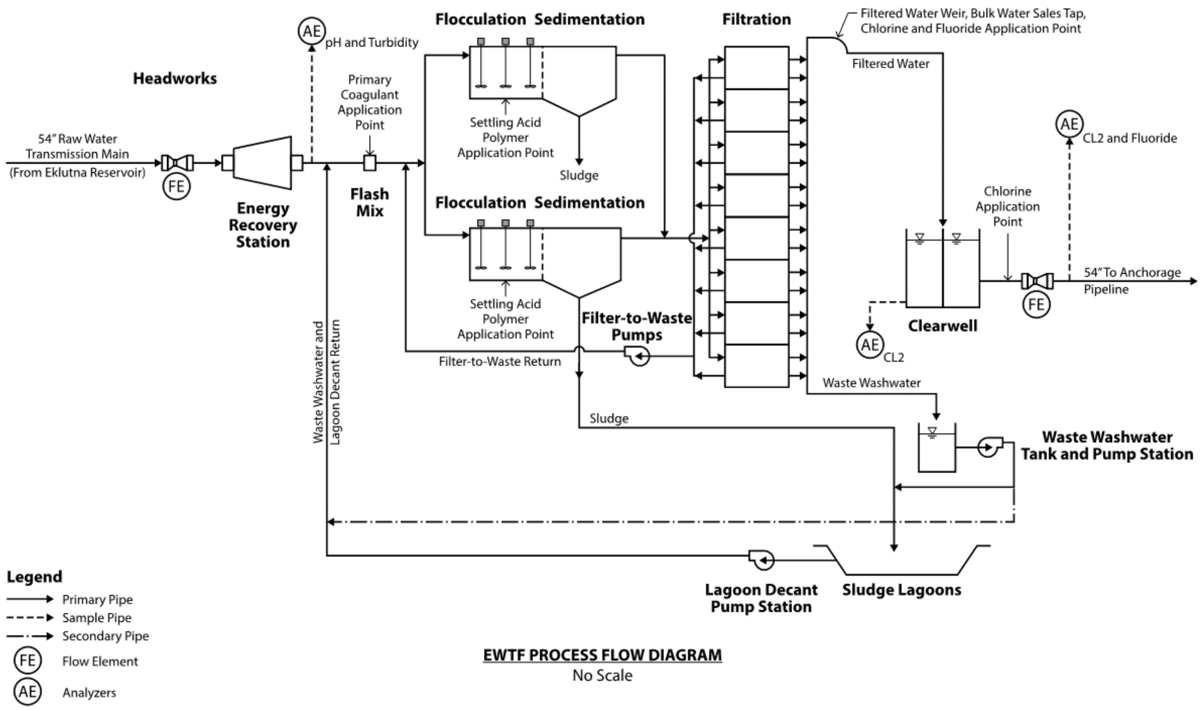

Figure 1.1
Overall Process Flow for the EWTF

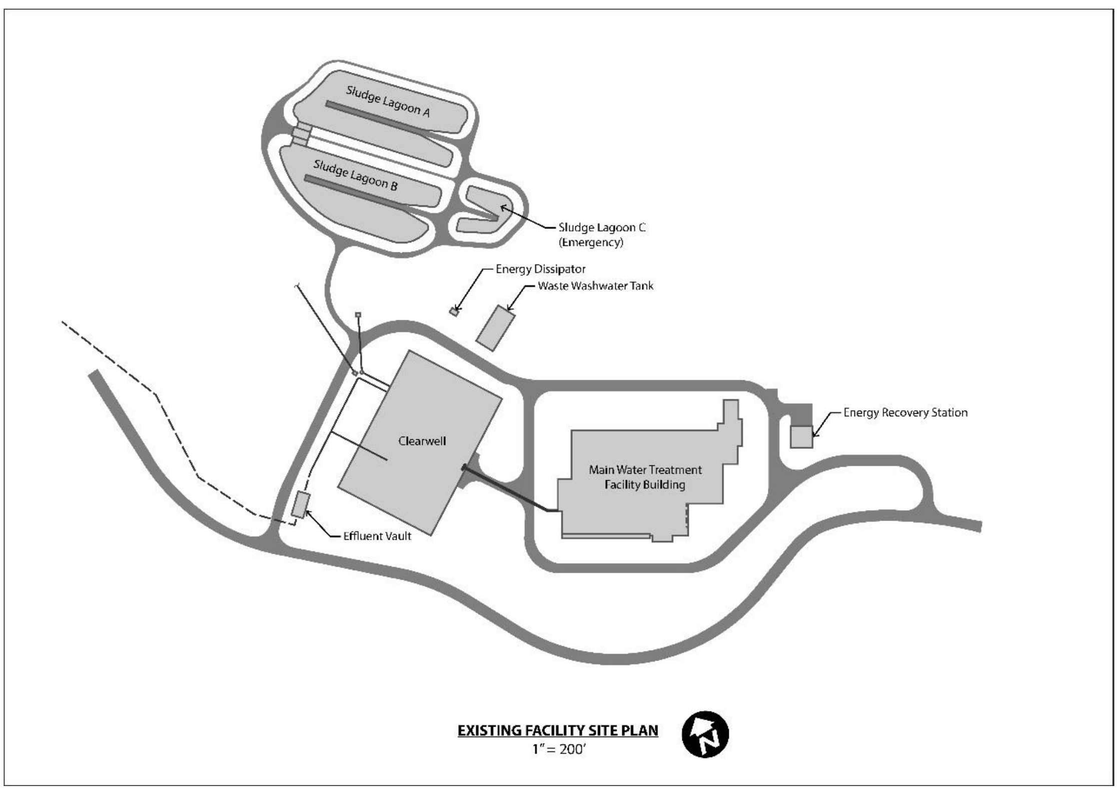

Figure 1.2
Site Plan

1.2 Level of Service

After the EWTF was constructed in the late 1980s, both the EWTF and the SCWTF were operated together until approximately mid-year 2000 when the EWTF became the base load treatment facility, normally supplying treated water to the AWWU system without the SCWTF being on-line. Beginning in 2006, the availability of the EWTF and AWWU's well sources increased owing to expansions/upgrades at the wells and fewer maintenance related shutdowns. Because the SCWTF remains a viable standby facility that can be relied upon for extended/planned shutdown(s) of the EWTF, the assumed level of service target is best described as 'average day demand year-round.' In previous AWWU vertical treatment plant AMPs, a lesser assumed level of service was contemplated as a rationale for applying a scalar multiplier, decreasing the COF scores facility-wide. With the EWTF serving as the primary production facility year-round, no such multiplier is applied and CoF scores are used directly.

1.3 Strategic Asset Management Model (NOT USED)

1.4 Risk Management

Appendix A includes the Risk Management Policy for AWWU (AWWU Board Resolution No. 2011-10), which indicates the timeframe associated with risk mitigation for five levels of Risk: *insignificant*, *minor*, *moderate*, *major* and *catastrophic*. To ascertain the level of risk associated with the assets at the EWTF, the following steps were undertaken:

1. Develop a process-based inventory for the EWTF that identifies the assets and their components across the entire facility (see **Appendix B**).

2. Evaluate the Likelihood of Failure (LoF) for each asset by assessing its condition based on visual observation/inspection and discussions with AWWU staff regarding performance and maintenance history (see **Appendix C**).

3. Develop a framework to summarize the Consequence of Failure (CoF) for each asset by defining criticality factors and applying qualitative judgments.

4. Define numerical scores (one to five) for both the LoF and CoF for each asset to categorize the Risk associated with each asset. Figure 1.3 includes the Risk Matrix that shows how quantified LoF and CoF scores for each asset are used to categorize its Risk.

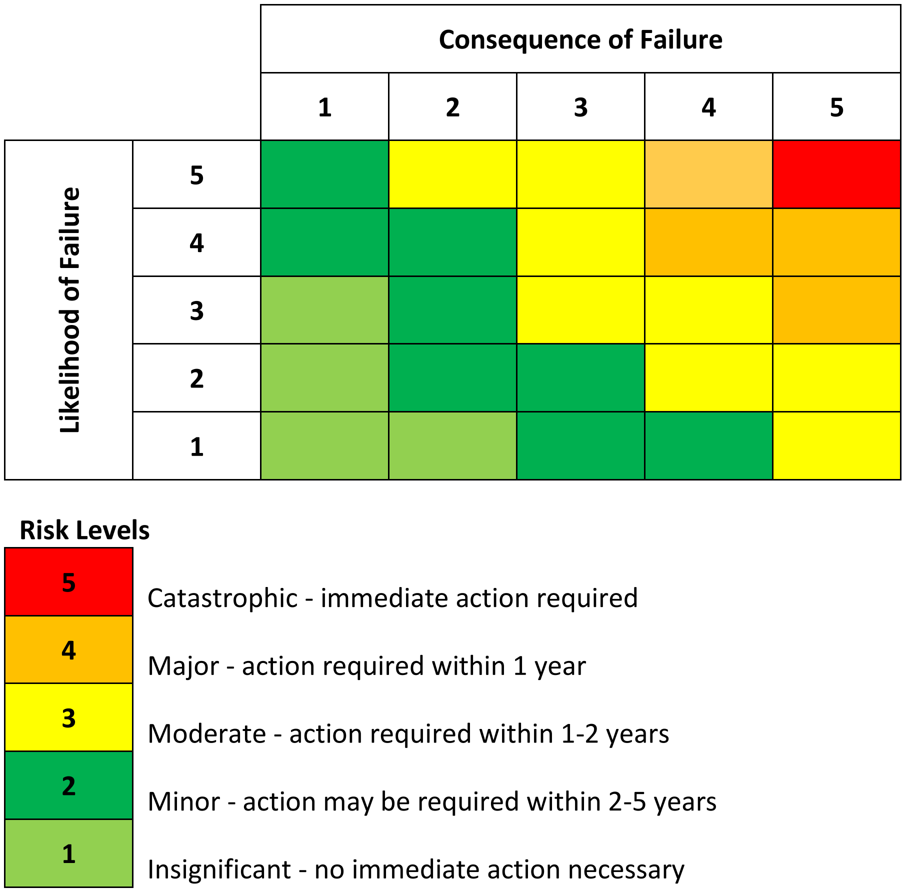

Figure 1.3
Risk Matrix

Both the LoF and CoF were evaluated at the lowest applicable level (component or asset).

1.4.1 Likelihood of Failure

Likelihood of Failure (LoF) was evaluated for the EWTF using information collected at interviews with AWWU staff and visual observations of the condition, along with known information such as maintenance records and performance history. Where possible, assets/components were observed while in operation and aspects such as noise and vibration for rotating equipment were included when assessing their condition to evaluate LoF. To provide a framework consistent with numerical approaches already being used by AWWU, the following rating system was developed to rank condition and assign LoF scores (**Appendix C** provides a more detailed discussion of the terms used below and identifies major influences in determining LoF scoring):

- Assets/components that were found to be *inoperable* were assigned an LoF score of 5.
- Assets/components that were found to be in *poor* overall condition were assigned an LoF score of 4.
- Assets/components that were found to be in *fair* overall condition were assigned an LoF score of 3.

- Assets/components that were found to be in *good* overall condition were assigned an LoF score of 2.
- Assets/components that were found to be in *excellent* overall condition were assigned an LoF score of 1.

A "confidence" value of high, medium or low was assigned to each LoF score to help quantify the approximate uncertainty associated with the assigned LoF score. Confidence values were determined using the following criteria:

- The extent of condition assessment information available for an asset or other similar assets in the same operational context (e.g. multiple pumps discharging to a common pipe). The more quality information that was available, the higher the level of confidence in the scoring.
- The degree to which a visual condition assessment can accurately predict the Likelihood of Failure of the asset. Assets whose condition can be readily assessed through visual means received a higher score.
- Operational data indicating wear and tear on the item, such as run time hours.
- Operator experience with the asset or with similar assets in the same operational context.
- Maintenance and/or performance history.

As an example, if an asset did not have detailed information on performance and maintenance history, and was inaccessible or was not effectively assessed by visual inspection during the condition assessment process, the assessment team could not obtain an accurate understanding of the condition of the equipment; therefore, a low confidence was assigned. LoF scores with a low confidence designation can be refined in the future as more detailed information becomes available. Many assets had recorded information on performance and maintenance history and/or were relatively accurately assessed using visual means; these were predominately assigned a medium confidence value. A high confidence value was reserved for items that are new or where dedicated performance history and thorough equipment inspection(s) were performed. Objective information contained in maintenance records and operations reports was given a higher weight in the confidence rating process than anecdotal information. However, discussions with operators were helpful in validating the confidence rating and differentiating between borderline scores.

AWWU should strive to document asset condition data, observed or measured, in conjunction with the performance of preventative O&M activities. This approach can provide an excellent historical record of how assets degrade, allowing more accurate predictions of failure. It is also the most cost-effective way to collect information.

1.4.2 Consequence of Failure

The approach followed for developing a quantitative Consequence of Failure (CoF) score for individual assets includes the following discrete activities:

1. Identify and define the relevant categories, termed 'criticality factors' that should be considered in determining the overall CoF for each asset.
2. Assign a relative weighting to each criticality factor.
3. Define a qualitative range of consequences associated with each identified criticality factor, such that consistent qualitative judgments can be made by multiple personnel.

4. Assign the qualitative judgments to each criticality factor for each asset.

5. Translate those qualitative judgments to a single, integrated quantitative CoF score for each asset using the relative weightings of each criticality factor.

Table 1.1 presents the relevant criticality factors as they were defined for the EWTF during workshops held with AWWU.

Table 1.1 Criticality Factors, Weightings and Definitions for the EWTF

Criticality Factor	Weight	Definition
Social - Customers & Reputation	15%	Impact of an event on meeting the needs of the customer or on public, customer, stakeholder, or employee confidence in AWWU.
Safety & Security	25%	Impact of an event on the health and safety of employees, contractors, customers, and visitors within the workplace (e.g., OSHA requirements, working conditions).
Environment & Regulatory	25%	Impact of an event on compliance with federal (e.g., EPA), state, county, and/or municipal laws and regulations, as well as on the environment.
Reliability & Financial Impacts	20%	Impact of event on reliability of the plant and financial considerations to utility, public or private property.
Spare Parts/ Manufacturer Support	15%	Impact of spare parts availability and manufacturer support on duration of outage.

Table 1.2 presents the qualitative range of consequences for each of the above criticality factors. Note that each criticality factor is assessed independently. For example, an asset can be described by a Very High consequence with respect to Safety & Security while exhibiting a Very Low consequence with respect to Environment & Regulatory, etc.

Table 1.2 Range of Consequences for Criticality Factors for the EWTF

Consequence	Social – Customers & Reputation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part / Manufacturer Support Availability
Very Low - 1	In-house work item, makes plant less efficient	No risk of injury and/or minor security threat	Non-compliance unlikely and/or minor damage to the environment	No impact to operations, no alternate funding required	Spare parts on site & manufacturer support is available.
Low - 2	Contained within plant, workarounds making work flow difficult	Low risk of minor injury and/or security threat	Non-compliance possible if not addressed and/or minimal damage to the environment	No disruption of services, no alternate funding required	Spare parts on site, manufacturer support not available
Medium - 3	Minor service impacts and/or diminishes reputation	Low risk of a moderate injury and/or security jeopardized	Non-compliance possible and/or some damage to the environment	Minimal or intermittent disruption of services, no alternate funding required	Replacement parts available offsite, manufacturer support is available.
High - 4	Intermittent service to some customers and/or threat to reputation	High expectation of an injury (non-life threatening) and/or security compromised	Fine, compliance order or other regulatory action possible and/or localized damage to the environment	Partial disruption of services and/or direct (or indirect) costs may require alternate funding	Replacement parts available offsite, manufacturer support is not available.
Very High - 5	Major impact on stakeholders and/or serious threat to long-term reputation	High expectation of a serious injury (potentially life threatening) and/or major security breach	Fine, compliance order or other regulatory action likely and/or significant damage to the environment	Complete disruption of services and/or direct (or indirect) costs require alternate funding	Replacement parts difficult to obtain and manufacturer support is not available.

The methodology for integrating the above concepts into a single, numerical CoF score for each asset is critical to ensure consistency and repeatability in the assessment. The selected methodology can best be described as a 'score using average' approach, wherein a numerical average of the weighted criticality factor ratings is derived using a direct numerical translation of: 1 = very low, 2= low, 3= medium, etc.

For example, if an asset were to be rated as 'high' for each of the five criticality factors, its integrated Consequence of Failure score would be derived as follows:

$$[0.15 * 4] + [0.25 * 4] + [0.25 * 4] + [0.20 * 4\} + [0.15 * 4] = 4$$

Though one criticality factor 'Spare Part / Manufacturer Support Availability' speaks to elements of overall redundancy for a given asset, redundancy is not separately identified/scored for each asset to remove its impact from CoF scoring. Instead, redundancy was actively considered qualitatively when developing and refining CoF scores with AWWU.

1.5 Source Data

The EWTF Asset Management Plan was primarily developed from field inspections performed specifically in support of this project (i.e. not from current data stored in AWWU's enterprise systems). Additional information such as detailed inspections performed by others in recent years and record drawings were also used to develop initial results. AWWU staff validated the field inspections by reviewing the asset inventory, LoF and CoF scores during multiple working sessions. In many instances, this validation step resulted in refined scores for individual assets/components. In some instances, for example when operator input was derived from a separate visual condition assessment performed when a major piece of equipment was taken off-line and was thus exposed for a more detailed evaluation, the validation step also resulted in an increased confidence in the LoF scores.

Section 2

Energy Recovery

2.1 Overview

Eklutna WTF's Energy Recovery Station is located in the area shown below. The facility utilizes excess head from incoming raw water to generate power for the facility and/or export to the Electrical Utility grid.

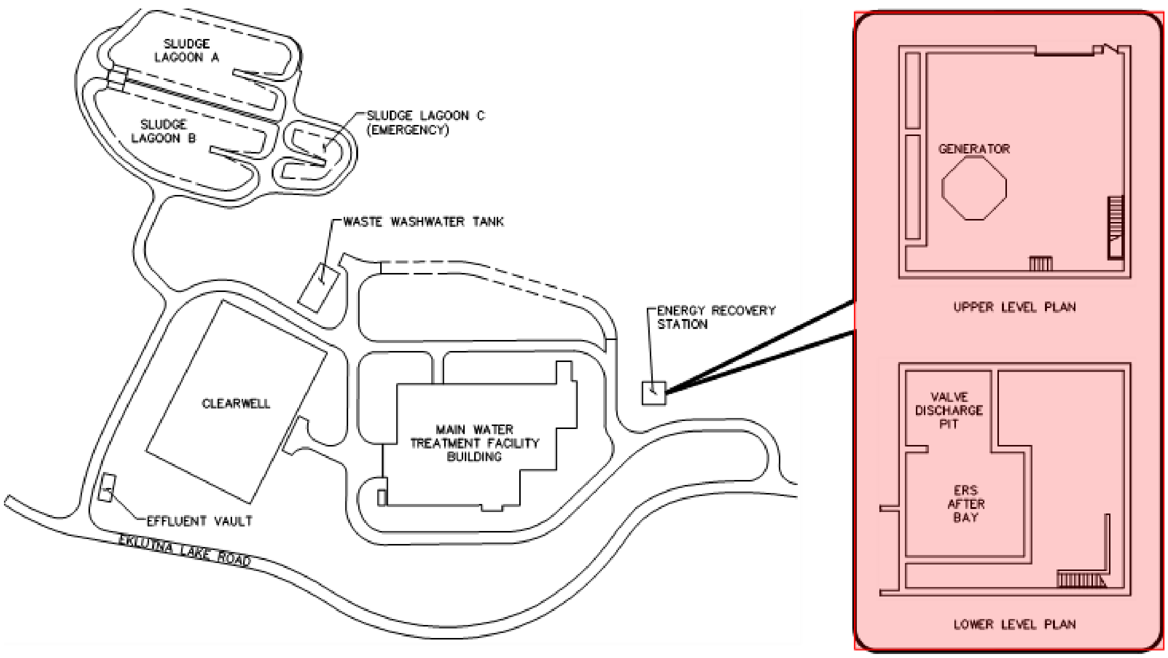

Figure 2-1
Energy Recovery Station Location

The existing EWTF Energy Recovery system includes the following major 'process areas':

- Plant Influent Pipe
- Generator Feed & Bypass
- Turbine Generator
- Bridge Crane

2.2 Asset Inventory

The Energy Recovery assets and components are shown in Table 2.1, along with their Likelihood of Failure, Consequence of Failure, and Risk scores.

Table 2.1 Energy Recovery Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
(P-4 Plant Influent Pipe)	54" Venturi	3	High	2	2
Generator Feed & Bypass	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	Medium	3	3
Turbine Generator Feed	42" Isolation Butterfly Valve (BV)	4	High	3	3
Turbine Generator Feed	Needle Valve	**5**	Medium	3	3
Turbine Generator Feed	Needle Valve	**5**	Medium	3	3
Turbine Generator	750 KW Hydro Turbine	**5**	Low	3	3
Turbine Generator Bypass	30" Isolation BV	3	High	2	2
Turbine Generator Bypass	30" Sleeve Valve	3	Medium	2	2
Turbine Generator & ERS Controls	Control Panel (including hardware/ software)	4	Medium	3	3
Bridge Crane - Structure	10 Ton Bridge Crane	2	Medium	2	2
Bridge Crane - Equipment	10 Ton Bridge Crane	**2**	Low	2	2

2.3 Risk Profile

Six assets have a *moderate* risk and are described more fully in Section 4.2.3 of the Facility Plan. The 42-in. isolation valve butterfly valve has reportedly experienced periods of less than watertight seating, which may be resolved through re-seating of the valve. The two needle valves are actuated by Auma electrical motorized operators, which are reportedly not reliable nor completely compatible with the existing plant control/SCADA system. This lack of reliability creates increased operator attention and labor. The 750kW Hydro Turbine should be inspected by a specialist to determine a more accurate LoF score. The generator control plan and SCADA interface is nearing the end of its useful life and is deficient in providing easy control of individual components from the control panel. It also does not allow for consistent, remote operation.

The Risk profile for the Energy Recovery system is shown in Table 2.2 and includes the distribution (i.e. quantity of assets/components) that were described by the various combinations of LoF and CoF scores respectively.

Table 2.2 Energy Recovery Risk Distribution

Risk Level	Description per AWWU Policy	Energy Recovery - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	6
2	Minor Risk	5
1	Insignificant Risk	0

2.4 Recommended Actions to Mitigate Risks

For the six assets with redundant risk, we recommend the following:

- Within the next 1-2 years, the staff should evaluate the cost-benefit of replacing the two needle valve actuators. This risk will be mitigated through the capital upgrade recommendation identified as 'ER1' in the Facility Plan. Initiating the planning, design and construction for this upgrade represents a proactive risk mitigation action.

- The condition of the 750-kW hydro turbine should be evaluated by a turbine generator specialist within the next 1-5 years and the likelihood of failure score adjusted as appropriate. If staff notice the commencement of (or an increase in) the number of issues with the turbine, the timing of the turbine inspection should be accelerated.

- Replacing the ERS control panel sometime over the next five years and providing improved Plant SCADA Integration with the ERS appear the most effective means of mitigating risk associated with this asset. Initiating the planning, design and construction for the capital upgrade recommendation identified as 'ER2' in the Facility Plan represents a proactive risk mitigation action.

- AWWU should monitor the continued operation and performance of the 42-in. butterfly valve during any planned periods of use to determine if there is a persistent seating issue that might benefit from adjustment(s) to the valve internals or seating surfaces in the future. Because this issue has not been continuously observed, the level of enhanced monitoring described above is the most appropriate risk mitigation method at this time.

For the five assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 3

Raw Water

3.1 Overview

The raw water system conveys water to the Energy Recovery Station (ERS) as well as from the ERS the riser box and flocculation basins within the main portion of the treatment plant. As part of this system, the primary coagulant (Polyaluminum chloride, or PACl) is injected and "flash mixed" with raw water prior to the flocculation basins. Figure 3.1 shows the raw water pipe as well as the mixing water and chemical injection on the top of the pipe.

Figure 3-1
Existing Raw Water Pipe from the Energy Recovery Station

The existing EWTF Raw Water system includes the following major process areas:

- Raw water tunnel/piping (i.e. upstream of ERS)
- A single 54" raw water influent pipe (see picture included as Figure 3-1)
- Flash mixer
- Intake flow control valves
- Powdered Activated Carbon system (not in use)

3.2 Asset Inventory

The Raw Water assets and components are shown in Table 3.1, along with their LoF, CoF, and Risk scores.

Table 3.1 Raw Water Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Tunnel	Exposed 54" Raw Water Pipe	3	Medium	2	2
Flash Mixer	Mixing Nozzle	3	Low	2	2
Flash Mixer	6" Pressure Control Valve	3	Medium	2	2
Flash Mixer	6" Butterfly Valve	3	High	2	2
Flash Mixer	6" Flow Meter	3	Medium	2	2
Wash Water Return/ Lagoon Decant	12" Flow Meter	3	Medium	2	2
Lake Diversion Tunnel	8,690 LF 72" PCCP pipe in 9' tunnel	5	Low	3	3
Pipe P-4	32,304 LF 54" and 60" MLCP pipe	5	Low	3	3
Intake - Flow Control	Kubota 54" Ring FolLower Valve	3	Low	2	2
Intake - Flow Control	Pratt 54" Butterfly Valve	3	Low	2	2
Intake - Flow Control	Hydraulic Power Supply	2	Low	2	2
Raw Water Transmission - Flow Control	Pratt 54" Butterfly Valve	3	Low	2	2
Raw Water Transmission - Flow Control	Hydraulic Power Supply	3	Low	2	2
Powdered Activated Carbon (PAC)	Storage Hopper	0	High	1	N/A
PAC	Bag Loader	0	High	1	N/A
PAC	Dust Collector	0	High	1	N/A
PAC	Slide Gate	0	High	1	N/A
PAC	Dry Feeder	0	High	1	N/A
PAC	Slurry Tank	0	High	1	N/A
PAC	Slurry Tank	0	High	1	N/A

3.3 Risk Profile

Two raw water assets have a *moderate* risk score. These assets are the Lake Diversion Tunnel and associated pipe. The tunnel's condition assessment should be updated after an internal pipe inspection is conducted by AWWU (see **Appendix D**).

The Risk profile for the Raw Water process is shown in Table 3.2 and includes the distribution (i.e. quantity of assets/components) that were described by the various combinations of Likelihood of Failure and Consequence of Failure scores respectively.

Table 3.2 Raw Water Risk Distribution

Risk Level	Description per AWWU Policy	Raw Water - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	2
2	Minor Risk	11
1	Insignificant Risk	0

3.4 Recommended Actions to Mitigate Risks

Moderate risk scores require that AWWU perform a more detailed condition assessment and determine the effectiveness of replacement versus adoption of other risk mitigation controls within the next 1-2 years. The planned, detailed condition assessment associated with the raw water tunnel and pipeline upstream of the ERS (see **Appendix D**) is the most appropriate risk mitigation action. Following this inspection, the results should be used to update the LoF (and thus the overall risk rating) for these assets. That inspection will identify the appropriate level of further response (if any). We also recommend that corrosion station monitoring readings be resumed on the pipe asset on a regular, recurring basis per the original O&M – this activity is currently being planned by AWWU.

For the remaining 11 assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

The powdered activated carbon assets/ components were abandoned-in-place decades ago. It is ultimately recommended that the equipment be removed, the feed hole in the floor plugged, and a partition wall installed so that the O&M staff can safely park equipment in the garage bay component of the room; however, this would not be driven by a risk mitigation need and would only be undertaken for convenience.

Note the Facility Plan identifies and discusses several additional upgrades and/or detailed condition assessment actions that address other needs – these items are not discussed here as they were not identified through the Asset Management planning effort and thus are not expected to influence the overall risk profile of the EWTF.

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Section 4

Flocculation

4.1 Overview

The EWTF has a conventional treatment train consisting of two flocculation basins, each with three stages and three compartments. A total of 18 two-speed flocculators provide tapered flocculation of the coagulated water in preparation for settling in the sedimentation basins. Figure 4.1 shows the location of the flocculation basins in the plant facilities.

Figure 4.1
Flocculation Basins – Location

4.2 Asset Inventory

The Flocculation assets and components are shown in Table 4.1, along with their Likelihood of Failure, Consequence of Failure, and Risk scores.

Table 4.1 Flocculation Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Flocc Basin No. 1	24" Influent Butterfly Valve (BV)	3	Medium	2	2
Flocc Basin No. 1	24" Influent BV	3	Medium	2	2
Flocc Basin No. 1	24" Influent BV	3	Medium	2	2
Flocc Basin No. 1	24" Influent BV	3	Medium	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2	24" Influent Butterfly Valve (BV)	3	Medium	2	2
Flocc Basin No. 2	24" Influent BV	3	Medium	2	2
Flocc Basin No. 2	24" Influent BV	3	Medium	2	2
Flocc Basin No. 2	24" Influent BV	3	Medium	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2
Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)	3	High	2	2

4.3 Risk Profile

All 26 flocculation assets ranked as *minor* risk, as shown in Table 4.2.

Table 4.2 Flocculation Risk Distribution

Risk Level	Description per AWWU Policy	Flocculation - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	0
2	Minor Risk	26
1	Insignificant Risk	0

4.4 Recommended Actions to Mitigate Risks

For the 26 assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 5

Sedimentation

5.1 Overview

Each flocculation basin is directly followed by a sedimentation basin. The location of these basins within the facilities is shown below.

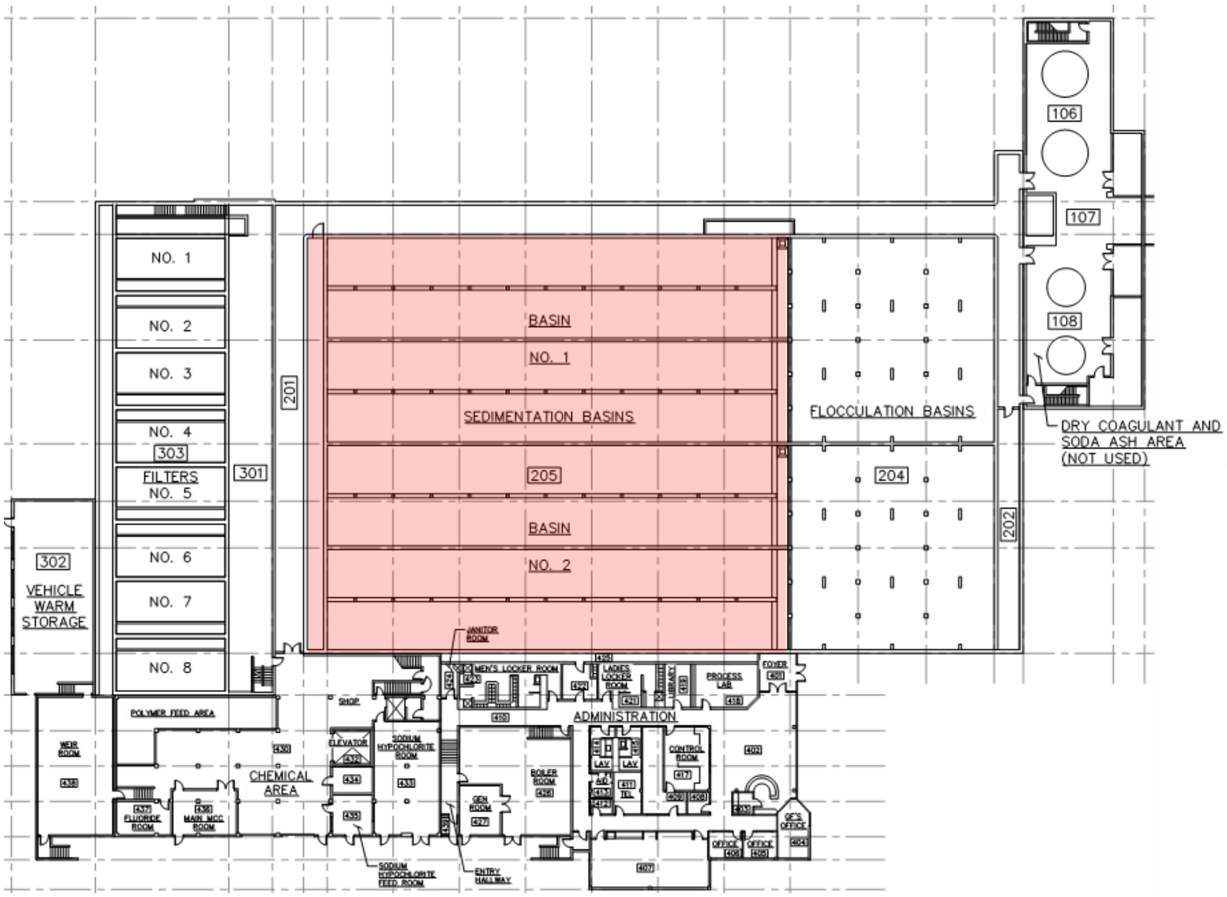

Figure 5.1
Sedimentation Basins – Location

5.2 Asset Inventory

The Sedimentation assets and components are shown in Table 5.1 along with their LoF, CoF, and Risk scores.

Table 5.1 Sedimentation Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	3	Medium	2	2
Sed Basin No.1	8" Telescoping Valve	2	High	2	2
Sed Basin No.1	Sludge Cross Collector	3	High	2	2
Sed Basin No.1	Sludge Cross Collector	4	High	2	2
Sed Basin No.1	Sludge Cross Collector	3	Low	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	3	High	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.1-South Side	Sludge Longitudinal Collector	3	Low	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	3	High	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.1- North Side	Sludge Longitudinal Collector	3	Low	2	2
Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	3	Medium	2	2
Sed Basin No.1	8" Telescoping Valve	2	High	2	2
Sed Basin No.2	Sludge Cross Collector	3	High	2	2
Sed Basin No.2	Sludge Cross Collector	4	High	2	2
Sed Basin No.2	Sludge Cross Collector	4	Low	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.2-South Side	Sludge Longitudinal Collector	4	Low	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	4	High	2	2
Sed Basin No.2-North Side	Sludge Longitudinal Collector	3	Low	2	2
Building Mechanical	Heat & Vent	1	High	2	1
Building Electrical	Interior Lighting	3	Medium	2	2
Building Electrical	Panelboards	3	Medium	2	2

5.3 Risk Profile

The Risk profile for the Sedimentation process is shown in Table 5.2. No assets were rated higher than *minor* risk.

Table 5.2 Sedimentation Risk Distribution

Risk Level	Description per AWWU Policy	Sedimentation - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	0
2	Minor Risk	24
1	Insignificant Risk	1

5.4 Recommended Actions to Mitigate Risks

For the 25 assets that have *minor* or *insignificant* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

Note the Facility Plan identifies and discusses several capital improvements associated with the sedimentation process that address other needs – these items are not discussed here as they were not identified through the Asset Management planning effort and thus are not expected to influence the overall risk profile of the EWTF.

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Section 6

Filtration

6.1 Overview

The EWTF's filtration system, which was modified in 2015, consists of eight self-backwashing filters in the location shown below.

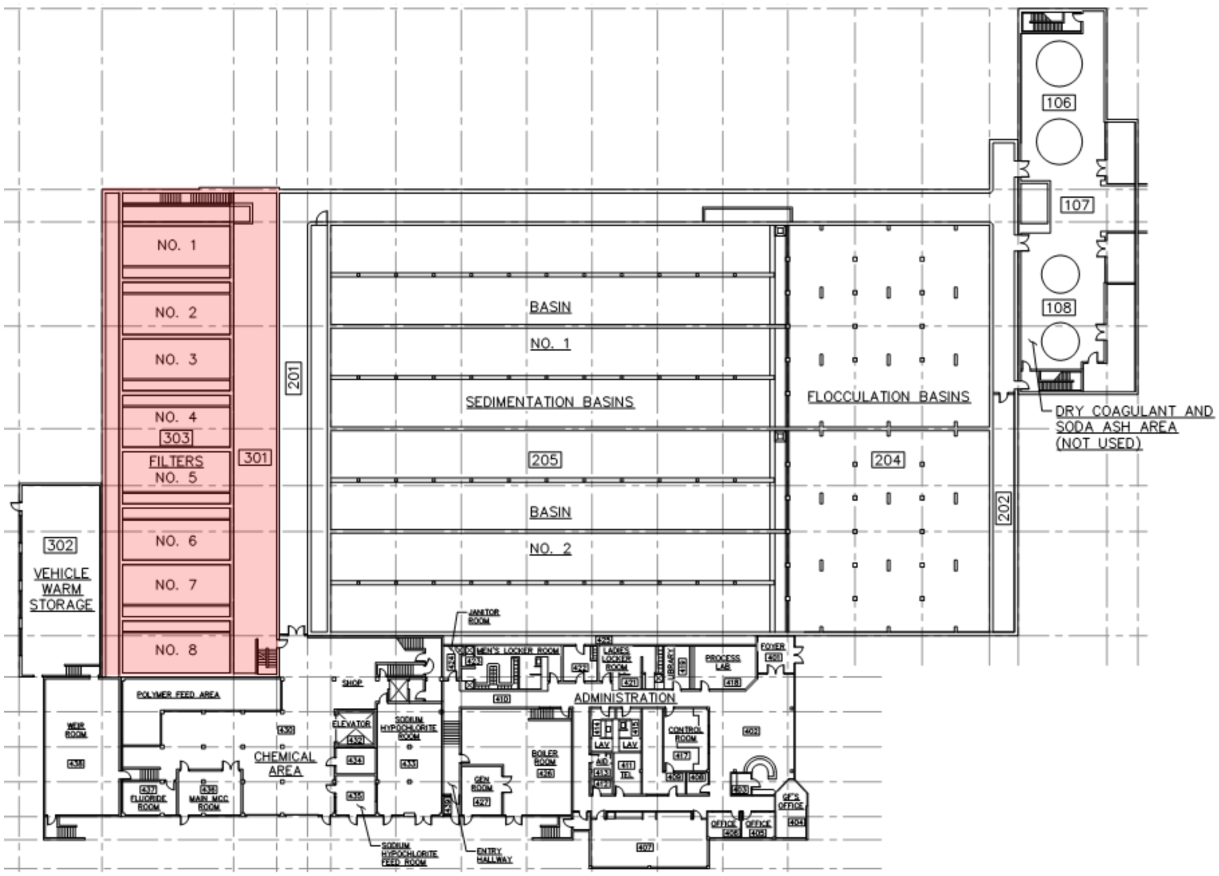

Figure 6.1
Filter Layout - Location

6.2 Asset Inventory

A considerable number of assets and components were identified within the Filtration Process. The Filtration assets and components are shown in Table 6.1, along with their LoF, CoF, and Risk scores.

Table 6.1 Filtration Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Filter Gallery	Original, Major, Exposed Valves (that are not listed separately) & Piping	2	High	2	2
Filter Gallery	FTW, Major, Exposed Valves (that are not listed separately) & Piping	1	High	2	1
Filter Gallery	Original, Major, Non-Exposed Piping	3	Medium	2	2
Filter Gallery	FTW, Major, Non-Exposed Piping	1	High	2	1
Filter Effluent Control Area	Exposed, Major Valves (not listed elsewhere) & Pipe	4	Medium	3	3
Filter Effluent Control Area	Filter Surface Wash Pump No.1	3	Medium	2	2
Filter Effluent Control Area	Filter Surface Wash Pump No.1	3	Medium	2	2
Filter Influent Channel	24" Filter No.1 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.1 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 1 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.1 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.1 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 1 Filter to Waste Water (FTW) BV	1	High	2	1
Filter No.1	Backwash Troughs	3	High	2	2
Filter No.1	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.1	Filter Media	3	Low	2	2
Filter No.1	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.2 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.2 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 2 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.2 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.2 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 2 FTW BV	1	High	2	1
Filter No.2	Backwash Troughs	3	High	2	2
Filter No.2	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.2	Filter Media	3	Low	2	2
Filter No.2	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.3 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.3 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 3 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No. 3Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.3 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 3 FTW BV	1	High	2	1
Filter No.3	Backwash Troughs	3	High	2	2
Filter No.3	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.3	Filter Media	3	Low	2	2
Filter No.3	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.4 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.4 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 4 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.4 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.4 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 4 FTW BV	1	High	2	1
Filter No.4	Backwash Troughs	3	High	2	2
Filter No.4	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.4	Filter Media	3	Low	2	2
Filter No.4	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.5 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.5 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 5 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.5 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.5 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 5 FTW BV	1	High	2	1
Filter No.5	Backwash Troughs	3	High	2	2
Filter No.5	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.5	Filter Media	3	Low	2	2
Filter No.5	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.6 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.6 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 6 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.6 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.6 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 6 FTW BV	1	High	2	1
Filter No.6	Backwash Troughs	3	High	2	2
Filter No.6	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.6	Filter Media	3	Low	2	2
Filter No.6	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.7 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.7 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 7 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.7 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.7 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 7 FTW BV	1	High	2	1
Filter No.7	Backwash Troughs	3	High	2	2
Filter No.7	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.7	Filter Media	3	Low	2	2
Filter No.7	Filter Underderdrain	3	Low	2	2
Filter Influent Channel	24" Filter No.8 Influent BV	3	Low	2	2
Filter Gallery	36" Filter No.8 Influent BV	1	High	2	1
Filter Effluent Channel	42" Filter No. 8 Filtered Water BV	1	High	2	1
Filter Gallery	36" Filter No.8 Waste Washwater BV	1	High	2	1
Filter Gallery	12" Filter No.8 Surface Washwater BV	1	High	2	1
Filter Gallery	16" Filter No. 8 FTW BV	1	High	2	1
Filter No.8	Backwash Troughs	3	High	2	2
Filter No.8	Surface Wash Rotating Arms	3	Medium	2	2
Filter No.8	Filter Media	3	Low	2	2
Filter No.8	Filter Underderdrain	3	Low	2	2
Filter Gallery	FTW Pump No.1	1	High	2	1
Filter Gallery	FTW Pump No.2	1	High	2	1

6.3 Risk Profile

Only one asset was ranked at *moderate* risk due primarily to its relatively high perceived impact to the 'safety and security' criticality factor resulting from its failure.

The Risk profile for the Filtration process is shown in Table 6.2.

Table 6.2 Filtration Risk Distribution

Risk Level	Description per AWWU Policy	Filtration - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	1
2	Minor Risk	44
1	Insignificant Risk	44

6.4 Recommended Actions to Mitigate Risks

Due to the high criticality associated with a significant amount of large diameter exposed piping and valves associated with the filtration process (i.e. the sole asset receiving a *moderate* risk rating), increasing the formality with which its condition is routinely assessed by AWWU is the most prudent risk mitigation action. This may take the form of more regular intervals of inspection (recommended at least quarterly for an updated visual condition assessment) and capturing of that information in a common location that allows the trend over time to be monitored. Should deterioration of any exposed piping/valve condition become evident over time, replacement of that asset should be accelerated. AWWU may also wish to consider adding seismic support hoops in the future to incrementally lower the LoF associated with this asset (though the numerical rating would not change).

For the 88 assets that have *minor* or *insignificant* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 7

Clearwell Storage and Effluent Vault

7.1 Overview

The EWTF's 15-million-gallon clearwell reservoir and effluent vault are located as shown on Figure 7-1.

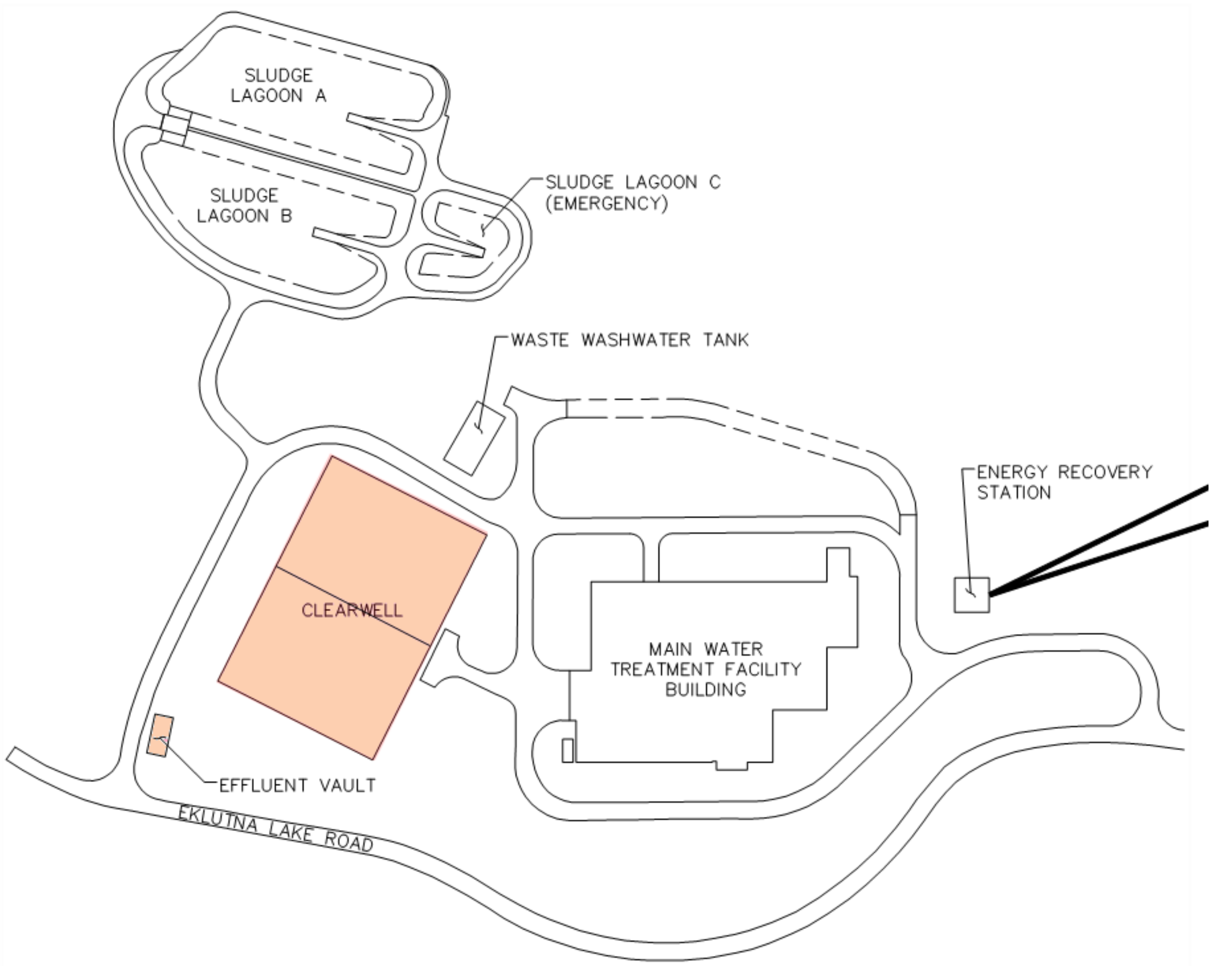

Figure 7.1
Clearwell and Effluent Vault – Location

7.2 Asset Inventory

The Clearwell Storage assets and components are shown in Table 7.1, along with their LoF, CoF, and Risk scores.

Table 7.1 Clearwell Storage Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Basins 1 & 2	Exposed & Submerged, Major Pipe	2	Medium	3	2
Basins 1 & 2 +directly adjacent	Buried, Major Pipe	3	Low	2	2
Basin No.1- Inlet Structure	54" Inlet BV	4	Medium	2	2
Basin No.1- Outlet Sump	54" Outlet BV	4	Medium	2	2
Basin No.1- Outlet Sump	12" Drain Check Valve	3	Medium	2	2
Basin No.1- Outlet Sump	12" Drain BV	4	Medium	2	2
Basin No.2- Inlet Structure	54" Inlet BV	4	Medium	2	2
Basin No.2- Outlet Sump	54" Outlet BV	4	Medium	2	2
Basin No.2- Outlet Sump	12" Drain Check Valve	3	Medium	2	2
Basin No.2- Outlet Sump	12" Drain BV	4	Medium	2	2
Underdrain	Pump Station	3	Low	2	2
Underdrain Piping		4	Low	3	3
Effluent Vault	Exposed Major Valves (not listed elsewhere) & Pipe	3	Medium	4	3
Effluent Vault	14" Air- Vacuum & Air Release Valve	3	High	2	2
Effluent Vault	14" Air- Vacuum & Air Release Valve	3	High	2	2
Effluent Vault	36"BV	3	High	2	2
Effluent Vault	36"BV	3	High	2	2
Effluent Vault	36 Venturi	4	High	2	2
Effluent Vault	36"BV	3	High	2	2
Effluent Vault	12"BV	3	High	2	2
Effluent Vault	12"BV	3	High	2	2
Effluent Vault	36"BV	3	High	2	2
Effluent Vault	36"BV	3	High	2	2

7.3 Risk Profile

The underdrain piping serving both basins and exposed major piping and valves in the effluent vault each rated *moderate* risk. For the clearwell underdrain piping, the rating is driven by its inaccessibility for a visual condition assessment and thus an LoF score of '4' was assigned with a 'low' confidence in that LoF score. Should planned activities at the plant allow for more direct condition assessment of this asset, a more refined LoF rating should be included, which would update the corresponding risk rating.

The *moderate* risk rating associated with effluent vault piping and valving is due primarily to the extreme impact to both the 'social – customers & reputation' and 'reliability & financial impacts' criticality factors resulting from its failure.

The Risk profile for the Clearwell Storage and Effluent Vault is shown in Table 7.2.

Table 7.2 Clearwell Storage & Effluent Vault Risk Distribution

Risk Level	Description per AWWU Policy	Clearwell Storage & Effluent Vault- Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	2
2	Minor Risk	21
1	Insignificant Risk	0

7.4 Recommended Actions to Mitigate Risks

Due to the high criticality associated with a significant amount of exposed piping and valves associated with the effluent vault, increasing the formality with which its condition is routinely assessed by AWWU is the most prudent risk mitigation action. This may take the form of more regular intervals of inspection (recommended at least quarterly for an updated visual condition assessment) and capturing of that information in a common location that allows the trend over time to be monitored. Should deterioration of any exposed piping/valve condition become evident over time, replacement of that asset should be accelerated.

Similarly, the most appropriate risk mitigation action for the clearwell underarin piping focus on enhanced condition assessment. In this case, other planned activities at the plant may allow for more direct condition assessment of this asset; and if so, AWWU should schedule/perform such activities to refine this asset's LoF score.

The Facility Plan identifies and discusses a number of additional upgrades and/or detailed condition assessment actions that address other needs (Recommendations CW1 through CW5 of the Facility Plan). Following their implementation (if undertaken by AWWU), the LoF, CoF and risk ratings associated with all clearwell and effluent vault assets should be revisited.

For the 21 assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 8

Chemical Systems

8.1 Overview

The chemical systems include polymer, poly aluminum chloride (PACl), fluoride, on-site hypochlorite generation, and two legacy systems: ferric sulfate and soda ash. Each of these systems is discussed below.

8.1.1 Polymer

Settling aid polymer equipment was installed around 2015 and filter aid polymer equipment was installed around 2010. Figures 8.1 and 8.2 show the location of the polymer systems.

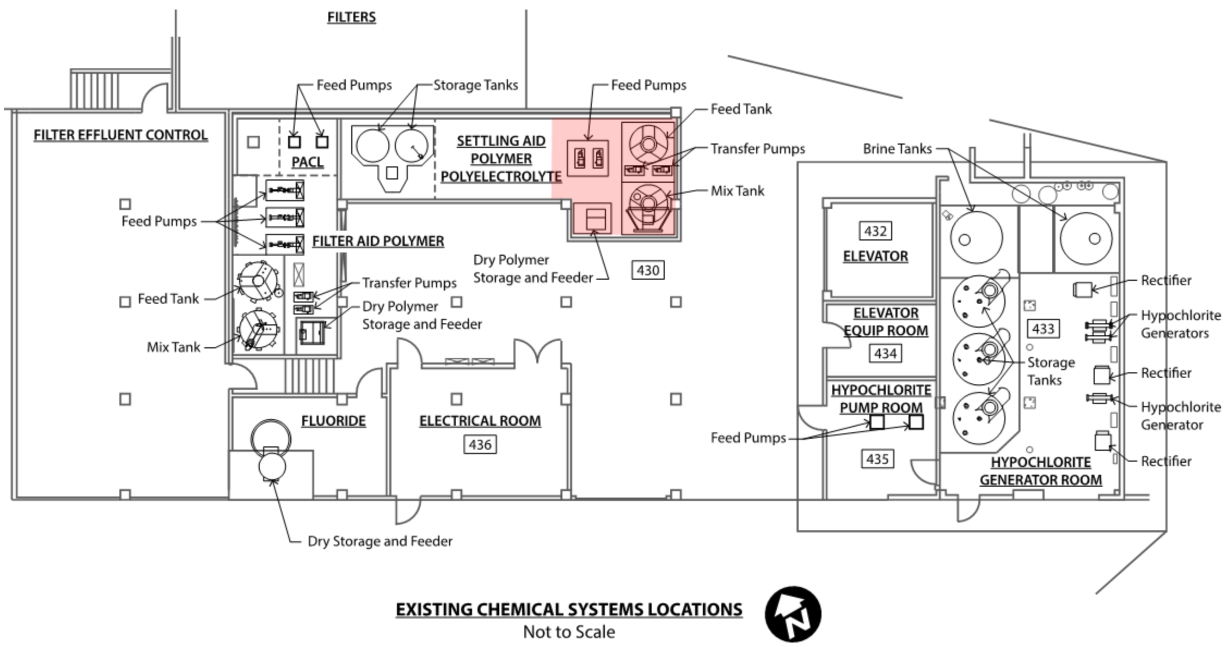

Figure 8.1
Settling Aid Polymer – Location

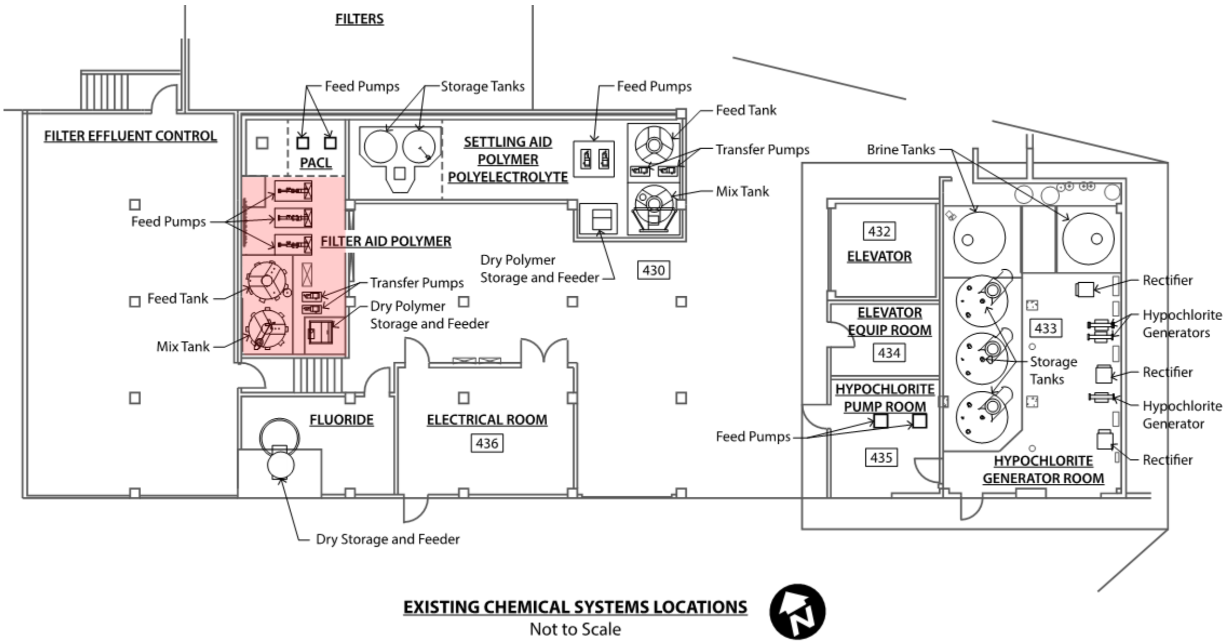

Figure 8.2
Filter Aid Polymer – Location

8.1.2 Poly Aluminum Chloride (PACl)

The PACl system equipment consists of two bulk storage and metering pumps and is located near the filter aid polymer system as shown in Figure 8.3.

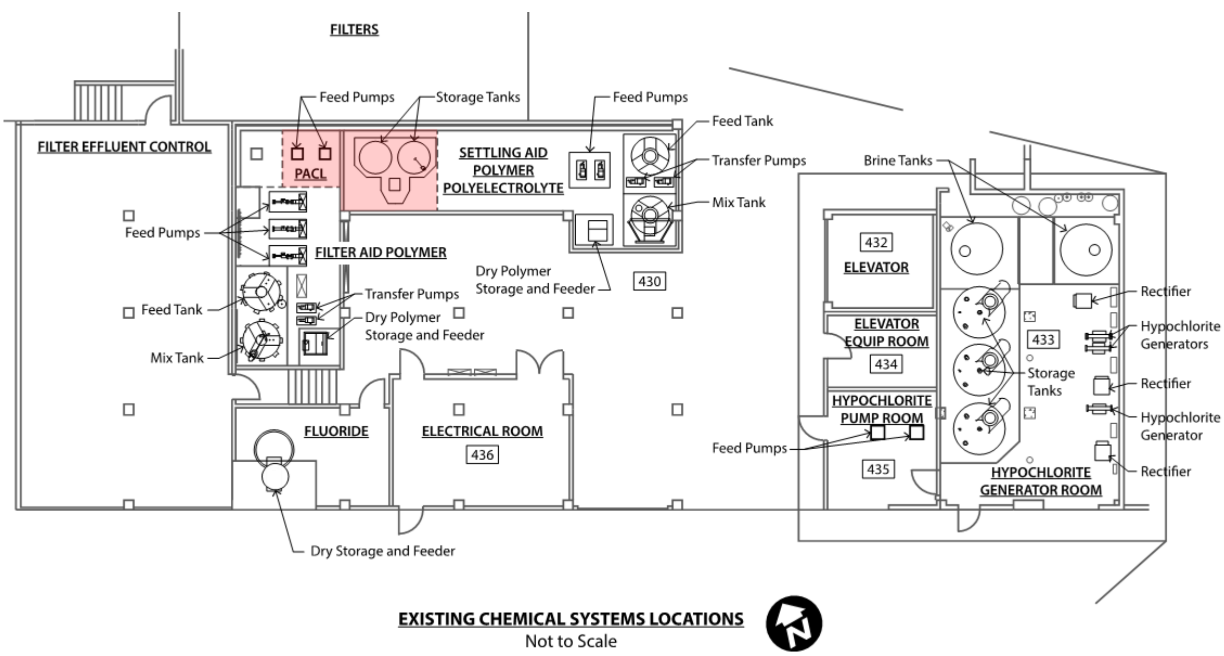

Figure 8.3
Poly Aluminum Chloride – Location

8.1.3 Fluoride

The EWTF has a dry fluoride system. The system was installed in 1988 and consists of a bag loader with dust collector, conical storage hopper, slide gate, dry feeder and mixing tank with mixer. The system is located near the electrical room, as shown in Figure 8.4.

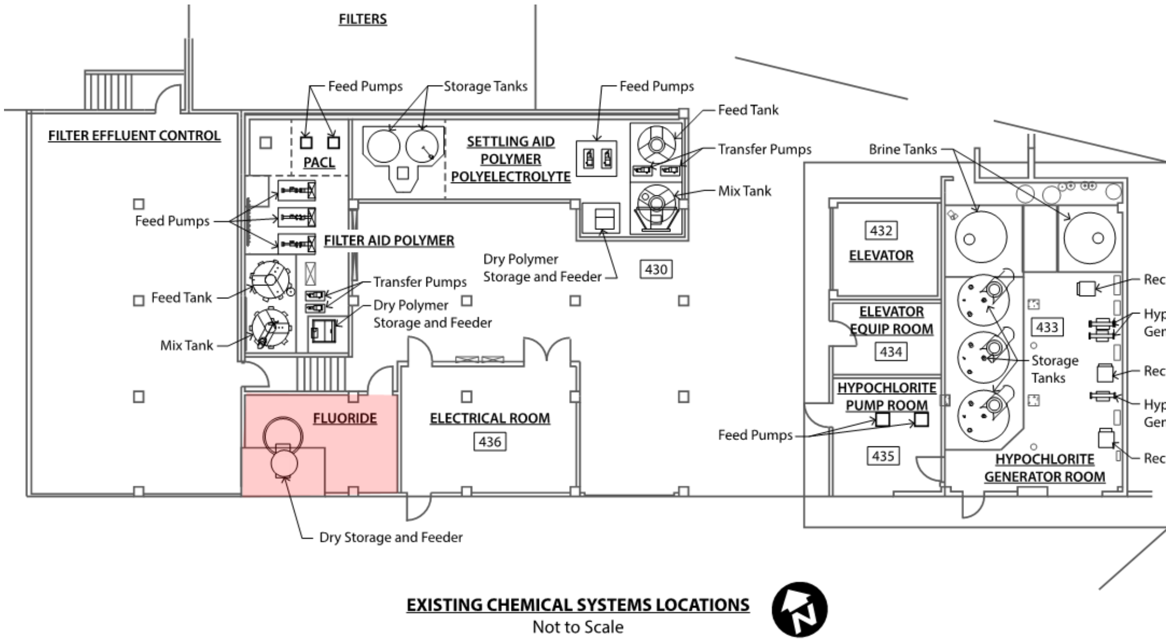

Figure 8.4
Fluoride Equipment – Location

8.1.4 On-Site Hypochlorite Generation

The EWTF has an existing On-site Sodium Hypochlorite Generation System (OSHG) with supporting equipment, which is designed to disinfect finished water. The OSHG system consists of brine storage tanks, horizontal cylinder hypochlorite generators, electrical rectifiers, controls, hypochlorite storage tanks, and peristaltic chemical feed pumps. The equipment was largely installed in 2000. The hypochlorite storage tanks were replaced in 2014. Figure 8.5 shows the location of the OSHG within the facility.

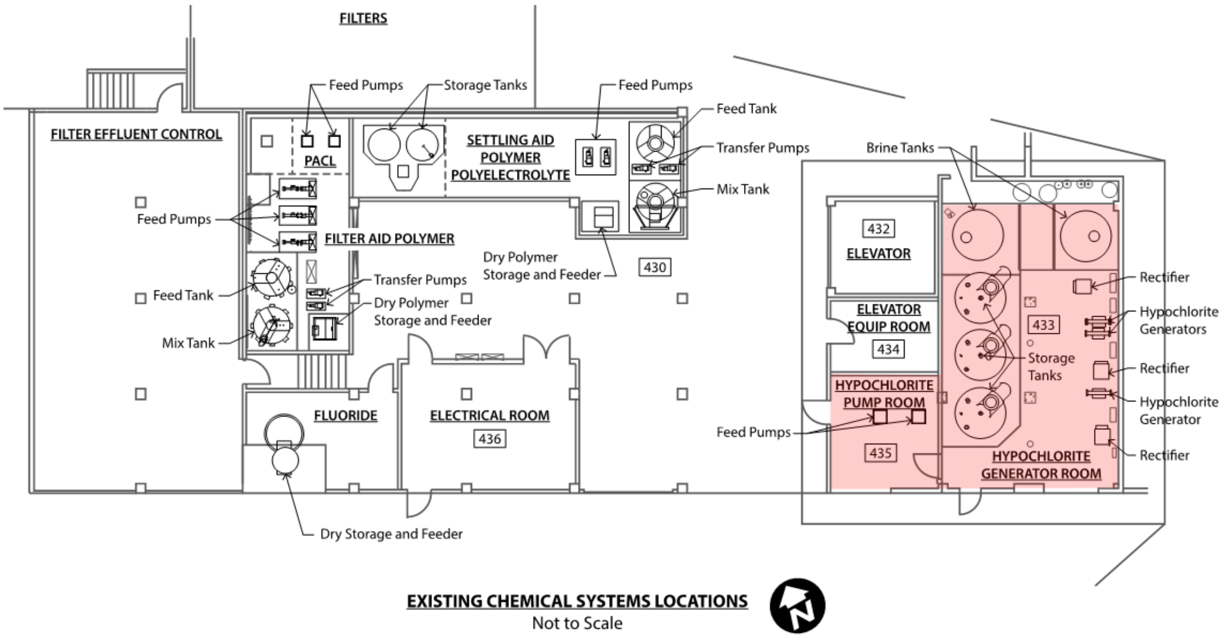

Figure 8.5
Hypochloride Generation Equipment – Location

8.1.5 Ferric Sulfate / Soda Ash (legacy system)

The legacy Ferric Sulfate / Soda Ash systems are located near the flocculation basins as shown in Figure 8.6. They are no longer in use.

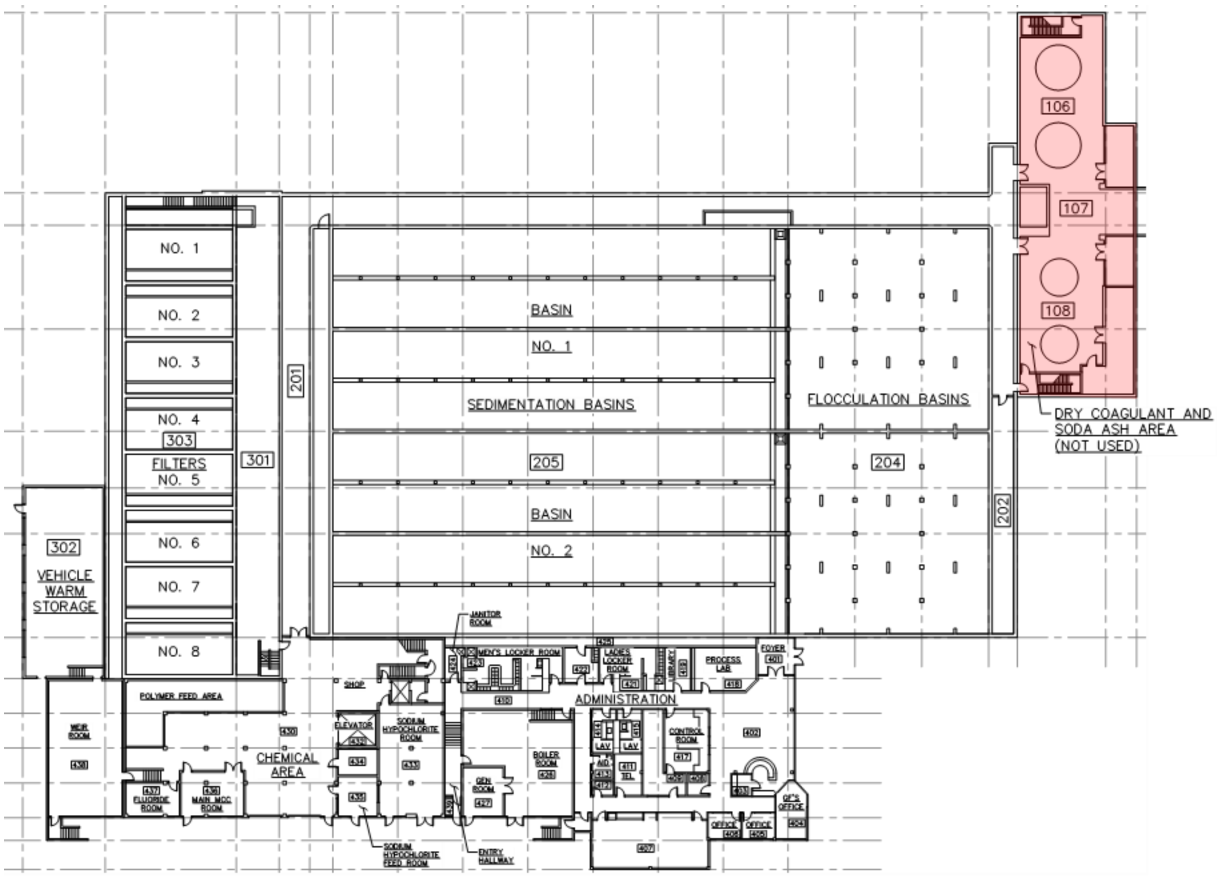

Figure 8.6
Ferric Sulfate and Soda Ash – Location (unused)

8.2 Asset Inventory

The operating chemical systems' assets and components are shown in Table 8.1, along with their LoF, CoF, and Risk scores. Table 8.2 sows the assets and components associated with the two legacy systems (largely for completeness of this document and to capture a complete inventory of all assets installed at the EWTF at the time of this writing).

Table 8.1 Chemical Feed System Assets and Components (operating)

Process Area	Asset	LoF	Confidence	CoF	Risk
Polymer	Dry Polymer Storage Hopper skid	2	High	2	2
Polymer	Dry Polymer Storage Hopper skid	2	High	2	2
Polymer	Dry Polymer Storage Hopper skid	2	High	2	2
Polymer	Mix/ Age Tank	2	High	2	2
Polymer	Mixer No.1 (eductor)	2	High	2	2
Polymer	Mixer No.2 (propeller)	2	High	2	2
Polymer	Feed Tank	2	High	2	2
Polymer	Transfer Pump No.1	2	High	2	2
Polymer	Transfer Pump No.2	2	High	2	2
Polymer	Solution Metering Pump No.1 (Progressing Cavity)	2	High	2	2
Polymer	Solution Metering Pump No.1 (Progressing Cavity)	2	High	2	2
Polymer	Solution Metering Pump No.1 (Progressing Cavity)	2	High	2	2
Polymer	Dry Polymer Storage Hopper skid	1	High	2	1
Polymer	Dry Polymer Storage Hopper skid	1	High	2	1
Polymer	Dry Polymer Storage Hopper skid	1	High	2	1
Polymer	Mix/ Age Tank	1	High	2	1
Polymer	Mixer No.1 (eductor)	1	High	2	1
Polymer	Mixer No.2 (propeller)	1	High	2	1
Polymer	Feed Tank	1	High	2	1
Polymer	Transfer Pump No.1	1	High	2	1
Polymer	Transfer Pump No.2	1	High	2	1
Polymer	Solution Metering Pump No.1 (Progressing Cavity)	1	High	2	1
Polymer	Solution Metering Pump No.1 (Progressing Cavity)	1	High	2	1
Poly Aluminum Chloride (PACl)	Tank	3	High	2	2
PACl	Tank	3	High	2	2
PACl	Tank	3	High	2	2
PACl	Metering Pump No.1 (Peristaltic)	2	High	2	2
PACl	Metering Pump No.2 (Peristaltic)	2	High	2	2
PACl	Metering Pump No.3 (Peristaltic)	2	High	2	2
Sodium Silcoflouride (Fluoride)	Storage Hopper	3	High	3	3
Fluoride	Bag Loader	3	High	3	3
Fluoride	Dust Collector	3	High	3	3
Fluoride	Slide Gate	3	High	3	3
Fluoride	Dry Feeder	3	High	3	3
Fluoride	Solution Tank	3	High	3	3
Fluoride	Solution Tank	3	High	3	3
Fluoride	Ventilation System	3	Medium	4	3
Hypo Generation System	Bulk Storage Tank No. 1 (3,000 gal-FRP)	1	High	2	1
Hypo Generation System	Bulk Storage Tank No. 2 (3,000 gal-FRP)	1	High	2	1
Hypo Generation System	Bulk Storage Tank No. 3 (3,000 gal-FRP)	1	High	2	1
Hypo Generation System	Bulk Storage Tank No. 4 (3,000 gal-Poly)	4	High	2	2
Hypo Generation System	Bulk Storage Tank No. 5 (3,000 gal-Poly)	4	High	2	2
Hypo Generation System	Brine Storage Tank No. 1 (100 gal-Poly)	3	Medium	2	2
Hypo Generation System	Brine Storage Tank No. 2 (100 gal-Poly)	3	Medium	2	2
Hypo Generation System	Water Softener	3	Medium	2	2
Hypo Generation System	Programmable Logic Controller	3	Low	2	2
Hypo Generation System	Programmable Logic Controller	3	Low	2	2
Hypo Generation System	Programmable Logic Controller	3	Low	2	2
Hypo Generation System	Generation System Control Panel	3	Low	2	2
Hypo Generation System	Rectifier	3	Low	3	3
Hypo Generation System	Hypo Generation Cells (2 columns of 3 horiz cylinders)	4	Medium	2	2
Hypo Generation System	Rectifier	3	Low	3	3
Hypo Generation System	Hypo Generation Cells (1 column of 2 horiz cylinders)	4	Medium	2	2
Hypo Generation System	Rectifier	3	Low	3	3
Hypo Distribution System	Metering Pump No. 1 (Peristaltic)	2	High	2	2
Hypo Distribution System	Metering Pump No. 2 (Peristaltic)	2	High	2	2
Hypo Distribution System	Blower	3	Medium	3	3

Table 8.2 Chemical Feed System Assets and Components (not in use)

Process Area	Asset	LoF	Confidence	CoF	Risk
Ferric Sulfate	Super Bag Loader	3	High	2	2
Ferric Sulfate	Loading Hopper	3	High	2	2
Ferric Sulfate	Loading Hopper	3	Medium	2	2
Ferric Sulfate	Loading Hopper (at hopper outlet)	3	Medium	2	2
Ferric Sulfate	Transfer Blower	3	High	2	2
Ferric Sulfate	Storage Silo (North)	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Dry Feeder	0	High	1	N/A
Ferric Sulfate	Solution Tank	3	High	2	2
Ferric Sulfate	Solution Tank	3	High	2	2
Ferric Sulfate	Storage Silo (South)	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Storage Silo	3	High	2	2
Ferric Sulfate	Dry Feeder	0	High	1	N/A
Ferric Sulfate	Solution Tank	3	High	2	2
Ferric Sulfate	Solution Tank	3	High	2	2
Ferric Sulfate	Feed Pump (originally was progressive cavity)	0	High	1	N/A
Ferric Sulfate	Feed Pump (originally was progressive cavity)	0	High	1	N/A
Ferric Sulfate	Feed Pump (originally was progressive cavity)	0	High	1	N/A
Soda Ash	Super Bag Loader	3	High	2	2
Soda Ash	Loading Hopper	3	High	2	2
Soda Ash	Loading Hopper	3	Medium	2	2
Soda Ash	Loading Hopper (at hopper outlet)	3	Medium	2	2
Soda Ash	Transfer BLower	3	High	2	2
Soda Ash	Storage Silo (North)	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Dry Feeder	0	High	1	N/A
Soda Ash	Solution Tank	3	High	2	2
Soda Ash	Solution Tank	3	High	2	2
Soda Ash	Storage Silo (South)	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Storage Silo	3	High	2	2
Soda Ash	Dry Feeder	0	High	1	N/A
Soda Ash	Solution Tank	3	High	2	2
Soda Ash	Solution Tank	3	High	2	2
Soda Ash	Feed Pump (originally was progressive cavity)	0	High	1	N/A
Soda Ash	Feed Pump (originally was progressive cavity)	0	High	1	N/A

8.3 Risk Profile

Of the various chemical systems, only those related to Fluoride and OSGH have assets with a *moderate* risk level. The assets/components that are described by *moderate risk ratings* include:

- Fluoride: All assets
- OSHG: Three rectifiers, and one blower

The Risk profile for the chemical systems are shown in Table 8.3.

Table 8.3 Chemical Systems Risk Distribution

Risk Level	Description per AWWU Policy	Chemical Feed Systems - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	12
2	Minor Risk	69
1	Insignificant Risk	14

8.4 Recommended Actions to Mitigate Risks

For the 12 *moderate* risk assets, eight are associated with the fluoride system and four are associated with the OSHG system. These risks will be effectively mitigated through the capital upgrade recommendations identified as 'FL1' and 'CL1' through 'CL2' in the Facility Plan respectively. This includes the complete replacement of the entire fluoride system and a complete replacement of the entire OSHG system. Initiating the planning, design and construction for these upgrades represent a proactive risk mitigation action. Following their implementation, new assets will replace those currently included and a new corresponding set of LoF, CoF and risk ratings should be developed in conjunction with their installation.

For the 83 assets that have *minor* or *insignificant* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

Section 9

Waste Washwater

9.1 Overview

The waste washwater system conveys used filter backwash water from the filters through the waste washwater tank to the lagoons. The lagoons are discussed further in the Residuals Management section; however, their location with respect to the waste washwater system is shown in Figure 9.1.

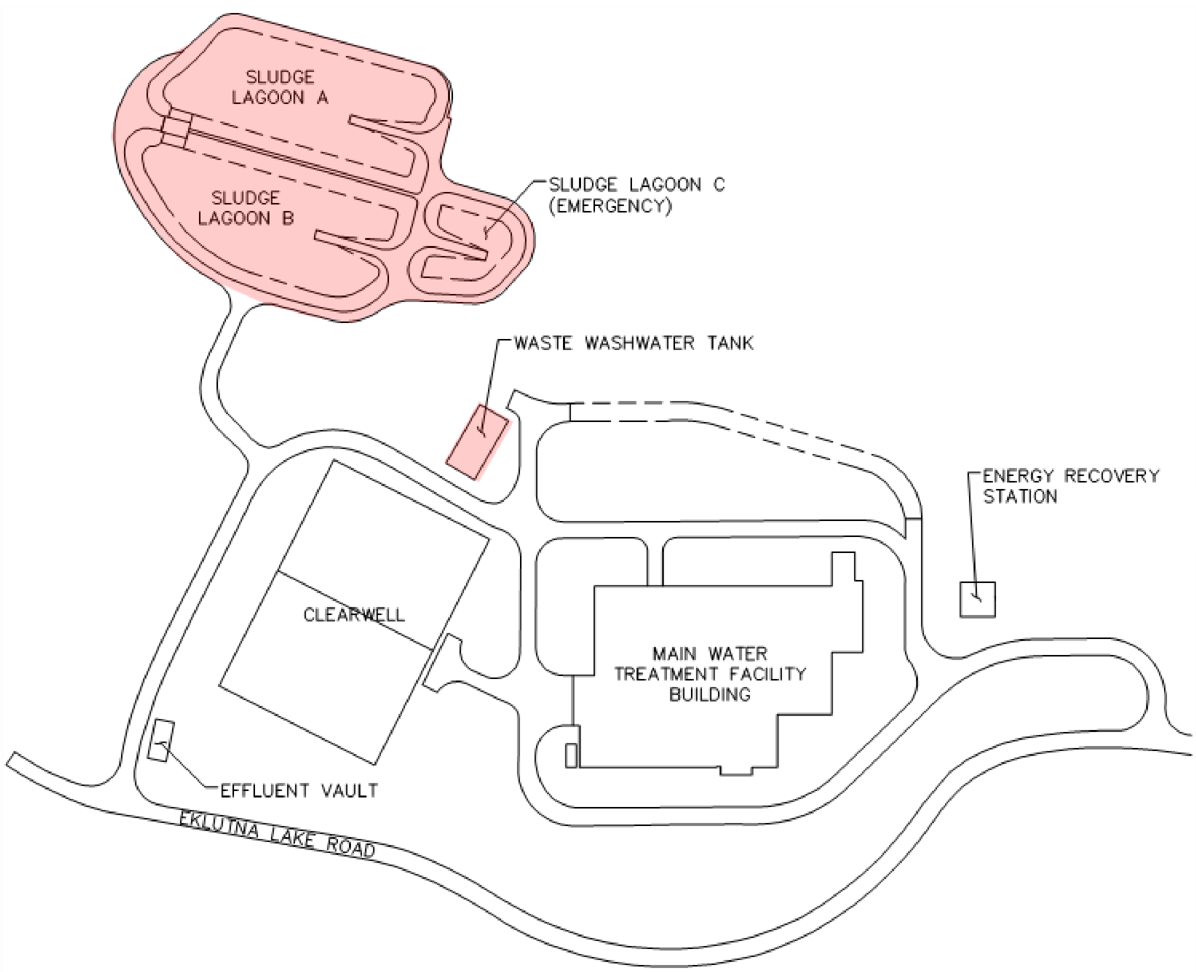

Figure 9.1
Waste Washwater Tank and Lagoons – Location

9.2 Asset Inventory

The Waste Washwater assets and components are shown in Table 9.1 along with their LoF, CoF, and Risk scores.

Table 9.1 Waste Washwater Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Waste Washwater Pump Sta.	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	Medium	2	2
Waste Washwater Tank	24"H x 48"W Sluice Gate	3	Medium	2	2
Waste Washwater Tank	24"H x 48"W Sluice Gate	3	Medium	2	2
Waste Washwater Tank	38"H x 48"W Sluice Gate	3	Medium	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.1 (Vertical Turbine)	3	High	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.2 (Vertical Turbine)	2	High	2	2
Waste Washwater Pump Sta.	Waste Washwater Pump No.3 (Vertical Turbine)	4	High	2	2
Waste Washwater Pump Sta.	10" Backpressure Valve	3	High	2	2

9.3 Risk Profile

The Risk profile for the Waste Washwater process is shown in Table 9.2. No assets were found to have a risk rating other than *minor*.

Table 9.2 Waste Washwater Risk Distribution

Risk Level	Description per AWWU Policy	Waste Washwater Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	0
2	Minor Risk	8
1	Insignificant Risk	0

9.4 Recommended Actions to Mitigate Risks

For the eight assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

Section 10

Residuals Management

10.1 Overview

The EWTF's residual management system consists of two duty lagoons and a third lagoon used for emergency purposes. The system also has three decant pumps. These lagoons treat waste washwater from the filter backwash system and sludge from the sedimentation basins. Their location is shown in Figure 10.1 below.

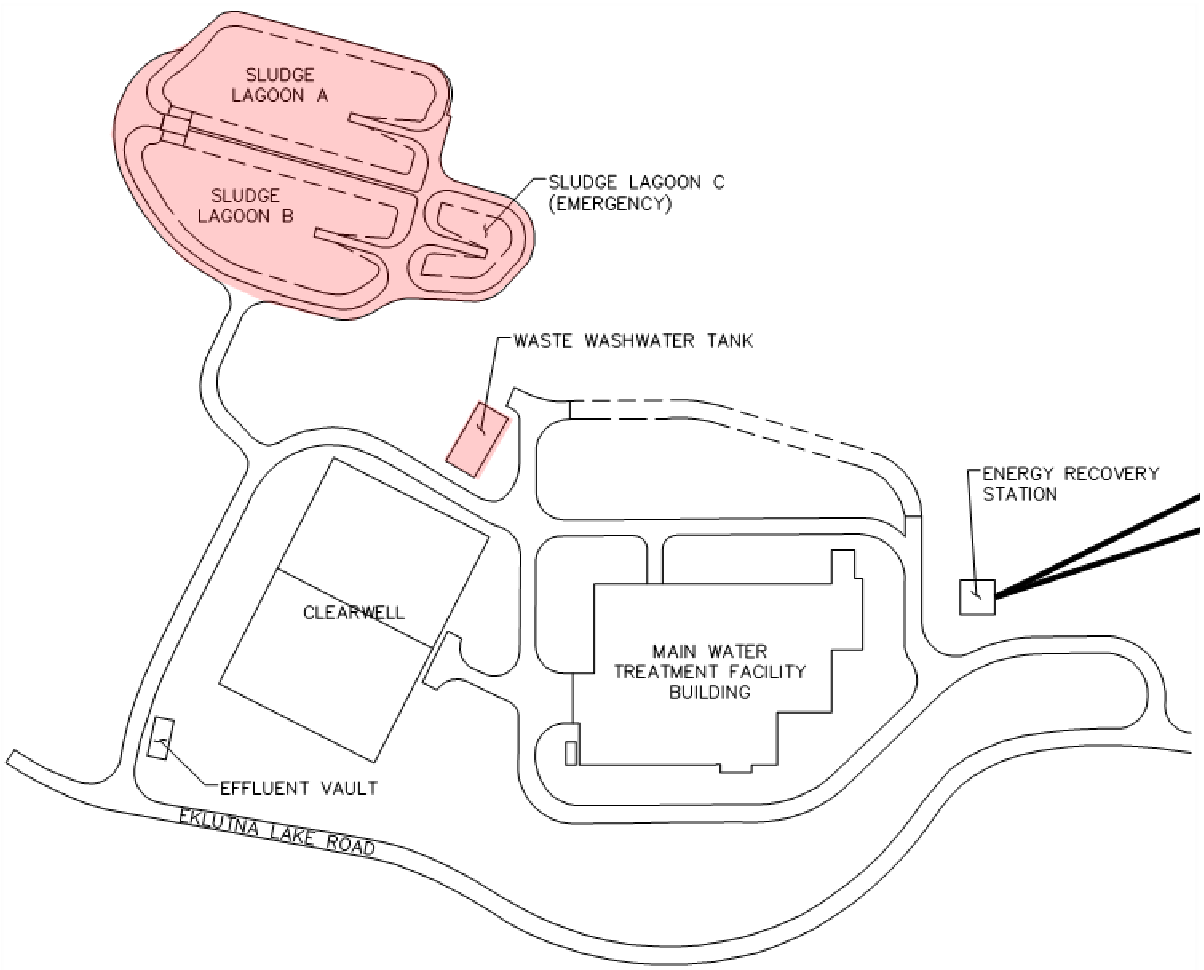

Figure 10.1
Residuals Management Facilities – Location

10.2 Asset Inventory

The Residuals Management assets and components are shown in Table 10.1 along with their LoF, CoF, and Risk scores.

Table 10.1 Residuals Management Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Lagoon Decant PS	Exposed, Major Valves (that are not listed elsewhere) & Pipe	3	Medium	2	2
Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on NE side)	3	High	2	2
Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on SW side)	3	High	2	2
Lagoon Decant PS	Lagoon Decant Return Pump No. 1 (Vertical Turbine)	4	High	3	3
Lagoon Decant PS	Lagoon Decant Return Pump No. 2 (Vertical Turbine)	4	High	3	3
Lagoon Decant PS	Lagoon Decant Return Pump No. 3 (Vertical Turbine)	2	High	3	2

10.3 Risk Profile

Two of the lagoon decant return pumps were ranked as *moderate* risk within Residuals Management due primarily to higher frequency of parts replacement and resources associated with maintaining the pumps in an operational state.

The Risk profile for the Residuals Management process is shown in Table 10.2.

Table 10.2 Residuals Management Risk Distribution

Risk Level	Description per AWWU Policy	Residuals Management - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	2
2	Minor Risk	4
1	Insignificant Risk	0

10.4 Recommended Actions to Mitigate Risks

The two lagoon decant pumps (the two assets rated as *moderate* risk) should be replaced. Their risk will be mitigated through the capital upgrade recommendation identified as ‘RM1’ in the Facility Plan. Initiating the planning, design and construction for this upgrade represents a proactive risk mitigation action.

For the four assets that have *minor* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 11

Site and Facilities

11.1 Overview

The site and facilities (i.e. buildings) process is described by major systems that support the facility as a whole. Generally, these consist of building electrical and building mechanical systems as well as service systems such as domestic water and remaining structures (e.g. building envelope) that are not grouped with a particular major process.

11.2 Asset Inventory

The Site and Facilities assets and components are shown in Table 11.1, along with their LoF, CoF, and Risk scores. The Site and Facilities process is divided into general site (e.g. parking, fencing), Building Electrical, Building Mechanical/ HVAC, and utility and drinking water vaults.

Table 11.1 Site and Facilities Assets and Components

Process Area	Asset	LoF	Confidence	CoF	Risk
Parking/Roads	Asphalt surface w/concrete curb gutter	3	high	2	2
Fencing/Gates	Chainlink fence w/barbwire, auto gates	3	high	2	2
Street Lights		1	high	2	1
Landscaping	Grass, trees, shrubs, wild growth areas	1	high	2	1
Grounddowns/Drainage		1	high	2	1
Storm water system	Surface drainage, culverts, piping	3	medium	2	2
Building Electrical	Interior Lighting	3	Medium	2	2
Building Electrical	Exterior Lighting	3	Medium	2	2
Building Electrical	Service Entrance	4	High	2	2
Building Electrical	Panelboards	3	Medium	2	2
Building Electrical	Transfer Switches	3	Medium	2	2
Building Electrical	Interior Lighting	2	Medium	2	2
Building Electrical	Panelboards	2	Medium	2	2
Building Electrical	Panelboards	2	Medium	2	2
Building Electrical - Effluent Vault	Interior Lighting	3	Medium	2	2
Building Electrical - Effluent Vault	Motor Control Centers	3	Medium	2	2
Building Electrical - Effluent Vault	Panelboards	3	Medium	2	2
Building Electrical - Lagoon Pump Station	Interior Lighting	3	Medium	2	2
Building Electrical - Lagoon Pump Station	Exterior Lighting	3	Medium	2	2
Building Electrical - Lagoon Pump Station	Motor Control Centers	3	Medium	2	2
Building Electrical - Lagoon Pump Station	Panelboards	3	Medium	2	2
Building Electrical - Operations Area	Interior Lighting	3	Medium	2	2
Building Electrical - Operations Area	Service Entrance	4	Medium	2	2
Building Electrical - Operations Area	Switchboards	3	Medium	2	2
Building Electrical - Operations Area	Panelboards	3	Medium	2	2
Building Electrical - Operations Area	Motor Control Centers	3	Medium	2	2
Building Electrical - Operations Area	Standby Power Generator	1	High	2	1
Building Electrical - Operations Area	Automatic Transfer Switches	1	High	2	1
Building Electrical	Interior Lighting	3	Medium	2	2
Building Electrical	Motor Control Centers	3	Medium	2	2
Building Electrical	Panelboards	3	Medium	2	2
Building Electrical	Dry Type Transformer	3	Medium	2	2
Builiding Electrical - Energy Recovery	Interior Lighting	3	Medium	2	2
Builiding Electrical - Energy Recovery	Exterior Lighting	3	Medium	2	2
Builiding Electrical - Energy Recovery	Motor Control Center	3	Medium	2	2
Builiding Electrical - Energy Recovery	Panelboards	3	Medium	2	2
Builiding Electrical - Energy Recovery	Switchgear	3	Medium	3	3
Builiding Electrical - Energy Recovery	Dry Type Transformer	3	Medium	2	2
Building Mechanical	Air Handling Units	3	Medium	2	2
Building Heat & Vent	Exhaust fans	2	Medium	2	2
Building HVAC	Boiler	2	Medium	3	2
Building HVAC	Boiler	2	Medium	3	2
Building HVAC	Air Handler	3	High	2	2
Building HVAC	Air Handler	3	High	2	2
Building HVAC	Air Handler	3	High	2	2
Building HVAC	AC System	1	High	2	1
Building HVAC	Miscellaneous exhaust fans	2	Medium	2	2
Building HVAC		2	Medium	2	2
Building HVAC - Energy Recovery	Heaters & Fans	2	Medium	2	2
Building Services	Water Heater	1	High	2	1
Building Mechanical - Effluent Vault	HVAC System (fans and heaters)	2	Medium	2	2
Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	3	High	2	2
Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	3	High	2	2

11.3 Risk Profile

One Building Electrical process area asset, the switchgear, was rated as *moderate* risk, this is primarily driven by its elevated impact associated with the 'reliability & financial impacts' criticality factor.

The Risk profile for the Site and Facilities process is shown in Table 11.2.

Table 11.2 Site and Facilities Risk Distribution

Risk Level	Description per AWWU Policy	Site and Facilities - Quantity of Assets/Components
5	Catastrophic Risk	0
4	Major Risk	0
3	Moderate Risk	1
2	Minor Risk	45
1	Insignificant Risk	7

11.4 Recommended Actions to Mitigate Risks

Only one asset (electrical switchgear) was rated as a *moderate* risk. The Facility Plan evaluated additional electrical items such as the primary and individual plant electrical service connections, which ultimately feed down to the electrical switchgear level. The Facility Plan recommends a series of large electrical upgrades that would, if implemented, together impact the overall risk rating of the plant switchgear. Initiating the planning, design and construction for the capital upgrade recommendations identified as 'ELEC1 through ELEC4' in the Facility Plan represents a proactive risk mitigation action.

For the 52 assets that have *minor* or *insignificant* risk, there are no immediate risk mitigation actions recommended beyond continuing to engage in strategic asset management planning activities. Such activities (already being performed by AWWU) appear to satisfy AWWU's policy on risk response (**Appendix A**).

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Section 12

Plant-Wide Summary

12.1 Eklutna Overall Risk Profile

The Risk profile for the entire EWTF is shown in Table 12.1 and includes the distribution (i.e. quantity of assets/components) that were described by the various combinations of LoF and CoF scores, resulting in their respective risk rating levels. This table represents a compilation of the materials presented in Sections 2 through 11.

Table 12.1 Overall EWTF Risk Distribution

Risk Level	Description and Mitigation Requirements	Quantity
5	Catastrophic Risk. Requires immediate action within 60 days.	0
4	Major Risk. Conduct thorough condition assessment and mitigate risk within 1 year.	0
3	Moderate Risk. Conduct condition assessment. Risk must be mitigated by most cost-effective method within 1-2 years.	26
2	Minor Risk. Risk must be mitigated by most cost-effective method within 2-5 years.	257
1	Insignificant Risk. No immediate action is necessary. Replacement will be scheduled in accordance with optimal life cycle cost.	66

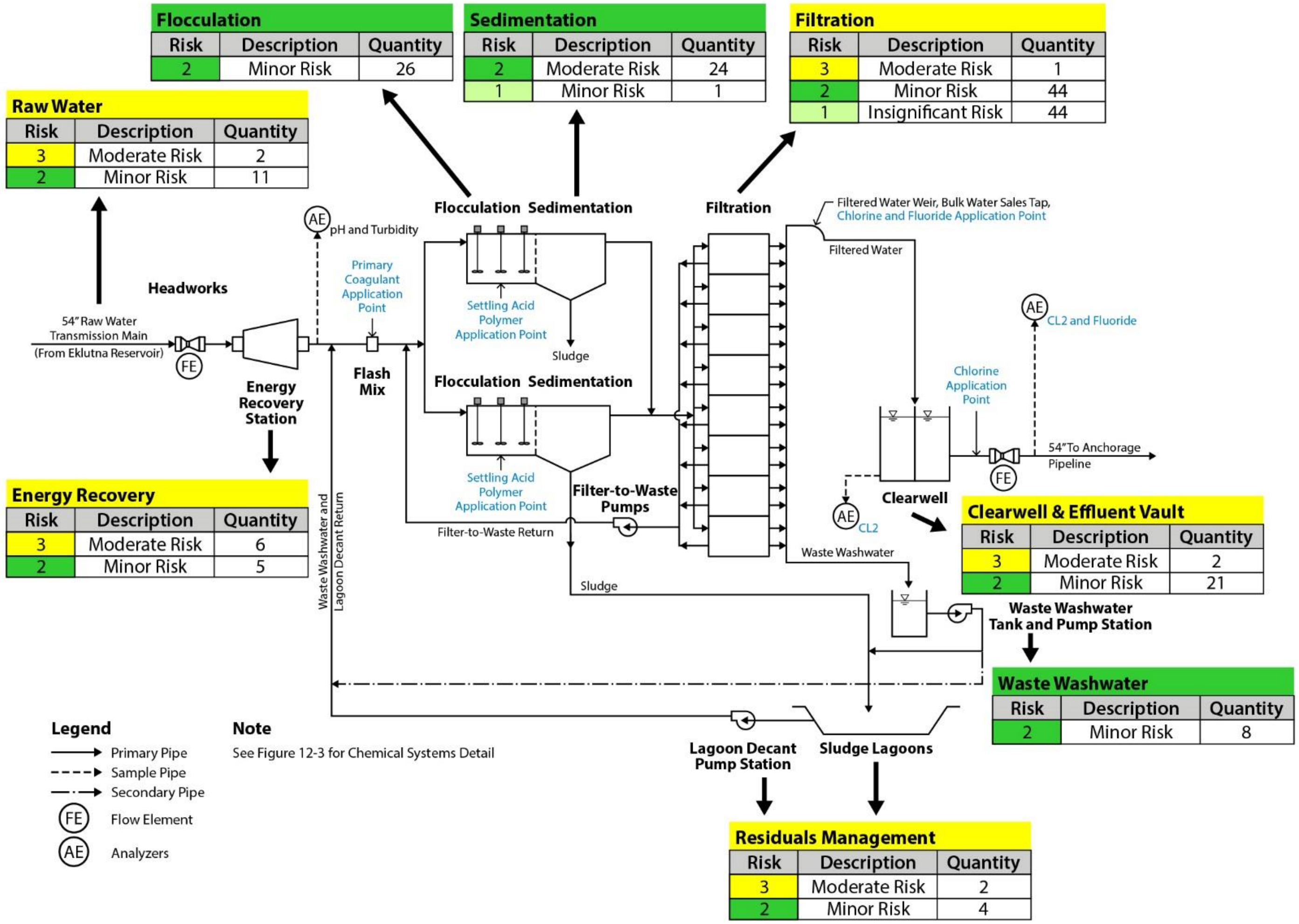
Figure 12.1 is an alternate presentation of the Risk profile showing a more detailed breakdown of each individual intersection of Likelihood and Consequence of Failure.

Likelihood of Failure	Consequence of Failure 1	2	3	4	5
5	0	0	5	0	0
4	0	24	6	0	0
3	0	197	13	2	0
2	0	32	4	0	0
1	0	66	0	0	0

Figure 12.1
EWTF Risk Distribution

12.2 Process-Based Risk Summary

Figures 12.2 through 12.4 have been prepared to summarize the overall Risk profile information by process and/or site area. This is intended to provide AWWU with a concise synopsis of the highest risk assets across each process and facilitate further discussions on future mitigation measures at the enterprise level.



Raw Water

Risk	Description	Quantity
3	Moderate Risk	2
2	Minor Risk	11

Flocculation

Risk	Description	Quantity
2	Minor Risk	26

Sedimentation

Risk	Description	Quantity
2	Moderate Risk	24
1	Minor Risk	1

Filtration

Risk	Description	Quantity
3	Moderate Risk	1
2	Minor Risk	44
1	Insignificant Risk	44

Energy Recovery

Risk	Description	Quantity
3	Moderate Risk	6
2	Minor Risk	5

Clearwell & Effluent Vault

Risk	Description	Quantity
3	Moderate Risk	2
2	Minor Risk	21

Waste Washwater

Risk	Description	Quantity
2	Minor Risk	8

Residuals Management

Risk	Description	Quantity
3	Moderate Risk	2
2	Minor Risk	4

EWTF PROCESS FLOW DIAGRAM
No Scale

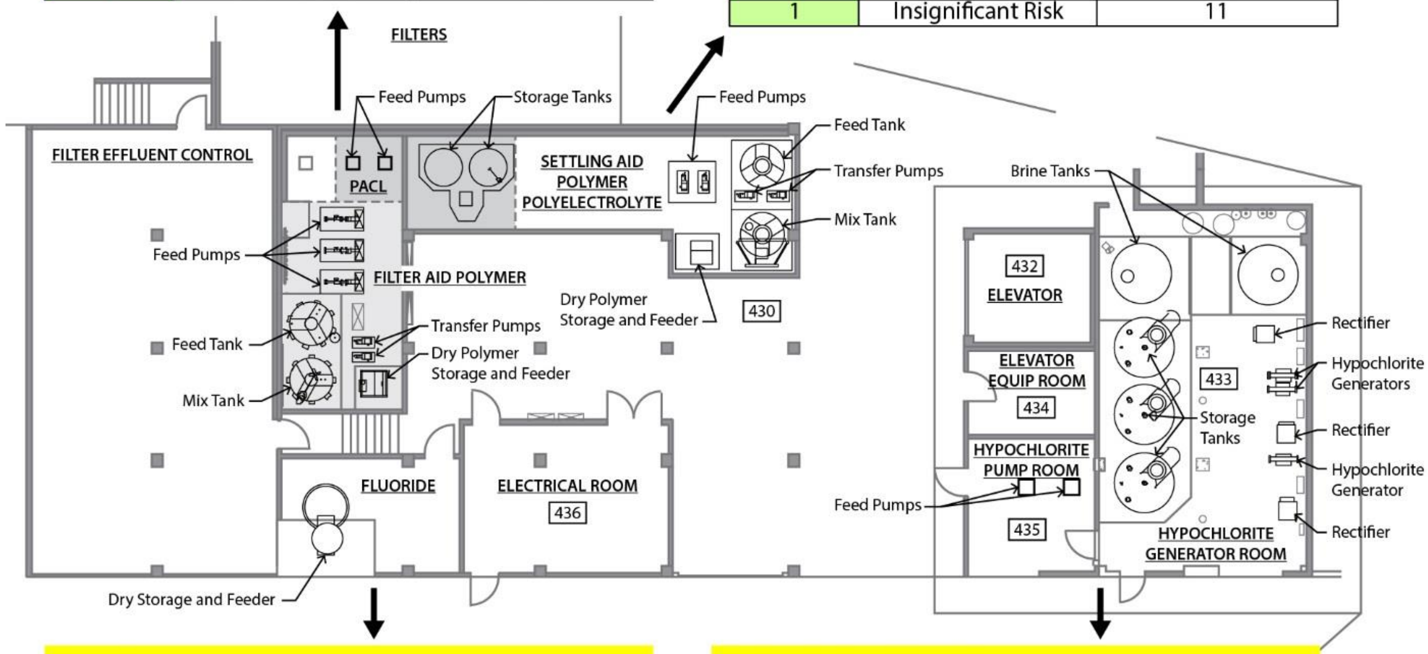
Figure 12.2
EWTF – Risk Results for Treatment Processes (to asset level only)

PACl

Risk Level	Description per AWWU Policy	Quantity of Assets/ Components
2	Minor Risk	6

Polymer

Risk Level	Description per AWWU Policy	Quantity of Assets/ Components
2	Minor Risk	12
1	Insignificant Risk	11



Fluoride

Risk Level	Description per AWWU Policy	Quantity of Assets/ Components
3	Moderate Risk	8

On-Site Sodium Hypochlorite

Risk Level	Description per AWWU Policy	Quantity of Assets/ Components
3	Moderate Risk	4
2	Minor Risk	13
1	Insignificant Risk	3

Note: Legacy chemical system not shown.

EXISTING CHEMICAL SYSTEMS LOCATIONS

Not to Scale

Figure 12.3
EWTF – Risk Results for Chemical Processes (to Asset level only)

Residuals Management

Risk	Description	Quantity
3	Moderate Risk	2
2	Minor Risk	4

Site and Facilities

Risk	Description	Quantity
3	Moderate Risk	1
2	Minor Risk	45
1	Insignificant Risk	7

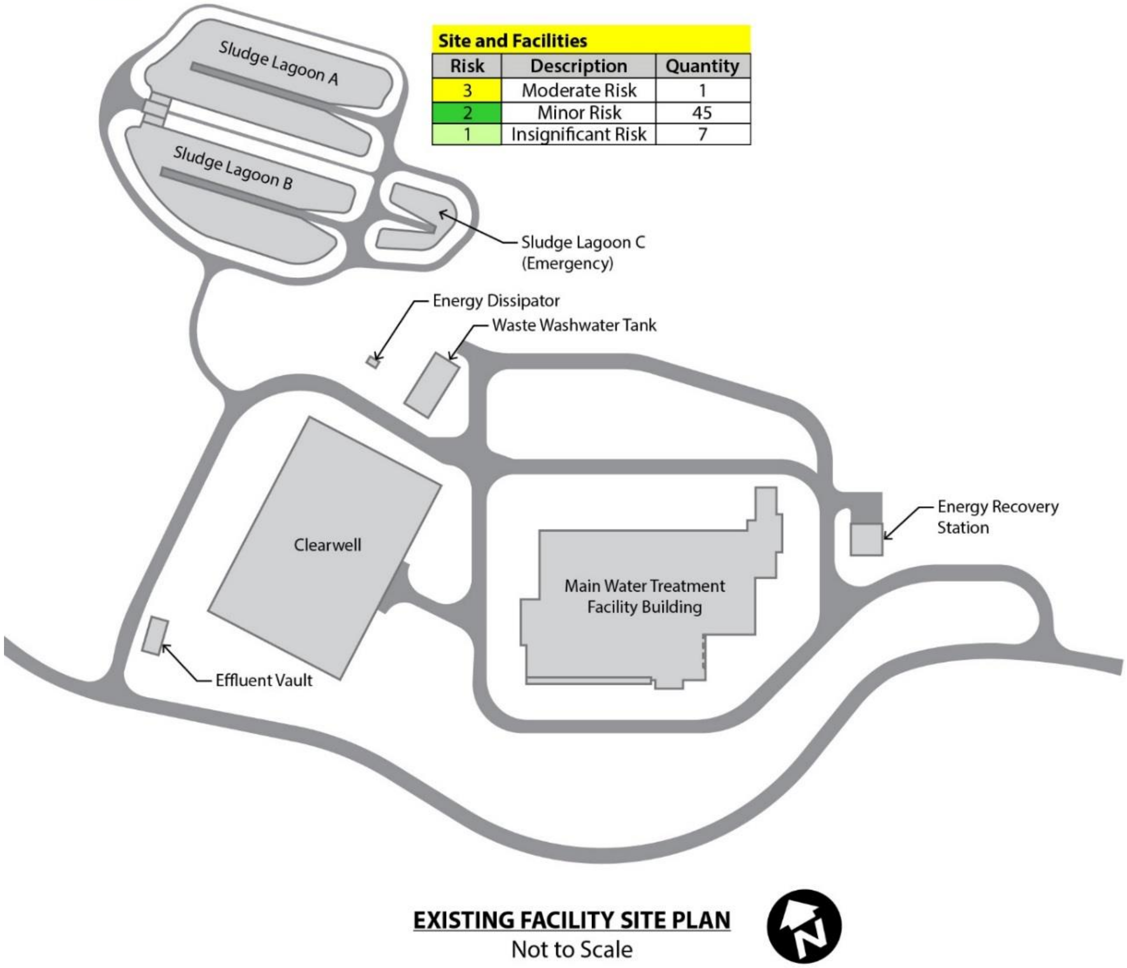


Figure 12.4
EWTF – Risk Results for Site and Facilities Processes (to Asset level only)

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Appendix A

AWWU Board Resolution No. 2011-10

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AUTHORITY BOARD APPROVED

Date: November 2, 2011

ANCHORAGE WATER AND WASTEWATER UTILITY
BOARD RESOLUTION
No. 2011-10

Meeting Date: November 2, 2011

Risk Management Policy for AWWU

WHEREAS, AWWU is prescribed under Article XVI, Section 16.01, of the Anchorage Charter, to operate in accordance with the general standards common to utilities providing the same utility service; and,

WHEREAS, industry practice is to develop a common risk framework for use across the various business units of the Utility; and,

WHEREAS, the Board, on May 5, 2010, provided strategic direction for AWWU, intended to provide long-term direction with a horizon of five to fifteen years in the future, to guide development of the Utility; and,

WHEREAS, the Board in 2010 adopted the strategic goal to optimize Utility processes to advance asset management through incorporation of best business practices, and improved efficiencies to promote sustainability; and,

WHEREAS, the Anchorage Assembly, through Ordinance AO 2011-24(S), delegated to the Board of Directors the duties to make recommendations to the Mayor regarding the Utility's capital improvement program and maintenance strategy and operations, as well the Utility's strategic plan operating budget; and,

WHEREAS, the concept of risk management may be used to prioritize the expenditure of capital program funds by focusing attention on assets determined to provide the highest level of risk to Utility operations; and,

WHEREAS, the level of risk associated with operation of a utility asset is gauged by the probability of failure of that asset to function effectively in conjunction with the magnitude of consequences related to that failure; and,

WHEREAS, AWWU faces increased risk over the near term as physical and information infrastructure assets age to the point of reaching their estimated useful lives; and,

WHEREAS, AWWU is proceeding through an evaluation of risk of asset failure of all of its infrastructure on an asset-class by asset-class; and,

WHEREAS, an effective risk management policy assigns asset management actions and time frames in accordance with identified levels of risk of asset failure.

NOW, THEREFORE, THE AWWU BOARD OF DIRECTORS RESOLVES:

AWWU's policy is to incorporate a consistent Utility-wide approach for the assessment and treatment of risk, using a consistent risk management approach; and, to integrate the concept of risk management within the planning and business case processes used to set the level of risk retention the Utility is prepared to adopt.

AWWU will:

- Apply appropriate resources to analyze and manage risks that have material impact on achieving Utility objectives.
- Give full consideration to the balance between risk retention, rates, and financial health measures (e.g., level of debt) in recommending funding levels for capital improvement programs and maintenance strategies.

To achieve this, the following concepts shall be uniformly applied across asset classes:

- Management will take action to mitigate risk of asset failure corresponding to the level of risk assigned to a particular asset in terms of consequence and likelihood of failure of that asset.
- For each class of assets, management will develop a level of risk matrix which scores the combination of likelihood and consequences in terms of insignificant, minor, moderate, major or catastrophic levels of risk
- For each class of assets, management will develop likelihood descriptions for five levels of likelihood (improbable, low, medium, high and very high), based on the probability of the failure of the asset.
- For each class of assets, management will develop consequence categories for five levels of consequence (low, medium, medium-high, high and extreme), based on potential impacts to AWWU resulting from a failure of the asset.
- Risk mitigation actions shall be implemented in accordance with the following timeframes, associated with levels of risk defined for each class of assets:
    1. Risks assessed to be insignificant are tolerable and no immediate action is necessary; replacement of an asset will be scheduled in accordance with optimal life cycle cost.
    2. Risks deemed to be minor are conditionally tolerable if the Utility determines cost effectiveness of asset replacement or risk mitigation via other cost effective controls are implemented within a 2-5 year timeframe.
    3. Risks assessed to be moderate are conditionally tolerable provided AWWU undertake preliminary condition assessment and determine cost effectiveness of replacement or adoption of other risk mitigation controls within the next 1-2 year timeframe.
    4. Risks assessed to be major are intolerable and require complete condition assessment and a business case analysis for asset replacement or adoption of other risk mitigation controls within a 1 year timeframe.

5. Risks assessed to be catastrophic risk are intolerable and require action immediately to eliminate the risk or reduce it through appropriate mitigation to an acceptable level within 60 days.

- Risk mitigation actions will be defined within each asset class to achieve a reduction in risk score and level of risk sufficient to meet a tolerable level of risk retention.

Documentation of this approach will be through issuance of asset management plans for each asset class in which this risk management approach is detailed. Plans will be reviewed on an annual basis by the Board in the discharge of its duties prescribed under Charter and Ordinance. Plans will be adjusted should policy guidance be revised and the level of risk retention the Utility is willing to assume change. The General Manager will hold Division Directors (Executives) accountable for implementing the Utility-wide risk management policy and the outcomes outlined within asset management plans within their divisions. The Executives of the Utility will, as part of Utility planning processes, carry out and approve risk assessments made consistent with this policy; plus, review status of action plans for mitigation of risk, and identify any potential gaps involved in risk assessments, business case evaluations, or other decision-making tools carried out by staff.

Approved by the Anchorage Water & Wastewater Utility Board of Directors this 2nd day of November, 2011.

[signature] 2 Nov 2011

Timothy M. Sullivan, Sr. — Date
Chair, AWWU Board of Directors

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Appendix B

Inventory with Likelihood of Failure and Consequence of Failure Scores

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Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

		GENERAL				LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
ENERGY RECOVERY																		
0-M-1	ER-001	Energy Recovery	(P-4 Plant Influent Pipe)	54" Venturi		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	ER-002	Energy Recovery	Generator Feed & Bypass	Exposed, Major Valves (that are not listed elsewhere) & Pipe		3	Medium	10 to 20 years	2	4	2	3	3	3	3	Mitigate w/in 1-2 years		<< Seismic Restraint hoops on pipe supports?
0-V-10	ER-003	Energy Recovery	Turbine Generator Feed	42" Isolation Butterfly Valve (BV)	Valve & Elec Actuator	4	High	10 to 20 years	2	2	2	4	3	3	3	Mitigate w/in 1-2 years		
0-V-??	ER-004	Energy Recovery	Turbine Generator Feed	Needle Valve	Valve & Elec Actuator	5	Medium	5 to 10 years	2	2	2	4	3	3	3	Mitigate w/in 1-2 years		Part of Turbine Generator Vendor furnished package- and should all be inspected by a specialist
0-V-??	ER-005	Energy Recovery	Turbine Generator Feed	Needle Valve	Valve & Elec Actuator	5	Medium	5 to 10 years	2	2	2	4	3	3	3	Mitigate w/in 1-2 years		Part of Turbine Generator Vendor furnished package- and should all be inspected by a specialist
0-?-?	ER-006	Energy Recovery	Turbine Generator	750 KW Hydro Turbine		5	Low	n/a	2	2	2	4	3	3	3	Mitigate w/in 1-2 years		Part of Turbine Generator Vendor furnished package- and should all be inspected by a specialist
0-V-11	ER-007	Energy Recovery	Turbine Generator Bypass	30" Isolation BV	Valve & Elec Actuator	3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-PRV-3	ER-008	Energy Recovery	Turbine Generator Bypass	30" Sleeve Valve	Valve & Elec Actuator	3	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	ER-009	Energy Recovery	Turbine Generator & ERS Controls	Control Panel (including hardware/ software)		4	Medium	n/a	2	2	2	4	5	3	3	Mitigate w/in 1-2 years		
0-C-1	ER-010	Energy Recovery	Bridge Crane - Structure	10 Ton Bridge Crane	Structure	2	Medium		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-C-1	ER-011	Energy Recovery	Bridge Crane - Equipment	10 Ton Bridge Crane	Equipment	2	Low	n/a	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
RAW WATER																		
	RW-001	Raw Water	Tunnel	Exposed 54" Raw Water Pipe		3	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Seismic restraint clamp recommended, see Facility Plan.
1-MX-1	RW-002	Raw Water	Flash Mixer	Mixing Nozzle		3	Low	0 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-PLV-1	RW-003	Raw Water	Flash Mixer	6" Pressure Control Valve		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-BV-4	RW-004	Raw Water	Flash Mixer	6" Butterfly Valve		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-M-6	RW-005	Raw Water	Flash Mixer	6" Flow Meter		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-M-5	RW-006	Raw Water	Wash Water Return/ Lagoon Decant	12" Flow Meter		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RW-007	Raw Water	Lake Diversion Tunnel	8,690 LF 72" PCCP pipe in 9' tunnel		5	Low	50	5	2	2	5	3	3	3	Mitigate w/in 1-2 years		dewatering & internal pipe inspection needed to provide current condition level
	RW-008	Raw Water	Pipe P-4	32,304 LF 54" and 60" MLCP pipe		5	Low	50	5	2	2	5	3	3	3	Mitigate w/in 1-2 years		resume test station readings
	RW-009	Raw Water	Intake - Flow Control	Kubota 54" Ring Follower Valve		3	Low		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RW-010	Raw Water	Intake - Flow Control	Pratt 54" Butterfly Valve		3	Low		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RW-011	Raw Water	Intake - Flow Control	Hydraulic Power Supply		2	Low		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RW-012	Raw Water	Raw Water Transmission - Flow Control	Pratt 54" Butterfly Valve		3	Low		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RW-013	Raw Water	Raw Water Transmission - Flow Control	Hydraulic Power Supply		3	Low		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		food grade oil only (sump return)
1-T-9	RW-014	Raw Water	Powdered Activated Carbon (PAC)	Storage Hopper		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-BL-9	RW-015	Raw Water	PAC	Bag Loader		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-DC-1	RW-016	Raw Water	PAC	Dust Collector		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-SCV-5	RW-017	Raw Water	PAC	Slide Gate		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-FD-10	RW-018	Raw Water	PAC	Dry Feeder		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-T-10	RW-019	Raw Water	PAC	Slurry Tank		0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place
1-MX-6	RW-020	Raw Water	PAC	Slurry Tank	Mixer	0	High	n/a	1	1	1	1	1	1	0	remove asset		abandoned in place

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

GENERAL						LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
Flocculation & Sedimentation																		
Flocculation Basin No. 1 (South Basin)																		
2-BV-1	FLC-B1-001	Flocculation	Flocc Basin No. 1	24" Influent Butterfly Valve (BV)		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-2	FLC-B1-002	Flocculation	Flocc Basin No. 1	24" Influent BV		3	Medium	6 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-3	FLC-B1-003	Flocculation	Flocc Basin No. 1	24" Influent BV		3	Medium	7 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-4	FLC-B1-004	Flocculation	Flocc Basin No. 1	24" Influent BV		3	Medium	8 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-MX-1	FLC-B1-005	Flocculation	Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-2	FLC-B1-006	Flocculation	Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-3	FLC-B1-007	Flocculation	Flocc Basin No. 1 -Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-4	FLC-B1-008	Flocculation	Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-5	FLC-B1-009	Flocculation	Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-6	FLC-B1-010	Flocculation	Flocc Basin No. 1 -Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-7	FLC-B1-011	Flocculation	Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-8	FLC-B1-012	Flocculation	Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-9	FLC-B1-013	Flocculation	Flocc Basin No. 1 -Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
Flocculation Basin No. 2 (North Basin)																		
2-BV-5	FLC-B2-001	Flocculation	Flocc Basin No. 2	24" Influent Butterfly Valve (BV)		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-6	FLC-B2-002	Flocculation	Flocc Basin No. 2	24" Influent BV		3	Medium	6 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-7	FLC-B2-003	Flocculation	Flocc Basin No. 2	24" Influent BV		3	Medium	7 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-BV-8	FLC-B2-004	Flocculation	Flocc Basin No. 2	24" Influent BV		3	Medium	8 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manually actuated- uses porta-pony to actuate - could use modification to actuator stand
2-MX-10	FLC-B2-005	Flocculation	Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-11	FLC-B2-006	Flocculation	Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-12	FLC-B2-007	Flocculation	Flocc Basin No. 2-Stage 1	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-13	FLC-B2-008	Flocculation	Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-14	FLC-B2-009	Flocculation	Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-15	FLC-B2-010	Flocculation	Flocc Basin No. 2-Stage 2	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-16	FLC-B2-011	Flocculation	Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-17	FLC-B2-012	Flocculation	Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-MX-18	FLC-B2-013	Flocculation	Flocc Basin No. 2-Stage 3	Vertical Flocculator (2 speed motor, gear , shaft & mix blade)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

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Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
Sedimentation Basin No. 1 (South Basin)																		Note SLC: It was indicated that all Sedimentation Collector drive motors & gears
2-TV-1	SED-B1-001	Sedimentation	Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	Valve	3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-002	Sedimentation	Sed Basin No.1	8" Telescoping Valve	Electric Actuator	2	High	15 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-5	SED-B1-003	Sedimentation	Sed Basin No.1	Sludge Cross Collector	1.5 HP Drive & Gear	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-004	Sedimentation	Sed Basin No.1	Sludge Cross Collector	Main Drive Gear & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-005	Sedimentation	Sed Basin No.1	Sludge Cross Collector	Flights & Rails	3	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-1	SED-B1-006	Sedimentation	Sed Basin No.1-South Side	Sludge Longitudinal Collector	0.75 HP Drive & Gear	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-007	Sedimentation	Sed Basin No.1-South Side	Sludge Longitudinal Collector	Main Drive Gears & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-008	Sedimentation	Sed Basin No.1-South Side	Sludge Longitudinal Collector	Flights & Rails	3	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-2	SED-B1-009	Sedimentation	Sed Basin No.1- North Side	Sludge Longitudinal Collector	0.75 HP Drive & Gear	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-010	Sedimentation	Sed Basin No.1- North Side	Sludge Longitudinal Collector	Main Drive Gears & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B1-011	Sedimentation	Sed Basin No.1- North Side	Sludge Longitudinal Collector	Flights & Rails	3	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
Sedimentation Basin No. 2 (South Basin)																		
2-TV-2	SED-B2-001	Sedimentation	Sed Basin No.1	8" Telescoping Valve (Sludge Drawoff)	Valve	3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-002	Sedimentation	Sed Basin No.1	8" Telescoping Valve	Electric Actuator	2	High	15 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-6	SED-B2-003	Sedimentation	Sed Basin No.2	Sludge Cross Collector	1.5 HP Drive & Gear	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-004	Sedimentation	Sed Basin No.2	Sludge Cross Collector	Main Drive Gear & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-005	Sedimentation	Sed Basin No.2	Sludge Cross Collector	Flights & Rails	4	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-3	SED-B2-006	Sedimentation	Sed Basin No.2-South Side	Sludge Longitudinal Collector	0.75 HP Drive & Gear	4	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-007	Sedimentation	Sed Basin No.2-South Side	Sludge Longitudinal Collector	Main Drive Gears & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-008	Sedimentation	Sed Basin No.2-South Side	Sludge Longitudinal Collector	Flights & Rails	4	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-SLC-4	SED-B2-009	Sedimentation	Sed Basin No.2-North Side	Sludge Longitudinal Collector	0.75 HP Drive & Gear	4	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-010	Sedimentation	Sed Basin No.2-North Side	Sludge Longitudinal Collector	Main Drive Gears & Chains	4	High	0 to 1 year	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	SED-B2-011	Sedimentation	Sed Basin No.2-North Side	Sludge Longitudinal Collector	Flights & Rails	3	Low	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-Various	SED-B2-012	Sedimentation	Building Mechanical	Heat & Vent	Unit Heaters	1	High	20 to 30 years	2	2	2	3	3	2	1	No action		Heating by multiple gas-fired unit heaters
2-E-1	SED-B2-013		Building Electrical	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
2-E-2	SED-B2-014		Building Electrical	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
FILTRATION																		
	FIL-001	Filtration	Filter Gallery	Original, Major, Exposed Valves (that are not listed separately) & Piping		2	High	15 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Note FM: Filter Media typically has a 15 years +/- life
	FIL-002	Filtration	Filter Gallery	FTW, Major, Exposed Valves (that are not listed separately) & Piping		1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-003	Filtration	Filter Gallery	Original, Major, Non-Exposed Piping		3	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-004	Filtration	Filter Gallery	FTW, Major, Non-Exposed Piping-		1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-005	Filtration	Filter Effluent Control Area	Exposed, Major Valves (not listed elsewhere) & Pipe		4	Medium	10 to 20 years	2	4	2	3	3	3	3	Mitigate w/in 1-2 years		<< Seismic Restraint hoops on pipe supports?
4-P-1	FIL-006	Filtration	Filter Effluent Control Area	Filter Surface Wash Pump No.1	Pump, Motor & Valves	3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-P-2	FIL-007	Filtration	Filter Effluent Control Area	Filter Surface Wash Pump No.1	Pump, Motor & Valves	3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

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For Filter No.1																		
3-BV-1	FIL-F1-001	Filtration	Filter Influent Channel	24" Filter No.1 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-9	FIL-F1-002	Filtration	Filter Gallery	36" Filter No.1 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-17	FIL-F1-003	Filtration	Filter Effluent Channel	42" Filter No. 1 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-25	FIL-F1-004	Filtration	Filter Gallery	36" Filter No.1 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-33	FIL-F1-005	Filtration	Filter Gallery	12" Filter No.1 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3107	FIL-F1-006	Filtration	Filter Gallery	16" Filter No. 1 Filter to Waste Water (FTW) BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F1-007	Filtration	Filter No.1	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F1-008	Filtration	Filter No.1	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F1-009	Filtration	Filter No.1	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F1-010	Filtration	Filter No.1	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
For Filter No.2																		
3-BV-2	FIL-F2-001	Filtration	Filter Influent Channel	24" Filter No.2 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-10	FIL-F2-002	Filtration	Filter Gallery	36" Filter No.2 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-18	FIL-F2-003	Filtration	Filter Effluent Channel	42" Filter No. 2 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-26	FIL-F2-004	Filtration	Filter Gallery	36" Filter No.2 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-34	FIL-F2-005	Filtration	Filter Gallery	12" Filter No.2 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3207	FIL-F2-006	Filtration	Filter Gallery	16" Filter No. 2 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F2-007	Filtration	Filter No.2	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F2-008	Filtration	Filter No.2	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F2-009	Filtration	Filter No.2	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F2-010	Filtration	Filter No.2	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
For Filter No.3																		
3-BV-3	FIL-F3-001	Filtration	Filter Influent Channel	24" Filter No.3 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-11	FIL-F3-002	Filtration	Filter Gallery	36" Filter No.3 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-19	FIL-F3-003	Filtration	Filter Effluent Channel	42" Filter No. 3 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-27	FIL-F3-004	Filtration	Filter Gallery	36" Filter No. 3Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-35	FIL-F3-005	Filtration	Filter Gallery	12" Filter No.3 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3307	FIL-F3-006	Filtration	Filter Gallery	16" Filter No. 3 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F3-007	Filtration	Filter No.3	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F3-008	Filtration	Filter No.3	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F3-009	Filtration	Filter No.3	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F3-010	Filtration	Filter No.3	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

		GENERAL				LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
For Filter No.4																		
3-BV-4	FIL-F4-001	Filtration	Filter Influent Channel	24" Filter No.4 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-12	FIL-F4-002	Filtration	Filter Gallery	36" Filter No.4 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-20	FIL-F4-003	Filtration	Filter Effluent Channel	42" Filter No. 4 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-28	FIL-F4-004	Filtration	Filter Gallery	36" Filter No.4 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-36	FIL-F4-005	Filtration	Filter Gallery	12" Filter No.4 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3407	FIl-F4-006	Filtration	Filter Gallery	16" Filter No. 4 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIl-F4-007	Filtration	Filter No.4	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIl-F4-008	Filtration	Filter No.4	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIl-F4-009	Filtration	Filter No.4	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIl-F4-010	Filtration	Filter No.4	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
For Filter No.5																		
3-BV-5	FIL-F5-001	Filtration	Filter Influent Channel	24" Filter No.5 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-13	FIL-F5-002	Filtration	Filter Gallery	36" Filter No.5 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-21	FIL-F5-003	Filtration	Filter Effluent Channel	42" Filter No. 5 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-29	FIL-F5-004	Filtration	Filter Gallery	36" Filter No.5 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-37	FIL-F5-005	Filtration	Filter Gallery	12" Filter No.5 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3507	FIL-F5-006	Filtration	Filter Gallery	16" Filter No. 5 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F5-007	Filtration	Filter No.5	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F5-008	Filtration	Filter No.5	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F5-009	Filtration	Filter No.5	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F5-010	Filtration	Filter No.5	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
For Filter No.6																		
3-BV-6	FIL-F6-001	Filtration	Filter Influent Channel	24" Filter No.6 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-14	FIL-F6-002	Filtration	Filter Gallery	36" Filter No.6 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-22	FIL-F6-003	Filtration	Filter Effluent Channel	42" Filter No. 6 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-30	FIL-F6-004	Filtration	Filter Gallery	36" Filter No.6 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-38	FIL-F6-005	Filtration	Filter Gallery	12" Filter No.6 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3607	FIL-F6-006	Filtration	Filter Gallery	16" Filter No. 6 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F6-007	Filtration	Filter No.6	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F6-008	Filtration	Filter No.6	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F6-009	Filtration	Filter No.6	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F6-010	Filtration	Filter No.6	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

		GENERAL				LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
For Filter No.7																		
3-BV-7	FIL-F7-001	Filtration	Filter Influent Channel	24" Filter No.7 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-15	FIL-F7-002	Filtration	Filter Gallery	36" Filter No.7 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-23	FIL-F7-003	Filtration	Filter Effluent Channel	42" Filter No. 7 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-31	FIL-F7-004	Filtration	Filter Gallery	36" Filter No.7 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-39	FIL-F7-005	Filtration	Filter Gallery	12" Filter No.7 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3707	FIL-F7-006	Filtration	Filter Gallery	16" Filter No. 7 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F7-007	Filtration	Filter No.7	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F7-008	Filtration	Filter No.7	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F7-009	Filtration	Filter No.7	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F7-010	Filtration	Filter No.7	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
For Filter No.8																		
3-BV-8	FIL-F8-001	Filtration	Filter Influent Channel	24" Filter No.8 Influent BV		3	Low	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Manual operation - submerged in filter influent channel (low confidence in visual condition assessment)
3-BV-16	FIL-F8-002	Filtration	Filter Gallery	36" Filter No.8 Influent BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-24	FIL-F8-003	Filtration	Filter Effluent Channel	42" Filter No. 8 Filtered Water BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-32	FIL-F8-004	Filtration	Filter Gallery	36" Filter No.8 Waste Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
3-BV-40	FIL-F8-005	Filtration	Filter Gallery	12" Filter No.8 Surface Washwater BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag # MOV 3807	FIL-F8-006	Filtration	Filter Gallery	16" Filter No. 8 FTW BV	Valve & Elec Actuator	1	High	20 or more years	2	2	2	3	3	2	1	No action		
	FIL-F8-007	Filtration	Filter No.8	Backwash Troughs		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F8-008	Filtration	Filter No.8	Surface Wash Rotating Arms		3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F8-009	Filtration	Filter No.8	Filter Media		3	Low	(Note FM)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	FIL-F8-010	Filtration	Filter No.8	Filter Under drain		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
Tag: PMP-3010	FIL-PMP-001	Filtration	Filter Gallery	FTW Pump No.1	Pump, Motor & Valves	1	High	20 or more years	2	2	2	3	3	2	1	No action		
Tag: PMP-3010	FIL-PMP-002	Filtration	Filter Gallery	FTW Pump No.2	Pump, Motor & Valves	1	High	20 or more years	2	2	2	3	3	2	1	No action		
CLEARWELL & EFFLUENT VAULT																		
	CLW-001	Clearwell	Basins 1 & 2	Exposed & Submerged, Major Pipe		2	Medium	10 to 20 years	2	4	2	3	3	3	2	Mitigate w/in 2-5 years		excellent condition pending normal hairline cracks
	CLW-002	Clearwell	Basins 1 & 2 +directly adjacent	Buried, Major Pipe		3	Low	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
Basin No.1-North Basin																		
8-V-1	CLW-B1-001	Clearwell	Basin No.1- Inlet Structure	54" Inlet BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-3	CLW-B1-002	Clearwell	Basin No.1- Outlet Sump	54" Outlet BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-7	CLW-B1-003	Clearwell	Basin No.1- Outlet Sump	12" Drain Check Valve		3	Medium	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-5	CLW-B1-004	Clearwell	Basin No.1- Outlet Sump	12" Drain BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

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Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
Basin No.1-South Basin																		
8-V-2	CLW-B2-001	Clearwell	Basin No.2- Inlet Structure	54" Inlet BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-4	CLW-B2-002	Clearwell	Basin No.2- Outlet Sump	54" Outlet BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-8	CLW-B2-003	Clearwell	Basin No.2- Outlet Sump	12" Drain Check Valve		3	Medium	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-V-6	CLW-B2-004	Clearwell	Basin No.2- Outlet Sump	12" Drain BV		4	Medium	10-20 years (actuator shaft: 1 to 3 years)	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CLW-B2-005	Clearwell	Underdrain	Pump Station		3	Low	20+ years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CLW-B2-006	Clearwell	Underdrain Piping			4	Low	20+ years	2	2	3	3	4	3	3	Mitigate w/in 1-2 years		This needs to be inspected & tested to make sure it is working properly
Effluent Vault																		
	EV-001	Finished Water	Effluent Vault	Exposed Major Valves (that are not listed elsewhere) & Pipe		3	Medium	10 to 20 years	5	4	2	5	3	4	3	Mitigate w/in 1-2 years		<< Seismic Restraint hoops on pipe supports?
6-??-??	EV-002	Finished Water	Effluent Vault	14" Air- Vacuum & Air Release Valve		3	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-??-??	EV-003	Finished Water	Effluent Vault	14" Air- Vacuum & Air Release Valve		3	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-3	EV-004	Finished Water	Effluent Vault	36"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-2	EV-005	Finished Water	Effluent Vault	36"BV	Valve & Elec Actuator	3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-M-1	EV-006	Finished Water	Effluent Vault	36 Venturi		4	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-1	EV-007	Finished Water	Effluent Vault	36"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-12	EV-008	Finished Water	Effluent Vault	12"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-13	EV-009	Finished Water	Effluent Vault	12"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-5	EV-010	Finished Water	Effluent Vault	36"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-BV-4	EV-011	Finished Water	Effluent Vault	36"BV		3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

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CHEMICAL SYSTEMS																		
Polymer																		
M-1-1	CHEM-FAP-001	Chemical Feed Systems	Filter Aid Polymer	Dry Polymer Storage Hopper skid		2	High	10 to 15 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		For Filter Aid Polymer (including Tag #) - see 2009 Polymer Upgrade Drawings- AWWU Ref: 9158; feeds to Filter Influent Channel
VF-1-1	CHEM-FAP-002	Chemical Feed Systems	Filter Aid Polymer	Dry Polymer Storage Hopper skid	Volumetric Feeder	2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
B-1-1	CHEM-FAP-003	Chemical Feed Systems	Filter Aid Polymer	Dry Polymer Storage Hopper skid	Blower	2	High	10 to 15 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
T-2-1	CHEM-FAP-004	Chemical Feed Systems	Filter Aid Polymer	Mix/ Age Tank		2	High	15 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
MXR-2-1	CHEM-FAP-005	Chemical Feed Systems	Filter Aid Polymer	Mixer No.1 (eductor)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
MXR-2-2	CHEM-FAP-006	Chemical Feed Systems	Filter Aid Polymer	Mixer No.2 (propeller)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
T-2-2	CHEM-FAP-007	Chemical Feed Systems	Filter Aid Polymer	Feed Tank		2	High	15 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
P-2-1	CHEM-FAP-008	Chemical Feed Systems	Filter Aid Polymer	Transfer Pump No.1		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
P-2-2	CHEM-FAP-009	Chemical Feed Systems	Filter Aid Polymer	Transfer Pump No.2		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
P-3-1	CHEM-FAP-010	Chemical Feed Systems	Filter Aid Polymer	Solution Metering Pump No.1 (Progressing Cavity)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
P-3-2	CHEM-FAP-011	Chemical Feed Systems	Filter Aid Polymer	Solution Metering Pump No.1 (Progressing Cavity)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
P-3-3	CHEM-FAP-012	Chemical Feed Systems	Filter Aid Polymer	Solution Metering Pump No.1 (Progressing Cavity)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
M-4-1	CEHM-SAP-001	Chemical Feed Systems	Settling Aid Polymer	Dry Polymer Storage Hopper skid		1	High	15 to 20 years	2	2	2	3	3	2	1	No action		For Settling Aid Polymer (including Tag #) - see 2014 Polymer Upgrade Drawings- AWWU Ref: 9826; feeds to at 2nd stage flocculators
VF-4-1	CEHM-SAP-002	Chemical Feed Systems	Settling Aid Polymer	Dry Polymer Storage Hopper skid	Volumetric Feeder	1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
B-4-1	CEHM-SAP-003	Chemical Feed Systems	Settling Aid Polymer	Dry Polymer Storage Hopper skid	Blower	1	High	10 to 15 years	2	2	2	3	3	2	1	No action		
T-5-1	CEHM-SAP-004	Chemical Feed Systems	Settling Aid Polymer	Mix/ Age Tank		1	High	15 to 20 years	2	2	2	3	3	2	1	No action		
MXR-5-1	CEHM-SAP-005	Chemical Feed Systems	Settling Aid Polymer	Mixer No.1 (eductor)		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
MXR-5-2	CEHM-SAP-006	Chemical Feed Systems	Settling Aid Polymer	Mixer No.2 (propeller)		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
T-5-2	CEHM-SAP-007	Chemical Feed Systems	Settling Aid Polymer	Feed Tank		1	High	15 to 20 years	2	2	2	3	3	2	1	No action		
P-5-1	CEHM-SAP-008	Chemical Feed Systems	Settling Aid Polymer	Transfer Pump No.1		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
P-5-2	CEHM-SAP-009	Chemical Feed Systems	Settling Aid Polymer	Transfer Pump No.2		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
P-6-1	CEHM-SAP-010	Chemical Feed Systems	Settling Aid Polymer	Solution Metering Pump No.1 (Progressing Cavity)		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
P-6-2	CEHM-SAP-011	Chemical Feed Systems	Settling Aid Polymer	Solution Metering Pump No.1 (Progressing Cavity)		1	High	5 to 10 years	2	2	2	3	3	2	1	No action		
Poly Aluminum Chloride																		
4-T-2	CHEM-RW-001	Chemical Feed Systems	Poly Aluminum Chloride (PACl)	Tank		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-T-1	CHEM-RW-002	Chemical Feed Systems	PACl	Tank		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-MX-1	CHEM-RW-003	Chemical Feed Systems	PACl	Tank	Mixer	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CHEM-RW-004	Chemical Feed Systems	PACl	Metering Pump No.1 (Peristaltic)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CHEM-RW-005	Chemical Feed Systems	PACl	Metering Pump No.2 (Peristaltic)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CHEM-RW-006	Chemical Feed Systems	PACl	Metering Pump No.3 (Peristaltic)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
Fluoride																		
4-T-8	CHEM-FEff-001	Chemical Feed Systems	Sodium Silcoflouride (Fluoride)	Storage Hopper		3	High	10 to 20 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-BL-3	CHEM-FEff-002	Chemical Feed Systems	Fluoride	Bag Loader		3	High	5 to 10 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-DC-3	CHEM-FEff-003	Chemical Feed Systems	Fluoride	Dust Collector		3	High	5 to 10 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-SCV-2	CHEM-FEff-004	Chemical Feed Systems	Fluoride	Slide Gate		3	High	5 to 10 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-FD-14	CHEM-FEff-005	Chemical Feed Systems	Fluoride	Dry Feeder		3	High	3 to 5 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-T-9	CHEM-FEff-006	Chemical Feed Systems	Fluoride	Solution Tank		3	High	10 to 20 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
4-MX-5	CHEM-FEff-007	Chemical Feed Systems	Fluoride	Solution Tank	Mixer	3	High	3 to 5 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
	CHEM-FEff-008	Chemical Feed Systems	Fluoride	Ventilation System	Exhaust Fans	3	Medium	5 to 10 years	3	5	3	3	3	4	3	Mitigate w/in 1-2 years		External damage to fan shroud. Accumulation of deposits.

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	Social - Customers & Reputation (15%)	Safety & Security (25%)	Environment & Regulatory (25%)	Reliability & Financial Impacts (20%)	Spare Part/ Manufacturer Support (15%)	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	NOTES/REMARKS
GENERAL						LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			
Sodium Hypochlorite (Hypo) On- Site Generation System																		
T-EK-1	CHEM-DIS-001	Chemical Feed Systems	Hypo Generation System	Bulk Storage Tank No. 1 (3,000 gal-FRP)		1	High	10 to 15 years	2	2	2	3	3	2	1	No action		For Hypochlorite System (including Tag #) - see Original CH2M 2001 Const dwgs-AWWU Ref: 6526 (& shop dwgs indicated there) & 2013 (?) Hypo Room Upgrades- AWWU Ref # _____
T-EK-2	CHEM-DIS-002	Chemical Feed Systems	Hypo Generation System	Bulk Storage Tank No. 2 (3,000 gal-FRP)		1	High	11 to 15 years	2	2	2	3	3	2	1	No action		
T-EK-3	CHEM-DIS-003	Chemical Feed Systems	Hypo Generation System	Bulk Storage Tank No. 3 (3,000 gal-FRP)		1	High	12 to 15 years	2	2	2	3	3	2	1	No action		
T-EK-4	CHEM-DIS-004	Chemical Feed Systems	Hypo Generation System	Bulk Storage Tank No. 4 (3,000 gal-Poly)		4	High	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
T-EK-5	CHEM-DIS-005	Chemical Feed Systems	Hypo Generation System	Bulk Storage Tank No. 5 (3,000 gal-Poly)		4	High	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
T-EK-6	CHEM-DIS-006	Chemical Feed Systems	Hypo Generation System	Brine Storage Tank No. 1 (100 gal-Poly)		3	Medium	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
T-EK-7	CHEM-DIS-007	Chemical Feed Systems	Hypo Generation System	Brine Storage Tank No. 2 (100 gal-Poly)		3	Medium	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
?-?-?	CHEM-DIS-008	Chemical Feed Systems	Hypo Generation System	Water Softener		3	Medium	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
PLC-EK-1	CHEM-DIS-009	Chemical Feed Systems	Hypo Generation System	Programmable Logic Controller		3	Low	0 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
PLC-EK-2	CHEM-DIS-010	Chemical Feed Systems	Hypo Generation System	Programmable Logic Controller		3	Low	0 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
PLC-EK-3	CHEM-DIS-011	Chemical Feed Systems	Hypo Generation System	Programmable Logic Controller		3	Low	0 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
PLC-EK-4	CHEM-DIS-012	Chemical Feed Systems	Hypo Generation System	Generation System Control Panel		3	Low	0 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
RP-EK-1	CHEM-DIS-013	Chemical Feed Systems	Hypo Generation System	Rectifier		3	Low	0 to 5 years	2	2	2	3	5	3	3	Mitigate w/in 1-2 years		
	CHEM-DIS-014	Chemical Feed Systems	Hypo Generation System	Hypo Generation Cells (2 columns of 3 horiz cylinders)		4	Medium	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		(For Rick B: Need to confirm vendors upgrades have been installed)
RP-EK-2	CHEM-DIS-015	Chemical Feed Systems	Hypo Generation System	Rectifier		3	Low	0 to 5 years	2	2	2	3	5	3	3	Mitigate w/in 1-2 years		
	CHEM-DIS-016	Chemical Feed Systems	Hypo Generation System	Hypo Generation Cells (1 column of 2 horiz cylinders)		4	Medium	0 to 3 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		(For Rick B: Need to confirm vendors upgrades have been installed)
RP-EK-3	CHEM-DIS-017	Chemical Feed Systems	Hypo Generation System	Rectifier		3	Low	0 to 5 years	2	2	2	3	5	3	3	Mitigate w/in 1-2 years		
951 Right	CHEM-DIS-018	Chemical Feed Systems	Hypo Distribution System	Metering Pump No. 1 (Peristaltic)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
952 Left	CHEM-DIS-019	Chemical Feed Systems	Hypo Distribution System	Metering Pump No. 2 (Peristaltic)		2	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	CHEM-DIS-020	Chemical Feed Systems	Hypo Distribution System	Blower		3	Medium	0 to 3 years	2	5	2	3	3	3	3	Mitigate w/in 1-2 years		
Ferric Sulfate/ Soda Ash (Legacy System)																		
1-BL-2	FC-001	Chemical Feed Systems	Ferric Sulfate	Super Bag Loader		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-11	FC-002	Chemical Feed Systems	Ferric Sulfate	Loading Hopper		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-2A	FC-003	Chemical Feed Systems	Ferric Sulfate	Loading Hopper	Dust Collector	3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-13	FC-004	Chemical Feed Systems	Ferric Sulfate	Loading Hopper (at hopper outlet)	Rotary Feeder	3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-BLR-1	FC-005	Chemical Feed Systems	Ferric Sulfate	Transfer Blower		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-1	FC-006	Chemical Feed Systems	Ferric Sulfate	Storage Silo (North)		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-3	FC-007	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Dust Collector	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-VB-1	FC-008	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Bin Activator	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-SGV-1	FC-009	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Slide Gate Valve	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-RV-1	FC-010	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Rotary Valve	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-1	FC-011	Chemical Feed Systems	Ferric Sulfate	Dry Feeder		0	High	n/a	1	1	1	1	1	1	0	remove asset		(replaced in approx. 2000?)
1-T-3	FC-012	Chemical Feed Systems	Ferric Sulfate	Solution Tank		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-MX-2	FC-013	Chemical Feed Systems	Ferric Sulfate	Solution Tank	Mixer	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-2	FC-014	Chemical Feed Systems	Ferric Sulfate	Storage Silo (South)		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-4	FC-015	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Dust Collector	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-VB-2	FC-016	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Bin Activator	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-SGV-2	FC-017	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Slide Gate Valve	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-RV-2	FC-018	Chemical Feed Systems	Ferric Sulfate	Storage Silo	Rotary Valve	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-2	FC-019	Chemical Feed Systems	Ferric Sulfate	Dry Feeder		0	High	n/a	1	1	1	1	1	1	0	remove asset		(replaced in approx. 2000?)
1-T-4	FC-020	Chemical Feed Systems	Ferric Sulfate	Solution Tank		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

		GENERAL				LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
Ferric Sulfate/ Soda Ash (Legacy System)																		
1-MX-3	FC-021	Chemical Feed Systems	Ferric Sulfate	Solution Tank	Mixer	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-3	FC-022	Chemical Feed Systems	Ferric Sulfate	Feed Pump (originally was progressive cavity)	Pump & Motor	0	High	n/a	1	1	1	1	1	1	0	remove asset		was removed
1-FD-4	FC-023	Chemical Feed Systems	Ferric Sulfate	Feed Pump (originally was progressive cavity)	Pump & Motor	0	High	n/a	1	1	1	1	1	1	0	remove asset		was removed
1-FD-5	FC-024	Chemical Feed Systems	Ferric Sulfate	Feed Pump (originally was progressive cavity)	Pump & Motor	0	High	n/a	1	1	1	1	1	1	0	remove asset		was removed
1-BL-3	SA-001	Chemical Feed Systems	Soda Ash	Super Bag Loader		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-12	SA-002	Chemical Feed Systems	Soda Ash	Loading Hopper		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-5A	SA-003	Chemical Feed Systems	Soda Ash	Loading Hopper	Dust Collector	3	Medium	5 to 15 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-?	SA-004	Chemical Feed Systems	Soda Ash	Loading Hopper (at hopper outlet)	Rotary Feeder	3	Medium	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-BLR-2	SA-005	Chemical Feed Systems	Soda Ash	Transfer Blower		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-5	SA-006	Chemical Feed Systems	Soda Ash	Storage Silo (North)		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-7	SA-007	Chemical Feed Systems	Soda Ash	Storage Silo	Dust Collector	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-VB-4	SA-008	Chemical Feed Systems	Soda Ash	Storage Silo	Bin Activator	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-SGV-3	SA-009	Chemical Feed Systems	Soda Ash	Storage Silo	Slide Gate Valve	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-RV-3	SA-010	Chemical Feed Systems	Soda Ash	Storage Silo	Rotary Valve	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-6	SA-011	Chemical Feed Systems	Soda Ash	Dry Feeder		0	High	n/a	1	1	1	1	1	1	0	remove asset		(replaced in approx. 2000?)
1-T-7	SA-012	Chemical Feed Systems	Soda Ash	Solution Tank		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-MX-4	SA-013	Chemical Feed Systems	Soda Ash	Solution Tank	Mixer	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-T-6	SA-014	Chemical Feed Systems	Soda Ash	Storage Silo (South)		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-DC-6	SA-015	Chemical Feed Systems	Soda Ash	Storage Silo	Dust Collector	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-VB-5	SA-016	Chemical Feed Systems	Soda Ash	Storage Silo	Bin Activator	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-SGV-4	SA-017	Chemical Feed Systems	Soda Ash	Storage Silo	Slide Gate Valve	3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-RV-4	SA-018	Chemical Feed Systems	Soda Ash	Storage Silo	Rotary Valve	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-7	SA-019	Chemical Feed Systems	Soda Ash	Dry Feeder		0	High	n/a	1	1	1	1	1	1	0	remove asset		(replaced in approx. 2000?)
1-T-8	SA-020	Chemical Feed Systems	Soda Ash	Solution Tank		3	High	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-MX-5	SA-021	Chemical Feed Systems	Soda Ash	Solution Tank	Mixer	3	High	3 to 5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-FD-8	SA-022	Chemical Feed Systems	Soda Ash	Feed Pump (originally was progressive cavity)	Pump & Motor	0	High	n/a	1	1	1	1	1	1	0	remove asset		was removed
1-FD-9	SA-023	Chemical Feed Systems	Soda Ash	Feed Pump (originally was progressive cavity)	Pump & Motor	0	High	n/a	1	1	1	1	1	1	0	remove asset		was removed
WASTE WASHWATER																		
	WWW-001	Waste Washwater	Waste Washwater Pump Sta.	Exposed, Major Valves (that are not listed elsewhere) & Pipe		3	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		<< Seismic Restraint hoops on pipe supports?
5-SLG-1	WWW-002	Waste Washwater	Waste Washwater Tank	24"H x 48"W Sluice Gate		3	Medium	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-SLG-2	WWW-003	Waste Washwater	Waste Washwater Tank	24"H x 48"W Sluice Gate		3	Medium	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-SLG-3	WWW-004	Waste Washwater	Waste Washwater Tank	38"H x 48"W Sluice Gate		3	Medium	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-P-1	WWW-005	Waste Washwater	Waste Washwater Pump Sta.	Waste Washwater Pump No.1 (Vertical Turbine)	Pump, Motor & Valves	3	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-P-2	WWW-006	Waste Washwater	Waste Washwater Pump Sta.	Waste Washwater Pump No.2 (Vertical Turbine)	Pump, Motor & Valves	2	High	15-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-P-3	WWW-007	Waste Washwater	Waste Washwater Pump Sta.	Waste Washwater Pump No.3 (Vertical Turbine)	Pump, Motor & Valves	4	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
5-BPV-1	WWW-008	Waste Washwater	Waste Washwater Pump Sta.	10" Backpressure Valve		3	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility
AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

		GENERAL				LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	15% Social - Customers & Reputation	25% Safety & Security	25% Environment & Regulatory	20% Reliability & Financial Impacts	15% Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
RESIDUALS MANAGEMENT																		
	RM-001	Residuals Management	Lagoon Decant PS	Exposed, Major Valves (that are not listed elsewhere) & Pipe		3	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		<< Seismic Restraint hoops on pipe supports?
	RM-002	Residuals Management	Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on NE side)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	RM-003	Residuals Management	Lagoon Decant PS	10" Decant Pressure Slide Gates (16 on SW side)		3	High	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
7-P-1	RM-004	Residuals Management	Lagoon Decant PS	Lagoon Decant Return Pump No. 1 (Vertical Turbine)		4	High	5 to 10 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
7-P-2	RM-005	Residuals Management	Lagoon Decant PS	Lagoon Decant Return Pump No. 2 (Vertical Turbine)		4	High	5 to 10 years	2	2	3	3	3	3	3	Mitigate w/in 1-2 years		
7-P-3	RM-006	Residuals Management	Lagoon Decant PS	Lagoon Decant Return Pump No. 3 (Vertical Turbine)		2	High	15 to 20 years	2	2	3	3	3	3	2	Mitigate w/in 2-5 years		
SITE																		
	Site-001	Site	Parking/Roads	Asphalt surface w/concrete curb gutter		3	high		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	Site-002	Site	Fencing/Gates	Chain-link fence w/barbwire, auto gates		3	high		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
	Site-003	Site	Street Lights			1	high		2	2	2	3	3	2	1	No action		
	Site-004	Site	Landscaping	Grass, trees, shrubs, wild growth areas		1	high		2	2	2	3	3	2	1	No action		
	Site-005	Site	Ground downs/Drainage			1	high		2	2	2	3	3	2	1	No action		
	Site-006	Site	Storm water system	Surface drainage, culverts, piping		3	medium		2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
FACILITIES																		
9-E-1	FAC-BE-001	Facilities	Building Electrical	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
9-E-2	FAC-BE-002	Facilities	Building Electrical	Exterior Lighting		3	Medium	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
9-E-3	FAC-BE-003	Facilities	Building Electrical	Service Entrance		4	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
9-E-4	FAC-BE-004	Facilities	Building Electrical	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
9-E-5	FAC-BE-005	Facilities	Building Electrical	Transfer Switches		3	Medium	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
3-E-1	FAC-BE-006	Facilities	Building Electrical	Interior Lighting		2	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
3-E-2	FAC-BE-007	Facilities	Building Electrical	Panelboards		2	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
8-E-1	FAC-BE-008	Facilities	Building Electrical	Panelboards		2	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-E-1	FAC-BE-009	Facilities	Building Electrical - Effluent Vault	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-E-2	FAC-BE-010	Facilities	Building Electrical - Effluent Vault	Motor Control Centers		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-E-3	FAC-BE-011	Facilities	Building Electrical - Effluent Vault	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
7-E-1	FAC-BE-012	Facilities	Building Electrical - Lagoon Pump Station	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
7-E-2	FAC-BE-013	Facilities	Building Electrical - Lagoon Pump Station	Exterior Lighting		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
7-E-3	FAC-BE-014	Facilities	Building Electrical - Lagoon Pump Station	Motor Control Centers		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
7-E-4	FAC-BE-015	Facilities	Building Electrical - Lagoon Pump Station	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-1	FAC-BE-016	Facilities	Building Electrical - Operations Area	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-2	FAC-BE-017	Facilities	Building Electrical - Operations Area	Service Entrance		4	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-3	FAC-BE-018	Facilities	Building Electrical - Operations Area	Switchboards		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-4	FAC-BE-019	Facilities	Building Electrical - Operations Area	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-5	FAC-BE-020	Facilities	Building Electrical - Operations Area	Motor Control Centers		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
4-E-6	FAC-BE-021	Facilities	Building Electrical - Operations Area	Standby Power Generator		1	High	25 years	2	2	2	3	3	2	1	No action		
4-E-7	FAC-BE-022	Facilities	Building Electrical - Operations Area	Automatic Transfer Switches		1	High	25 years	2	2	2	3	3	2	1	No action		
1-E-1	FAC-BE-023	Facilities	Building Electrical	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-E-2	FAC-BE-024	Facilities	Building Electrical	Motor Control Centers		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-E-3	FAC-BE-025	Facilities	Building Electrical	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-E-4	FAC-BE-026	Facilities	Building Electrical	Dry Type Transformer		3	Medium	5 to 10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-E-1	FAC-BE-027	Facilities	Building Electrical - Energy Recovery	Interior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Eklutna Water Treatment Facility

AWWU EWTF - Asset Inventory/Hierarchy (Process Mechanical)

GENERAL						LIKELIHOOD OF FAILURE (LoF)			CONSEQUENCE OF FAILURE (CoF) (60%)						RISK			NOTES/REMARKS
									15%	25%	25%	20%	15%					
Reference Drawing Info / Tag No.	Unique Asset ID	Process	Process Area	Asset	Component	Condition Assessment Rating (LoF Score)	Confidence in Condition Assessment	Estimated Time until Replacement	Social - Customers & Reputation	Safety & Security	Environment & Regulatory	Reliability & Financial Impacts	Spare Part/ Manufacturer Support	Rounded CoF Score	Risk Rating - Rounded	Risk Response Timeframe	Mitigation Method(s)	
FACILITIES																		
0-E-2	FAC-BE-028	Facilities	Building Electrical - Energy Recovery	Exterior Lighting		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-E-3	FAC-BE-029	Facilities	Building Electrical - Energy Recovery	Motor Control Center		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-E-4	FAC-BE-030	Facilities	Building Electrical - Energy Recovery	Panelboards		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
0-E-5	FAC-BE-031	Facilities	Building Electrical - Energy Recovery	Switchgear		3	Medium	10 years	2	3	2	4	3	3	3	Mitigate w/in 1-2 years		
0-E-6	FAC-BE-032	Facilities	Building Electrical - Energy Recovery	Dry Type Transformer		3	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
1-AHU-1&2	FAC-BM-001	Facilities	Building Mechanical	Air Handling Units		3	Medium	5 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Fan units serviceable, but gas fired duct furnaces suspect due to age (potential for cracked heat exchangers)
	FAC-BM-002	Facilities	Building Heat & Vent	Exhaust fans		2	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Wall mounted exhaust fans and motorized inlet dampers/louvers
4-HWB-1	FAC-BM-003	Facilities	Building HVAC	Boiler		2	Medium	up to 20 years	2	2	2	3	5	3	2	Mitigate w/in 2-5 years		Boilers are older technology and not as efficient (80% vs 88%) as newer. Components will start becoming obsolete for potential repair needs
4-HWB-2	FAC-BM-004	Facilities	Building HVAC	Boiler		2	Medium	up to 20 years	2	2	2	3	5	3	2	Mitigate w/in 2-5 years		Boilers are older technology and not as efficient (80% vs 88%) as newer. Components will start becoming obsolete for potential repair needs
4-AHU-1	FAC-BM-005	Facilities	Building HVAC	Air Handler		3	High	10 to 20 years	2	3	2	2	3	2	2	Mitigate w/in 2-5 years		Cleaning, servicing, and minor repairs needed
4-AHU-1	FAC-BM-006	Facilities	Building HVAC	Air Handler		3	High	10 to 20 years	2	3	2	2	3	2	2	Mitigate w/in 2-5 years		Cleaning, servicing, and minor repairs needed
4-AHU-1	FAC-BM-007	Facilities	Building HVAC	Air Handler		3	High	10 to 20 years	2	3	2	2	3	2	2	Mitigate w/in 2-5 years		Cleaning, servicing, and minor repairs needed
Various	FAC-BM-008	Facilities	Building HVAC	AC System		1	High	20 to 30 years	2	2	2	3	3	2	1	No action		Condensing units located in sedimentation basin area with fan coils in offices, conference rm and operations room.
Various	FAC-BM-009	Facilities	Building HVAC	Miscellaneous exhaust fans		2	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Exhaust fans serving various areas
	FAC-BM-010	Facilities	Building HVAC		Fans & Heaters	2	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Electric Heaters, wall mounted exhaust fans & interlocked intake motorized damper/louver
0-XX-XX	FAC-BM-011	Facilities	Building HVAC - Energy Recovery	Heaters & Fans		2	Medium	10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		H&V system consist of three gas fired unit heaters, two exhaust fans with two interlocked inlet louvers with motorized dampers
4-HWH-1	FAC-BM-012	Facilities	Building Services	Water Heater		1	High	25 years	2	2	2	3	3	2	1	No action		New water heater system being installed.
Various	FAC-BM-013	Facilities	Building Mechanical - Effluent Vault	HVAC System (fans and heaters)		2	Medium	10 to 20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		Electric heaters, exhaust fans & intake motorized dampers
6-P-1> 4	FAC-UWDW-001	Facilities	Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	Pumps & Elec Motors	3	High	5-10 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		
6-T-1	FAC-UWDW-002	Facilities	Utility & Drinking Water (UW/ DW) - Effluent Vault	UW/ DW Package Pumping Unit	Hydro Accumulator Tank	3	High	10-20 years	2	2	2	3	3	2	2	Mitigate w/in 2-5 years		

Appendix C

Using Condition Ratings to Form Likelihood of Failure Scores for the EWTF

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Condition assessments are very commonly used by utilities as the primary basis for determining the likelihood that an asset/component will fail. Detailed rating definitions for direct visual assessments are typically prepared that include specific parameters to be observed, such as vibration and noise levels for mechanical and rotating equipment. The following scale was used:

- Excellent = 1
- Good = 2
- Fair = 3
- Poor = 4
- Inoperable = 5

Excellent (Likelihood of Failure = 1)

This condition rating is applied when no apparent problems exist. When assigning this value, the following are considered to be a "rule-of-thumb":

1. Coatings and/or finishes appear to be new or nearly new;
2. Asset/component does not leak, drip, spill or discharge lubricants or process fluids excessively, except as designed;
3. Appears to fit the application to which it is applied; and,
4. Does not need repair or replacement.

Good (Likelihood of Failure = 2)

This condition rating is applied when the asset/component fails one or more of the criteria outlined in the *Excellent* description above. While an asset/component may be working properly, it may show signs of corrosion or may be improperly sized. A *Good* condition rating should be assigned to an asset/component when it is characterized by the following:

1. Does not meet all criteria described under *Excellent*; and,
2. Is greater than 5 years old but generally less than 10 years old (Not applicable for structures).
3. Does not need repair or replacement.

Fair (Likelihood of Failure = 3)

This condition rating is applied when the asset/component is generally greater than 10 years old (not applicable for Structures) and meets the following criteria:

1. Does not leak, drip, spill or discharge lubricants or process fluids excessively, except as designed, and
2. Is capable of remaining in useful service, likely without requiring repair or replacement, for at least five years.
3. May show signs of corrosion (structures).

Poor (Likelihood of Failure = 4)

This condition rating is applied when the asset/component appears to be near the end of its useful life cycle, or when the asset/component requires excessive maintenance or repair to remain in service.

Inoperable (Likelihood of Failure = 5)

This condition rating is reserved for assets/components that need immediate replacement because they are incapable of performing their intended function or present a danger to human health and safety.

As described in Section 1.4.1, a 'confidence' value was applied to each Likelihood of Failure (LoF) score per AWWU request. The confidence values were limited to High, Medium and Low.

The following pages contain additional detail on factors that were considered when assessing and determining LoF scores for various assets. Note that not all considerations are applicable to each type of asset (e.g. reciprocating equipment vs. rotating equipment, etc.).

Condition Assessment Rating Definitions

For History and Other Records

1 – Excellent overall condition: - asset is fully functional as designed.

a. The age of this unit is 1/4 or less of the life expectancy as stated by the manufacturer, or design engineer, historical record or other recognized standard.
    i. Design life as stated by manufacturers specifications
    ii. Design engineer statement
    iii. Historical, records
        1. CMMS Data
        2. PM records
        3. Rebuild records
        4. Efficiency testing and comparison
        5. AS-built plans
        6. Condition assessment history
    iv. Other recognized records
b. Unit shows no record of difficult infancy, early heavy repair or overhaul.
    i. Early overhaul will automatically give the unit a grade of 2
c. Installation proceeded as planned.
d. Initial Diagnostic analysis was conducted and results were within acceptable parameters.
e. Unit continues to operate within acceptable limits as proven by continued diagnostic testing.
    i. Diagnostic data
        1. Vibration analysis
        2. Ultrasound
        3. Thermography
        4. Oil Analysis
        5. Efficiency testing (energy used to produce)
f. Preventive maintenance procedures are being conducted according to manufacturer's requirements.

2 - Good overall condition: - asset fully functional for current operating conditions.

g. Age is between 1/4 and 3/4 of that expected by the manufacturer, design engineer, Diagnostic data or other acceptable historical record.
    i. Design life as stated by Manufacturers Specifications
    ii. Design engineer statement

iii. Past Diagnostic data
    1. Vibration analysis
    2. Ultrasound
    3. Thermography
    4. Oil Analysis
iv. Historical, records
    1. CMMS Data
    2. PM records
    3. Rebuild records
    4. Efficiency testing and comparison
    5. AS-built plans
    6. Condition assessment history

h. Unit may show a record of troubled infancy or heavy repair, overhaul or major component replacement.
    i. Consider the type of unit and the magnitude of the unit repairs & replacements.
    ii. Consider whether the unit may have been secondarily affected by the failure of the replaced unit.
    iii. The unit has been and is currently successful.
i. PM is provided as stated by manufacturer's recommendations.
j. Unit operates within acceptable limits as proven by continued diagnostic testing.
    i. Diagnostic testing
        1. Vibration analysis
        2. Ultrasound
        3. Thermography
        4. Oil Analysis
        5. Efficiency testing (energy used to produce)

3– Fair overall condition: - the asset functions as needed for current operating conditions

a. Age is between 3 /4 or and the total expected life as stated by the manufacturer, Designer, or other acceptable time affected record.
    i. Design life as stated by Manufacturers Specifications
    ii. Design engineer statement
    iii. Past Diagnostic data
        1. Vibration analysis
        2. Ultrasound
        3. Thermography
        4. Oil Analysis
    iv. Historical, records
        1. CMMS Data

2. PM records
3. Rebuild records
4. Efficiency testing and comparison
5. AS-built plans
6. Condition assessment history

b. Unit shows no record of infancy trouble or early heavy repair.
c. PM is provided as planned.
d. Unit operates within acceptable limits as proven by continued diagnostic testing.

4 - Poor overall condition: - asset operable, but does not function as needed for current operating conditions.

a. Asset is beyond the operating life as stated by the manufacturer, designer, or other acceptable time affected record.
    i. Design life as stated by Manufacturers Specifications
    ii. Design engineer statement
    iii. Past Diagnostic data shows poor efficiency
        1. Vibration analysis
        2. Ultrasound
        3. Thermography
        4. Oil Analysis
    iv. Historical, records show decline of efficiency.
        1. CMMS Data
        2. PM records
        3. Rebuild records
        4. Efficiency testing and comparison
        5. AS-built plans
        6. Condition assessment history
b. Unit shows record of infancy trouble or early heavy repair.
c. Cost of operation exceeds 50% of the original unit purchase price.
d. PM is not provided as planned.
e. Unit does not operate within acceptable limits as proven by continued diagnostic testing.

5 - Inoperable: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a. Asset is five or more years beyond the manufacturers recommended life expectancy.
    i. Design life as stated by Manufacturers Specifications
    ii. Design engineer statement
    iii. Diagnostic Evaluation cannot be provided
    iv. Historical, records

    1. CMMS Data
    2. PM records
    3. Rebuild records
    4. Efficiency testing and comparison
    5. AS-built plans
    6. Condition assessment history

b. Unit shows trouble or early heavy repair.
c. PM has not been provided as planned.

Unit does not or cannot operate within acceptable limits without a major rebuild.

0 – Abandoned: asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

f. Asset is within the operating life as stated by the manufacturer, designer, or other acceptable time affected record.
  i. Design life as stated by Manufacturers Specifications
  ii. Design engineer statement
  iii. Past Diagnostic data
    1. Vibration analysis
    2. Ultrasound
    3. Thermography
    4. Oil Analysis
  iv. Historical, records
    1. CMMS Data
    2. PM records
    3. Rebuild records
    4. Efficiency testing and comparison
    5. AS-built plans
    6. Condition assessment history
g. Unit shows record of infancy trouble or early heavy repair.
h. PM is not provided as planned.
i. Unit may or may not operate within acceptable limits.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Mechanical and Rotating Equipment

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.

a Looks like it did when it was first installed and accepted.
b Runs smooth with very little vibration or unexpected noise levels.
  i Consider the type of equipment.
    a Compressors are intrinsically noisier than centrifugal pumps of the same rated horse power.
c No leaking around the bearing housings.
d No leaking around oil and/or mechanical seals or seal housings.
e Shafts show no signs of wear, heating, or deterioration.
f Housings are clean, painted by the manufacturer, showing no signs of overheating, burning, wear, cracking, or deterioration.
g Air ducts, screens and channels are clean and flowing unrestricted.
h Welds are complete, strong, no pitting or cracking and no signs of wear.
i Mountings are secure with no signs of wear, cracking, excessive vibration.
j Concrete pedestal is new with no cracking broken edges and fresh seal.

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.

a Looks like it did when it was first installed and accepted.
b Runs smooth with very little vibration, noise and no cavitation in pumps.
c Slight leaking around the covers and housings may be acceptable.
  i Consider that larger gasketed covers may leak slightly as they age or as they are removed and replaced for service.
  ii Consider the amount of leakage verses the size of reservoir capacity. Leakage may not affect the operation of the unit.
d No leaking around bearings, oil and/or mechanical seals or seal housings.
e Shafts show no signs of wear, heating, or deterioration.
f (Could be removed) Housings are clean, freshly painted, showing no signs of overheating, wear, cracking, or deterioration.
g Air ducts, screens and channels are clean and flowing unrestricted.
h Welds are complete, strong, no signs of stress, pitting or cracking.

- i No pitting between mating parts; and no signs of rubbing.
- j Mountings are secure but may show signs of wear due to retightening and adjustment, no signs of cracking, excessive vibration.
- k Pedestal still looks new may have some signs that work (oil changes scratching from heavy tools). No cracking or broken edges or seal.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions

- a There are some visible signs of wear, but show no signs of abuse.
  - i Hammering, heating, chipping, or scoring.
  - ii Brush away lose paint to reveal the surface and assure that there is no cracking.
- b Runs with very little vibration, there may be some noise but not from bearings; and there should be no cavitation in pumps.
- c Slight leaking around the bearing housings may be acceptable.
  - i Consider that larger gasketed covers may leak slightly as they age or as they are removed and placed back.
  - ii Consider the amount of leakage verses the size of reservoir capacity.
  - iii Leakage cannot cause excessive oil retention under or around the unit.
- d Shafts show no signs of wear, heating, or deterioration.
- e Housings may be dusty or freshly painted, showing no signs of overheating, wear, cracking, or deterioration.
- f Air ducts, screens and channels are clean and flowing unrestricted.
- g Welds show no pitting, cracking or signs of stress.
- h Mountings are secure but may show signs of wear due to retightening and adjustment, no signs of cracking, excessive vibration.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.

- a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.
- b Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.
- c There are visible signs of defects, equipment wear is more than should be expected and there may be personnel safety issues.
- d Excessive vibration
- e Leaking packing and seals caused by shaft vibration.
- f Constantly replacing seals and packing

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a This equipment cannot be sufficiently maintained, rebuilt or component replaced to restore it back to a higher condition standard.

b There are visible signs of major defects, equipment wear is more than expected and there may be personnel safety issues.

c Excessive vibration.

d Leaking packing and seals caused by shaft vibration.

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Mechanical and Reciprocating Equipment

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.

- a Looks like it did when it was first installed and accepted.
- b Runs smooth with very little vibration or unexpected noise levels.
  - i Consider the type of equipment.
    - a Reciprocating equipment is intrinsically noisy.
- c No leaking around the bearing housings.
- d No leaking around oil and/or mechanical seals or seal housings.
- e Shafts show no signs of wear, heating, or deterioration.
- f Housings are clean, painted by the manufacturer, showing no signs of overheating, burning, wear, cracking, or deterioration.
- g Air screens and channels are clean and flowing unrestricted.
- h Welds are complete, strong, no pitting or cracking and no signs of wear.
- i Mountings are secure with no signs of wear, cracking, excessive vibration.
- j Concrete pedestal is new with no cracking broken edges and fresh seal.

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.

- a Looks like it did when it was first installed and accepted.
- b Runs smooth with very little vibration, noise and no cavitation in pumps.
- c Slight leaking around the covers and housings may be acceptable.
  - i Consider that larger gasketed covers may leak slightly as they age or as they are removed and replaced for service.
  - ii Consider the amount of leakage verses the size of reservoir capacity. Leakage may not affect the operation of the unit.
- d No leaking around bearings, oil and/or mechanical seals or seal housings.
- e Shafts show no signs of wear, heating, or deterioration.
- f Housings may show signs that maintenance has been provided but showing no signs of overheating, wear, cracking, or deterioration.
- g Air ducts, screens and channels are clean and flowing unrestricted.
- h Welds are complete, strong, no signs of stress, pitting or cracking.
- i No pitting between mating parts; and no signs of rubbing.
- j Mountings are secure but may show signs of wear due to retightening and

adjustment, no signs of cracking, excessive vibration.

k Pedestal still looks new may have some signs that work (oil changes scratching from heavy tools). No cracking or broken edges or seal.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions

a There are some visible signs of wear, but show no signs of abuse.

i Hammering, heating, chipping, or scoring.

ii Brush away lose paint to reveal the surface and assure that there is no cracking.

b Runs with very little vibration, there may be some noise but not from bearings.

c Slight leaking around the bearing housings may be acceptable.

i Consider that larger gasketed covers may leak slightly as they age or as they are removed and placed back.

ii Consider the amount of leakage verses the size of reservoir capacity.

iii Leakage cannot cause excessive oil retention under or around the unit.

d Shafts show no signs of wear, heating, or deterioration.

e Housings may be dusty or freshly painted, showing no signs of overheating, wear, cracking, or deterioration.

f Air ducts, screens and channels are clean and flowing unrestricted.

g Welds show no pitting, cracking or signs of stress.

h Mountings are secure but may show signs of wear due to retightening and adjustment, no signs of cracking, excessive vibration.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.

a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.

b Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.

c There are visible signs of defects, equipment wear is more than should be expected and there may be personnel safety issues.

d Excessive vibration

e Leaking packing and seals caused by shaft vibration.

f Constantly replacing seals and packing

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a This equipment cannot be sufficiently maintained, rebuilt or component replaced to restore it back to a higher condition standard.

b There are visible signs of major defects, equipment wear is more than expected and there may be personnel safety issues.

c Excessive vibration.

d Leaking packing and seals caused by shaft vibration.

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Mechanical Piping and Valves

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.
   - a Looks like it did when it was first installed and accepted.
   - b Pipe is properly sized and specified for the intended purpose.
   - c Gages and other ancillary equipment are new and working properly.
   - d Pipe hangers and supports are aligned, spaced properly and tight against the pipe.
     - i Pipe is being supported not sagging.
   - e There is proper clearance between pipe and wall or other obstruction.
   - f Pipe joint restrainers are properly constructed, secure and tight.
   - g Thrust blocking is tight, secure and designed correctly for the intended purpose.
   - h Pipe joints are secure and tight with no leaks.
   - i The types of pipe joints that will generally be encountered on the plant are:
     - i Mechanical joint No missing "T" bolts or nuts, rubber gasket is seated properly, not protruding or pinched
     - ii Flange joint there are no bolts or nuts missing, gasket is secure and not protruding.
     - iii Glue joint is constructed properly without excessive splash from glue or primer, or excess has been properly cleaned.
     - iv Thread or (Screw) joint is properly constructed excess pipe joint compound is cleaned up.
     - v Bell and spigot joint no lead joint is acceptable, Rubber ring is seated properly and not protruding. Use a feeler gage is necessary to check ring seat.
     - vi Soldered joints are clean and secure without excess solder drip.
     - vii Brazed joints are clean and secure without excess solder drip.
     - viii Welded pipe is secured no cracking welds and no signs of undercut or buried slag. Weld looks solid and complete with good penetration all around.
     - ix Hot Air Fusion of Plastic Pipe the butt connection looks solid and even all around.
   - j The types of pipe that will be encountered on the plant are:

- i Ductile iron No signs of corrosion
- ii Cast iron No signs of corrosion
- iii Steel
  - a High and low Carbon No signs of corrosion
  - b Sch-80 Sch-40 No signs of corrosion
  - c Galvanized Pipe is coated with sacrificial zinc this may have corroded slightly to protect the iron pipe under the zinc.
- iv Copper tubing
  - a Type K some patina may develop to protect the copper under.
  - b Type L some patina may develop to protect the copper under.
- v Stainless steel tubing No signs of corrosion
- vi Plastic
  - a PVC no cracking or signs of UV degradation.
  - b SDR-35 cracking or signs of UV degradation.
  - c Spec. C-900 cracking or signs of UV degradation.
  - d UV Resistant Pipe cracking or signs of UV degradation.
  - e And other special plastic types based on specific application and chemical resistance requirements.

k Pipe casings are in good shape.

l Pipe exterior is protected from corrosion and UV degradation.

m If there is insulation it is in good shape and protected from heat and UV degradation.

n Valves are of proper size, class, rating and configuration for the application.

o Valves are positioned correctly for operation.
- i Check Valves are used for backflow protection, and to force the flow in a single direction.
- ii Gate valves, Ball valves, slide gates, Plug valves will cavitate if in a throttling application.
- iii Gate valves, globe style valves, Diaphragm valves and cone valves are generally good for throttling.

p Valve operators are new.
- i The valve operates freely
- ii The screw and yoke are new
- iii The valve bonnet is not leaking
- iv No drips or leaks from the operator

q Automated operators are new and operating correctly

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.

a There may be sings that maintenance has been provided.
- i No Hammering, chipping gouging, heating or cutting.

b Pipe is properly sized and specified for the intended purpose.

c Gages and other ancillary equipment are working properly.

d Pipe hangers and supports are aligned, spaced properly and tight against the pipe.

  i Pipe is being supported not sagging.

e There is proper clearance between pipe and wall or other obstruction.

f Pipe joint restrainers are properly constructed, secure and tight.

g Thrust blocking is tight, secure and designed correctly for the intended purpose.

h Pipe joints are secure and tight with no leaks.

i The types of pipe joints that will generally be encountered on the plant are:

  i Mechanical joint No missing “T” bolts or nuts, rubber gasket is seated properly, not protruding or pinched

  ii Flange joint there are no bolts or nuts missing, gasket is secure and not protruding.

  iii Glue joint is constructed properly without excessive splash from glue or primer, or excess has been properly cleaned.

  iv Thread or (Screw) joint is properly constructed excess pipe joint compound is cleaned up.

  v Bell and spigot joint no lead joint is acceptable, Rubber ring is seated properly and not protruding. Use a feeler gage is necessary to check ring seat.

  vi Soldered joints are clean and secure without excess solder drip.

  vii Brazed joints are clean and secure without excess solder drip.

  viii Welded pipe is secured no cracking welds and no signs of undercut or buried slag. Weld looks solid and complete with good penetration all around.

  ix Hot Air Fusion of Plastic Pipe the butt connection looks solid and even all around.

j The types of pipe that will be encountered on the plant are:

  i Ductile iron No signs of corrosion

  ii Cast iron No signs of corrosion

  iii Steel

    a High and low Carbon No signs of corrosion

    b Sch-80 Sch-40 No signs of corrosion

    c Galvanized Pipe is coated with sacrificial zinc this may have corroded slightly to protect the iron pipe under the zinc.

  iv Copper tubing

    a Type K some patina may develop to protect the copper under.

    b Type L some patina may develop to protect the copper under.

  v Stainless steel tubing No signs of corrosion

  vi Plastic

    a PVC no cracking or signs of UV degradation.

- b SDR-35 cracking or signs of UV degradation.
- c Spec. C-900 cracking or signs of UV degradation.
- d UV Resistant Pipe cracking or signs of UV degradation.
- e And other special plastic types based on specific application and chemical resistance requirements.

k Pipe casings are in good shape.

l Pipe exterior is protected from corrosion and UV degradation.

m If there is insulation it is in good shape and protected from heat and UV degradation.

n Valves are of proper size, class, rating and configuration for the application.

o Valves are positioned correctly for operation.

- i Check Valves are used for backflow protection, and to force the flow in a single direction.
- ii Gate valves, Ball valves, slide gates, Plug valves will cavitate if in a throttling application.
- iii Gate valves, globe style valves, Diaphragm valves and cone valves are generally good for throttling.

p Valve operators are new.

- i The valve operates freely
- ii The screw and yoke are new
- iii The valve bonnet is not leaking
- iv No drips or leaks from the operator

q Automated operators are operating correctly

3. **Fair overall condition:** - the asset functions as needed for current operating conditions

a There are some visible signs of wear or maintenance, but show no signs of abuse.

- i Hammering, heating, chipping, or scoring cutting.
- ii Brush away lose paint to reveal the surface and assure that there is no cracking.

b Pipe is properly sized and specified for the intended purpose.

c Gages and other ancillary equipment are working properly.

d Pipe hangers and supports are aligned, spaced properly and tight against the pipe.

- i Pipe is being supported not sagging.

e There is proper clearance between pipe and wall or other obstruction.

f Pipe joint restrainers are properly constructed, secure and tight.

g Thrust blocking is tight, secure and designed correctly for the intended purpose.

h Pipe joints are secure and tight with no leaks.

i The types of pipe joints that will generally be encountered on the plant are:

i Mechanical joint-on missing "T" bolts or nuts, rubber gasket is seated properly, not protruding or pinched

ii Flange joint there are no bolts or nuts missing, gasket is secure and not protruding.

iii Glue joint is constructed properly without excessive splash from glue or primer, or excess has been properly cleaned.

iv Thread or (Screw) joint is properly constructed excess pipe joint compound is cleaned up.

v Bell and spigot joint no lead joint is acceptable, Rubber ring is seated properly and not protruding. Use a feeler gage is necessary to check ring seat.

vi Soldered joints are clean and secure without excess solder drip.

vii Brazed joints are clean and secure without excess solder drip.

viii Welded pipe is secured no cracking welds and no signs of undercut or buried slag. Weld looks solid and complete with good penetration all around.

ix Hot Air Fusion of Plastic Pipe the butt connection looks solid and even all around.

j The types pf pipe that will be encountered on the plant are:

i Ductile iron Slight signs of corrosion

ii Cast iron Slight signs of corrosion

iii Steel

a High and low Carbon Slight signs of corrosion

b Sch-80, Sch-40 Slight signs of corrosion

c Galvanized Pipe is coated with sacrificial zinc this may have corroded slightly to protect the iron pipe under the zinc.

iv Copper tubing

a Type K some patina may develop to protect the copper under.

b Type L some patina may develop to protect the copper under.

v Stainless steel tubing No signs of corrosion

vi Plastic

a PVC no cracking or signs of UV degradation.

b SDR-35 cracking or signs of UV degradation.

c Spec. C-900 cracking or signs of UV degradation.

d UV Resistant Pipe cracking or signs of UV degradation.

e And other special plastic types based on specific application and chemical resistance requirements.

k Pipe casings are in good shape.

l Pipe exterior is protected from corrosion and UV degradation.

m If there is insulation it is in good shape and protected from heat and UV degradation.

n Valves are of proper size, class, rating and configuration for the application.

- o Valves are positioned correctly for operation.
  - i Check Valves are used for backflow protection, and to force the flow in a single direction.
  - ii Gate valves, Ball valves, slide gates, Plug valves will cavitate if in a throttling application.
  - iii Gate valves, globe style valves, Diaphragm valves and cone valves are generally good for throttling.
- p Valve operators are new.
  - i The valve operates freely
  - ii The screw and yoke are new
  - iii The valve bonnet is not leaking
  - iv No drips or leaks from the operator
- q Automated operators are operating correctly

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.

Note: The piping system should be considered in poor shape if two or more of the following conditions exist:

Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.

- a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.
- b There are heavy visible signs of wear or maintenance, showing signs of abuse.
  - i Hammering, heating, chipping, or scoring cutting.
  - ii Brush away lose paint to reveal the surface and assure that there is no cracking.
- c Pipe is improperly sized and specified for the intended purpose.
- d Gages and other ancillary equipment are not working properly.
- e Pipe hangers and supports are not aligned and tight against the pipe.
  - i Pipe is being is sagging.
- f There is no clearance between pipe and wall or other obstruction.
- g Pipe joint restrainers are not properly constructed, secure and tight there is some dripping or leaking.
- h Thrust blocking is tight, secure and designed correctly for the intended purpose.
- i Pipe joints may be leaking.
- j The types of pipe joints that will generally be encountered on the plant are:
  - i Mechanical joint missing “T” bolts or nuts, rubber gasket is protruding or pinched
  - ii Flange joint there are bolts or nuts missing, gasket is protruding.

iii Glue joint has excessive splash from glue or primer.
iv Thread or (Screw) joint is not properly constructed excess pipe joint compound.
v Bell and spigot joint no lead joint is acceptable, Rubber ring not seated properly and/or protruding.
vi Soldered joints have excess solder drip or run.
vii Brazed joints have excess solder drip or run the joint is not soldered correctly.
viii Welded pipe is not secured there nay be some cracked welds, signs of undercut or buried slag.
ix Hot Air Fusion of Plastic Pipe the butt connection is not even all around.

k The types of pipe that will be encountered on the plant are:
i Ductile iron Slight signs of corrosion
ii Cast iron signs of corrosion
iii Steel
a High and low Carbon signs of corrosion
b Sch-80, Sch-40 signs of corrosion
c Galvanized Pipe is coated with sacrificial zinc this coating may have been scraped away and the iron pipe is exposed and corroding.
d Copper tubing copper is beginning to corrode severely and is turning bluish green
iv Stainless steel tubing is shoeing signs of corrosion
v Plastic
a PVC cracking or signs of UV degradation.
b SDR-35 cracking or signs of UV degradation.
c Spec. C-900 cracking or signs of UV degradation.
d UV Resistant Pipe cracking or signs of UV degradation.
e And other special plastic types based on specific application and chemical resistance requirements.

l Pipe casings are in poor shape.

m Pipe exterior is not protected from corrosion and UV degradation.

n Insulation is in poor shape and no longer protects from heat and UV degradation.

o Valves are not properly sized, or the class is wrong, or the rating and configuration are wrong for the application.

p Valves are not positioned correctly for operation.
i Check Valves are in poor shape and do not seat correctly.
ii Gate valves, Ball valves, slide gates, Plug valves are being used in a throttling application.
iii Gate valves, globe style valves, Diaphragm valves and cone valves are generally good for throttling, but they are being used I an application that the velocity is too quick causing cavitation.

- q Valve operators are in poor shape
  - i The valve does not operates freely
  - ii The screw and yoke are damaged
  - iii The valve bonnet is leaking
  - iv Drips or leaks from the operator
- r Automated operators are not operating correctly

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

Note: The piping system should be considered in inoperable if four or more of the following conditions exist:

- a There are heavy visible signs of wear or showing signs of abuse.
  - i Hammering, heating, chipping, or scoring cutting.
  - ii Brush away lose paint to reveal the surface there are signs of cracking.
- b Pipe is improperly sized and specified for the intended purpose.
- c Gages and other ancillary equipment are not working.
- d Pipe hangers and supports are not aligned and tight against the pipe.
  - i Pipe is being is sagging.
- e There is no clearance between pipe and wall or other obstruction.
- f Pipe joint restrainers are not properly constructed, secure and tight there is some dripping or leaking.
- g Thrust blocking is tight, secure and designed correctly for the intended purpose.
- h Pipe joints may be leaking.
- i The types of pipe joints that will generally be encountered on the plant are:
  - i Mechanical joint missing "T" bolts or nuts, rubber gasket is protruding or pinched
  - ii Flange joint there are bolts or nuts missing, gasket is protruding.
  - iii Glue joint has excessive splash from glue or primer.
  - iv Thread or (Screw) joint is not properly constructed excess pipe joint compound.
  - v Bell and spigot joint no lead joint is acceptable, Rubber ring not seated properly and/or protruding.
  - vi Soldered joints have excess solder drip or run.
  - vii Brazed joints have excess solder drip or run the joint is not soldered correctly.
  - viii Welded pipe is not secured there nay be some cracked welds, signs of undercut or buried slag.
  - ix Hot Air Fusion of Plastic Pipe the butt connection is not even all around.
- j The types of pipe that will be encountered on the plant are:
  - i Ductile iron Slight signs of corrosion
  - ii Cast iron signs of corrosion

iii Steel
a High and low Carbon signs of corrosion
b Sch-80, Sch-40 signs of corrosion
c Galvanized Pipe is coated with sacrificial zinc this coating may have been scraped away and the iron pipe is exposed and corroding.
d Copper tubing copper is beginning to corrode severely and is turning bluish green
iv Stainless steel tubing is shoeing signs of corrosion
v Plastic
a PVC cracking or signs of UV degradation.
b SDR-35 cracking or signs of UV degradation.
c Spec. C-900 cracking or signs of UV degradation.
d UV Resistant Pipe cracking or signs of UV degradation.
e And other special plastic types based on specific application and chemical resistance requirements.

k Pipe casings are in poor shape.
l Pipe exterior is not protected from corrosion and UV degradation.
m Insulation is in poor shape and no longer protects from heat and UV degradation.
n Valves are not properly sized, or the class is wrong, or the rating and configuration are wrong for the application.
o Valves are not positioned correctly for operation.
i Check Valves are in poor shape and do not seat correctly.
ii Gate valves, Ball valves, slide gates, Plug valves are being used in a throttling application.
iii Gate valves, globe style valves, Diaphragm valves and cone valves are generally good for throttling, but they are being used I an application that the velocity is too quick causing cavitation.

p Valve operators are in poor shape
i The valve does not operates freely
ii The screw and yoke are damaged
iii The valve bonnet is leaking
iv Drips or leaks from the operator

q Automated operators are not operating correctly

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Heating Ventilation and Air Conditioning

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.
   - a Looks like it did when it was first installed and accepted.
   - b There are no leaks in the system. This can typically be verified by screening the system with a halogen sensor.
     - i Pay special attention to the high side piping and capillary lines.
   - c The main components of the HVAC system are as follows:
     - i Compressor – compresses refrigerant into a smaller volume for use on the high side of the unit. This unit is typically piston or rotary vane.
     - ii Condenser – is a coil with channeling fins that allows the refrigerant to condense where heat is given off to the atmosphere before entering the receiver.
     - iii Receiver – stores hot refrigerant from the compressor for the system and is the main supply when the system needs refrigerant.
     - iv Expansion valve – holds the refrigerant on the high side of the unit and open automatically to allow refrigerant to flow slowly through the evaporator.
     - v Evaporator – is a coil with channeling fins that allows the refrigerant to evaporate while air is forced through the fins. The evaporative reaction absorbs heat from the air which in turn removes humidity and cools the air.
   - d Check all major components they should be new with no signs of maintenance or abuse.
   - e There should be no signs of handling abuse.
   - f Name plate is clean, readable and in good condition.
   - g The housing is properly specified, sized and constructed for intended purpose.
     - i The housing is kept clean inside
     - ii Think of the atmosphere, unit size and other necessary components.
   - h Lifting hooks and jacks are in good shape.
   - i The bushings and covers are in good shape.
   - j There are no signs of corrosion or deterioration.
   - k There are no signs of abuse to the condensers or evaporators
   - l All panel doors swing free and easy.

m All locking and Lockout-tagout mechanisms are working properly.
n Pressure-relief devices are operating, clean, and in good shape.
   i Pressure-vacuum valves
   ii Expansion valves or tanks
o All gages are new, operating correctly and readings are within operating parameters.
p No Irregularities!
   i Thermometers
   ii Sight glass
   iii Pressure-Vacuum gages
   iv Alarms
   v Relays
q Filters are clean and replaced often
   i Often dates are kept o the unit this is a good indication.
   ii Remember there are air filters and there are oil or fluid filters
r All coils and fins are operating, in good shape and free of any blockage or debris.
   i No bent fins
s Grounding is secure with no signs of deterioration.
t If electric line ends are visible there are no signs of heating, arching and there are no strands missing or pulled.
u Mountings are secure with no signs of over-torque, wear, or cracking.
v Concrete pedestal is new with no cracking broken edges and fresh seal.

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.
a There may be signs that maintenance has been provided.
b There are no leaks in the system. This can typically be verified by screening the system with a halogen sensor.
   i Pay special attention to the high side piping and capillary lines.
c The main components of the HVAC system are as follows:
   i Compressor
   ii Condenser
   iii Receiver
   iv Expansion valve
   v Evaporator
d Check all major components they should be minor signs of maintenance but no abuse.
e There should be no signs of handling abuse.
f Name plate is clean, readable and in good condition.
g The housing is properly specified, sized and constructed for intended purpose.
   i The housing is kept clean inside

    - ii Think of the atmosphere, unit size and other necessary components.
- h Lifting hooks and jacks are in good shape.
- i The bushings and covers are in good shape.
- j There are no signs of corrosion or deterioration.
- k There are no signs of abuse to the condensers or evaporators
    - i There are no bent channeling fins.
    - ii If some fins have been bent they have been properly combed out.
- l All panel doors swing free and easy.
- m All locking and Lockout-tagout mechanisms are working properly.
- n Pressure-relief devices are operating, clean, and in good shape.
    - i Pressure-vacuum valves
    - ii Expansion valves or tanks
- o All gages are operating correctly and readings are within operating parameters.
    - i Some of these components may have been replaced during maintenance.
    - ii Thermometers
    - iii Sight glass
    - iv Pressure-Vacuum gages
    - v Alarms
    - vi Relays
- p Filters are clean and replaced often
    - i Often dates are kept o the unit this is a good indication.
    - ii Remember there are air filters and there are oil or fluid filters
- q All coils and fins are operating, in good shape and free of any blockage or debris.
- r Grounding is secure with no signs of deterioration.
- s If electric line ends are visible there are no signs of heating, arching and there are no strands missing or pulled.
- t Mountings are secure with no signs of over-torque, wear, or cracking.
- u Concrete pedestal is new with no cracking broken edges and fresh seal.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions
- a There are some visible signs of wear, but show no signs of abuse.
- b There may be signs that maintenance has been provided.
- c There are no leaks in the system. This can typically be verified by screening the system with a halogen sensor.
    - i Pay special attention to the high side piping and capillary lines.
- d The main components of the HVAC system are as follows:
    - i Compressor
    - ii Condenser
    - iii Receiver

- iv Expansion valve
- v Evaporator

e Check all major components there should be minor signs of maintenance but no abuse.
- i Some of these components may have been replaced.

f There should be no signs of handling abuse.

g Name plate is clean, readable and in good condition.

h The housing is properly specified, sized and constructed for intended purpose.
- i The housing is kept clean inside
- ii Think of the atmosphere, unit size and other necessary components.

i Lifting hooks and jacks are in good shape.
- i May show signs of use for maintenance

j The bushings and covers are in good shape.

k There are no signs of corrosion or deterioration.

l There are no signs of abuse to the condensers or evaporators
- i If some fins may have been bent they have been properly combed out.
- ii May have some signs of external corrosion based on the age of the system.

m All panel doors swing free and easy.
- i Panel doors will show signs of age and continued maintenance.

n All locking and Lockout-tagout mechanisms are working properly.
- i May be showing signs of use but no abuse.

o Pressure-relief devices are operating, clean, and in good shape.
- i Pressure-vacuum valves
- ii Expansion valves or tanks

p All gages are operating correctly and readings are within operating parameters.
- i Some of these components may have been replaced during maintenance.
- ii Thermometers
- iii Sight glass
- iv Pressure-Vacuum gages
- v Alarms
- vi Relays

q Filters are clean and replaced often.
- i Often dates are kept o the unit this is a good indication.
- ii Remember there are air filters and there are oil or fluid filters

r All coils and fins are operating, in good shape and free of any blockage or debris.

s Grounding is secure with no signs of deterioration.

t If electric line ends are visible there are no signs of heating, arching and there are no strands missing or pulled.

- u Mountings are secure with no signs of over-torque, wear, or cracking.
- v Concrete pedestal is new with no cracking broken edges and fresh seal.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.
   - a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.
   - b Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.
   - c There are some visible signs of wear, and shows no signs of abuse.
   - d There may be signs that maintenance has been provided.
   - e There are no leaks in the system. This can typically be verified by screening the system with a halogen sensor.
     - i Pay special attention to the high side piping and capillary lines.
   - f The main components of the HVAC system are as follows:
     - i Compressor
     - ii Condenser
     - iii Receiver
     - iv Expansion valve
     - v Evaporator
   - g Check all major components there should be minor signs of maintenance but no abuse.
     - i Some of these components may have been replaced.
   - h There should be no signs of handling abuse.
   - i Name plate is clean, readable and in good condition.
   - j The housing is properly specified, sized and constructed for intended purpose.
     - i The housing is kept clean inside
     - ii Think of the atmosphere, unit size and other necessary components.
   - k Lifting hooks and jacks are not in good shape.
   - l The bushings and covers are not in good shape.
   - m There are some signs of corrosion or deterioration.
   - n There are some signs of abuse to the condensers or evaporators
     - i Some fins may have been bent and they are currently blocking air flow.
     - ii May have some signs of external corrosion based on the age of the system.
   - o All panel doors are hard to open.
     - i Panel doors will show signs of age and continued maintenance.
   - p Locking and Lockout-tagout mechanisms are not working properly.
     - i May be showing signs of use but no abuse.
   - q Pressure-relief devices are not operating correctly and are not clean.
     - i Pressure-vacuum valves

ii Expansion valves or tanks

r All gages are not operating correctly or readings are not within operating parameters.

i Some of these components may need to be replaced.

ii Thermometers

iii Sight glass

iv Pressure-Vacuum gages

v Alarms

vi Relays

s Filters are not clean.

i No indication that filters are changed regularly.

t All coils and fins are operating, but there may be a blockage or debris.

u Grounding is not secure with slight signs of deterioration.

v If electric line ends are visible there may be some signs of heating, arching but there are no strands missing or pulled.

w Mountings are not secure may have signs of over-torque, wear, or cracking.

x Concrete pedestal is may have some cracking broken edges.

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a There are heavy visible signs of wear, and shows slight signs of abuse.

b There may be signs that maintenance has been provided.

c There are leaks in the system. This can typically be verified by screening the system with a halogen sensor.

i Pay special attention to the high side piping and capillary lines.

d The main components of the HVAC system are as follows:

i Compressor

ii Condenser

iii Receiver

iv Expansion valve

v Evaporator

e Check all major components if there are signs of abuse this unit should be considered Inoperable.

i Components that need to be replaced have not been replaced.

f There are signs of handling abuse.

g Name plate is no longer readable.

h The housing is no longer properly specified, sized and constructed for intended purpose.

i The housing is not kept clean inside

ii Think of the atmosphere, unit size and other necessary components.

i Lifting hooks and jacks are not in good shape.

j The bushings and covers are not in good shape.

k There are major signs of corrosion or deterioration.

l There are some signs of abuse to the condensers or evaporators

- i Some fins may have been bent and they are currently blocking air flow over 30% of the coil
- ii Showing signs of external corrosion and deterioration more than should be expected.

m All panel doors are hard to open or they may not completely close.

n Locking and Lockout-tagout mechanisms are not working properly.

- i May be showing signs of use but no abuse.

o Pressure-relief devices are not operating correctly and are not clean.

- i Pressure-vacuum valves
- ii Expansion valves or tanks

p All gages are not operating correctly or readings are not within operating parameters.

- i Some of these components may need to be replaced.
- ii Thermometers
- iii Sight glass
- iv Pressure-Vacuum gages
- v Alarms
- vi Relays

q Filters are not clean.

- i No indication that filters are changed regularly.

r All coils and fins are operating, but there may be a blockage or debris.

s Grounding is not secure with slight signs of deterioration.

t If electric line ends are visible there may be some signs of heating, arching but there are no strands missing or pulled.

u Mountings are not secure may have signs of over-torque, wear, or cracking.

v Concrete pedestal is may have some cracking broken edges.

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

HVAC Ductwork

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.
   a Looks like it did when it was first installed and accepted.
   b There are no signs of corrosion or deterioration.
   c Ductwork is most often constructed of the following material:
      i Fiberglass
      ii Plastic
      iii Sheet metal
   d Components of ventilation duct include:
      i Supply air duct
      ii Return or exhaust air duct
      iii Dampers
      iv Splitters
      v Turning vanes
      vi Diffusers
      vii Grills (Registers)
   e Exposed air duct is often insulated
      i This insulation must be in good shape without holes except for where the access panel is.
   f There are no leaks in the flanged ends.
   g All duct connections are solid and sealed.
   h If the ductwork is suspended it should be straight and allow air to flow easily without constant bending and turning.

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.
   a Looks like it did when it was first installed and accepted.
      i There may be slight signs of maintenance or cleaning around the access panels or around the grill or diffusers.
   b There are no signs of corrosion or deterioration.
   c Ductwork is most often constructed of the following material:
      i Fiberglass
      ii Plastic
      iii Sheet metal

d Components of ventilation duct include:
   i Supply air duct
   ii Return or exhaust air duct
   iii Dampers
   iv Splitters
   v Turning vanes
   vi Diffusers
   vii Grills (Registers)
e Exposed air duct is often insulated
   i This insulation must be in good shape without holes except for where the access panel is.
f There are no leaks in the flanged ends.
g All duct connections are solid and sealed.
h If the ductwork is suspended it should be straight and allow air to flow easily without constant bending and turning.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions

a There are some visible signs of wear, but show no signs of abuse.
   i There may be slight signs of maintenance or cleaning around the access panels or around the grill or diffusers.
b There are no signs of corrosion or deterioration.
c Ductwork is most often constructed of the following material:
   i Fiberglass
   ii Plastic
   iii Sheet metal
d Components of ventilation duct include:
   i Supply air duct
   ii Return or exhaust air duct
   iii Dampers
   iv Splitters
   v Turning vanes
   vi Diffusers
   vii Grills (Registers)
e Exposed air duct is often insulated
   i This insulation may not be in good shape without only small holes are acceptable.
   ii The insulation around the access panel may be torn slightly due to maintenance.
f There are no leaks in the flanged ends.
g All duct connections are solid and sealed.
h If the ductwork is suspended it should be straight and allow air to flow

easily without constant bending and turning.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.
   a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.

   Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.

   b There are visible signs of wear, but show no signs of abuse.
      i There are sign of heavy maintenance or cleaning around the access panels or around the grill or diffusers.
   c There are no signs of corrosion or deterioration.
   d Ductwork is most often constructed of the following material:
      i Fiberglass
      ii Plastic
      iii Sheet metal
   e Components of ventilation duct include:
      i Supply air duct
      ii Return or exhaust air duct
      iii Dampers
      iv Splitters
      v Turning vanes
      vi Diffusers
      vii Grills (Registers)
   f Exposed air duct is often insulated
      i This insulation is not in good shape large holes, missing insulation.
      ii The access panel is missing the seal due to excessive maintenance.
   g There are leaks in the flanged ends.
   h Suspended ductwork is not straight air to flow is required to constantly flow around bends.
   i Sheet metal ductwork may have minor dents in the side from impacts.

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.
   a There are visible signs of wear that is beyond that that should be expected for the age.
   b There is corrosion in and around the ductwork.
   c The ductwork is severely deteriorating.
      i There are sign of heavy maintenance or cleaning around the access panels or around the grill or diffusers.
   d Ductwork is most often constructed of the following material:
      i Fiberglass
      ii Plastic

iii Sheet metal

e Components of ventilation duct include:

i Supply air duct

ii Return or exhaust air duct

iii Dampers

iv Splitters

v Turning vanes

vi Diffusers

vii Grills (Registers)

f Exposed air duct is often insulated

i This insulation is not in good shape large holes, missing insulation.

ii The access panel is missing the seal due to excessive maintenance.

g There are leaks in the flanged ends.

h Suspended ductwork is not straight air to flow is required to constantly flow around bends.

i Sheet metal ductwork may have severe dents in the side from impacts.

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Instrumentation

Inspection of instrumentation is not as simple as evaluating a piece of equipment. Evaluation of instrumentation is more a functionality vs. new technology question. While assessing the condition of instruments the technician must consider the fact that new technologies are always entering the market. These new introductions may add another component of functionality that may better suit process requirements or provide much more reliable service. Parts availability is another component of condition assessment of instrumentation. It is not cost effective to rebuild boards or other components in house when these parts are no longer available; therefore, age is extremely important, not just in the idea of expected service life as in mechanical equipment, but also in evaluating obsolescence.

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.
   - a Looks like it did when it was first installed and accepted.
   - b Some of the more common instruments encountered will include the following:
     - i Gauges
       - a Pressure
       - b Differential
       - c Liquid level probe
       - d Ultrasonic level
       - e Temperature
       - f Velocity
     - ii Meters
       - a Flow
       - b pH
       - c ORP
       - d D.O.
       - e Combustible gas
       - f Ultrasonic flow
       - g Magnetic flow
     - iii Switches
       - a Flow

b Liquid level
c Float
iv All may have transmitters
v All may be connected to PLC for control
c There should be no leaks or signs of abuse.
d Remove covers of electric service if possible, and give a slight pull test.
i There should be no loose connections.
e All housings should be in good shape with no signs of abuse.
f All gauges, meters, should be operating properly.
g All switches should be operating properly.
h All transmitters should be operating properly.
i All conduit connections should be complete with no leaks in seal tight fittings.

2. **Good overall condition**: - asset fully functional for current operating conditions with no visible signs of minor defects or wear.

a Looks like it did when it was first installed and accepted.
b There may be some slight signs of maintenance.
c Some of the more common instruments encountered will include the following:
i Gauges
a Pressure
b Differential
c Liquid level probe
d Ultrasonic level
e Temperature
f Velocity
ii Meters
a Flow
b pH
c ORP
d D.O.
e Combustible gas
f Ultrasonic flow
g Magnetic flow
iii Switches
a Flow
b Liquid level
c Float
iv All may have transmitters
v All may be connected to PLC for control
d There should be no leaks or signs of abuse.

- e Remove covers of electric service if possible, and give a slight pull test.
  - i There should be no loose connections.
- f All housings should be in good shape with no signs of abuse.
- g All gauges, meters, should be operating properly.
- h All switches should be operating properly.
- i All transmitters should be operating properly.
- j All conduit connections should be complete with no leaks in seal tight fittings.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions
- a There are some visible signs of wear, but show no signs of abuse.
- b Some of the more common instruments encountered will include the following:
  - i Gauges
    - a Pressure
    - b Differential
    - c Liquid level probe
    - d Ultrasonic level
    - e Temperature
    - f Velocity
  - ii Meters
    - a Flow
    - b pH
    - c ORP
    - d D.O.
    - e Combustible gas
    - f Ultrasonic flow
    - g Magnetic flow
  - iii Switches
    - a Flow
    - b Liquid level
    - c Float
  - iv All may have transmitters
  - v All may be connected to PLC for control
- c There should be no leaks or signs of abuse.
- d Remove covers of electric service if possible, and give a slight pull test.
  - i There should be no loose connections.
- e All housings should be in good shape with no signs of abuse.
- f All gauges, meters, should be operating properly.
- g All switches should be operating properly.
- h All transmitters should be operating properly.
- i All conduit connections should be complete with no leaks in seal tight

fittings.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.
   a This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.
   b A couple but not all parts are obsolete.
   c Note: No equipment can be restored back to its original excellent condition standard and therefore cannot receive a grade of five.
   d Some of the more common instruments encountered will include the following:
      i Gauges
         a Pressure
         b Differential
         c Liquid level probe
         d Ultrasonic level
         e Temperature
         f Velocity
      ii Meters
         a Flow
         b pH
         c ORP
         d D.O.
         e Combustible gas
         f Ultrasonic flow
         g Magnetic flow
      iii Switches
         a Flow
         b Liquid level
         c Float
      iv All may have transmitters
      v All may be connected to PLC for control
   e There should be no leaks or signs of abuse.
   f Remove covers of electric service if possible, and give a slight pull test.
      i There should be no loose connections.
   g All housings should be in good shape with no signs of abuse.
   h All gauges, meters, should be operating properly.
   i All switches should be operating properly.
   j All transmitters should be operating properly.
   k All conduit connections should be complete with no leaks in seal tight fittings.

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a Too many of the parts are obsolete to repair; replacement is a better suited approach.

b Some of the more common instruments encountered will include the following:

- i Gauges
  - a Pressure
  - b Differential
  - c Liquid level probe
  - d Ultrasonic level
  - e Temperature
  - f Velocity
- ii Meters
  - a Flow
  - b pH
  - c ORP
  - d D.O.
  - e Combustible gas
  - f Ultrasonic flow
  - g Magnetic flow
- iii Switches
  - a Flow
  - b Liquid level
  - c Float
- iv All may have transmitters
- v All may be connected to PLC for control

c Remove covers of electric service if possible, and give a slight pull test.

- i There should be no loose connections.

d Housings could be in bad shape with slight signs of abuse.

e Gauges, meters, may not be operating properly.

f Switches may not be operating properly.

g Transmitters may not be operating properly.

h Conduit connections are broken or there are leaks in seal tight fittings.

- i The wire is questionable.

0 **Abandoned:** asset is abandoned in place, this equipment may only need minimal maintenance to be placed in service.

Condition Assessment

Rating Definitions for Direct Visual Assessment

Architectural; Structural

1. **Excellent overall condition**: - asset fully functional as designed with no visible defects or wear.

- a This asset looks like it did when it was first constructed and accepted.
- b Architectural systems of a structure are generally the following:
  - i Roof system – these structures oar generally made of concrete, steel or wood.
  - ii Exterior walls
  - iii Interior bearing walls
  - iv Tunnel system (Pipe galleries)
  - v Basements
  - vi Driveways
  - vii Sidewalks
  - viii Stair ways
  - ix Elevators
  - x Footer systems
  - xi Basements
  - xii Foundation systems
- c Structural systems generally include the following:
  - i Access hatches
  - ii Stairways
  - iii Ladders
  - iv Manholes
  - v Man-ways
  - vi Large diameter piping
  - vii Flow channels
  - viii Tank structures
  - ix Support structures
  - x Overflow channels
  - xi Guard rails
  - xii Walkways and driveways over tank and channel structures
  - xiii Bridges
  - xiv Gantry or bridge crane supports
- d Roof should be clean, solid with no apparent flaws.
  - i Check along the sides and intersections look at all flashings to be sure

that they are sealed.

- ii If tile there should be no cracked or broken tiles
- iii If shingles all shingles should be properly set with straight lines no missing shingles and no failed or rolled edges.

e All brick, tile and masonry should be clean with no cracks in the joints or in the masonry.

- i All mortar joints should be clean with no flaws.

f There should be no signs of stress, cracking, bending, warping.

g Seals between components should be solid with no signs of fracture,

- i Pay close attention to the edges of these components for cracking due to over stressing conditions.

h There should be no missing or cracked fasteners.

i All rails should be strong and straight with no signs of corrosion

j All concrete edges should be complete with no signs of cracking or deterioration.

k There should be no signs of staining especially on concrete walls

- i Staining often is a precursor to intrusion into sealed concrete cause by chemical attack.

l The only aggregate that should be visible is that which is decorative and intended.

m Supporting structures are in good shape with no flaws.

n Stairways are solid with no signs of deterioration or corrosion, and no missing hardware.

o Handrails are solid with no signs of corrosion and no missing assemblies.

p Guard rails are solid and temporary guards are in place with no violations.

q Walkways are clear of obstruction and missing or damaged panels.

r Seal on concrete is complete with no signs of deterioration.

- i Pay special attention to water flow lines and areas where chemical attack is most probable.

s All access hatches, man-ways and manholes are solid with no flaws.

t Locks are solid.

u Lifting hardware is complete and in good shape.

v Warning signs are properly placed legible and clean.

w Ladders are solid.

x Hinge hardware is solid and works properly.

y There are no signs of abuse

- i Hammering, chipping, over stressing fasteners and other hardware.

z All hardware is in good shape.

aa All access hatch seals are clean, and made of proper materials intended for the sealing purpose.

2. **Good overall condition**: - asset fully functional for current operating

conditions with no visible signs of minor defects or wear.

- a There may be slight signs that maintenance has been provided.
- b Roof should be clean, solid with no apparent flaws.
  - i Check along the sides and intersections look at all flashings to be sure that they are sealed.
  - ii If tile there should be no cracked or broken tiles
  - iii If shingles all shingles should be properly set with straight lines no missing shingles and no failed or rolled edges.
- c All brick, tile and masonry should be clean with no cracks in the joints or in the masonry.
  - i All mortar joints should be clean with no flaws.
- d There should be no signs of stress, cracking, bending, warping.
- e Seals between components should be solid with no signs of fracture,
  - i Pay close attention to the edges of these components for cracking due to over stressing conditions.
- f There should be no missing or cracked fasteners.
- g All rails should be strong and straight with no signs of corrosion
- h All concrete edges should be complete with no signs of cracking or deterioration.
- i There should be no signs of staining especially on concrete walls
  - i Staining often is a precursor to intrusion into sealed concrete cause by chemical attack.
- j The only aggregate that should be visible is that which is decorative and intended.
- k Supporting structures are in good shape with no flaws.
- l Stairways are solid with no signs of deterioration or corrosion, and no missing hardware.
- m Handrails are solid with no signs of corrosion and no missing assemblies.
- n Guard rails are solid and temporary guards are in place with no violations.
- o Walkways are clear of obstruction and missing or damaged panels.
- p Seal on concrete is complete with no signs of deterioration.
  - i Pay special attention to water flow lines and areas where chemical attack is most probable.
- q All access hatches, man-ways and manholes are solid with no flaws.
- r Locks are solid.
- s Lifting hardware is complete and in good shape.
- t Warning signs are properly placed legible and clean.
- u Ladders are solid.
- v Hinge hardware is solid and works properly.
- w There are no signs of abuse
  - i Hammering, chipping, over stressing fasteners and other hardware.
- x All hardware is in good shape.

y All access hatch seals are clean, and made of proper materials intended for the sealing purpose.

3. **Fair overall condition:** - the asset functions as needed for current operating conditions

a There are some visible signs of wear, but show no signs of abuse.
b Roof should be clean, solid with few apparent flaws.
  i Check along the sides and intersections look at all flashings to be sure that they are sealed.
  ii If tile there should be no cracked or broken tiles
  iii If shingles all shingles should be properly set with straight lines no missing shingles and may be showing some rolled edges.
c All brick, tile and masonry should be clean with no cracks in the joints or in the masonry.
  i All mortar joints should be clean with no flaws.
d There should be no signs of stress, cracking, bending, warping.
e Seals between components should be solid with no signs of fracture,
  i Pay close attention to the edges of these components for cracking due to over stressing conditions.
f There should be no missing or cracked fasteners.
g All rails should be strong and straight with no signs of corrosion
h All concrete edges should be complete with no signs of cracking or deterioration.
i There could be some signs of staining especially on concrete walls
  i Look carefully staining often is a precursor to intrusion into sealed concrete cause by chemical attack.
  ii Some staining is permissible but there should be no signs of deterioration.
j Some aggregate could be visible due to chemical attack or flow deterioration.
  i This should be minimal and plans should be made to apply a new fresh seal.
k Supporting structures are in good shape with no flaws.
l Stairways are solid with no signs of deterioration or corrosion, and no missing hardware.
m Handrails are solid with no signs of corrosion and no missing assemblies.
n Guard rails are solid and temporary guards are in place with no violations.
o Walkways are clear of obstruction and missing or damaged panels.
p Seal on concrete is showing signs of deterioration.
  i Pay special attention to water flow lines and areas where chemical attack is most probable.

- q All access hatches, man-ways and manholes are solid with no flaws.
- r Locks are solid.
- s Lifting hardware is complete and in good shape.
- t Warning signs are properly placed legible and clean.
- u Ladders are solid.
- v Hinge hardware is solid and works properly.
- w There are no signs of abuse
  - i Hammering, chipping, over stressing fasteners and other hardware.
- x All hardware is in good shape.
- y All access hatch seals are clean, and of proper materials intended for the sealing purpose.

4. **Poor overall condition**: - asset is operable, but does not function as needed for current operating conditions.

- a **All safety problems should be reported and repairs made immediately.**
- b This asset can be maintained, rebuilt or a subcomponent replaced to restore its condition to a higher level.

Note: No equipment can be restored back to its original excellent condition standard unless completely replaced and therefore cannot receive a grade of five.

- c Roof could show minimal apparent flaws.
  - i Check along the sides and intersections look at all flashings to be sure that they are sealed.
  - ii If tile there could be few cracked or broken tiles
  - iii Shingles could be missing or show some rolled edges.
- d Brick, tile and masonry could have some cracks in the joints or in the masonry.
- e There should be no signs of stress, cracking, bending, warping.
- f Seals between components could may have failed but with no signs of material fracture.
  - i Pay close attention to the edges of these components for cracking due to over stressing conditions.
- g There could be missing or cracked fasteners.
- h All rails should be strong and straight but they may show slight signs of corrosion
- i Concrete could show hairline signs of cracking or deterioration.
- j There could be some signs of staining or exposed aggregate on concrete walls
  - i Look carefully staining often is a precursor to intrusion into sealed concrete cause by chemical attack.

ii Some staining may be signs of deterioration.

k Some aggregate could be visible due to chemical attack or flow deterioration.

i Plans should be made to apply a new fresh seal.

l Supporting structures are in good shape with there may be small hairline cracks

i There may be some efflorescence visible.

m Stairways are solid with no signs of deterioration or corrosion, and no missing hardware.

n There may be signs of corrosion on handrails but at no time are there missing assemblies or rails.

o Guard rails are solid and temporary guards are in place with no violations.

p Walkways are deteriorating but they are still clear of obstruction and missing or damaged panels.

q Seal on concrete is showing signs of deterioration.

i Pay special attention to water flow lines and areas where chemical attack is most probable.

ii There is no cracking severe enough to expose rebar.

iii No rebar is exposed.

r All access hatches, man-ways and manholes are solid with no flaws.

s Locks are solid.

t Lifting hardware is complete and in good shape.

u Warning signs are properly placed legible and clean.

v Ladders are solid.

w Hinge hardware is solid and works properly.

x There are no signs of abuse

i Hammering, chipping, over stressing fasteners and other hardware.

y All hardware is in good shape.

z All access hatch seals are clean, and of proper materials intended for the sealing purpose.

5. **Inoperable**: asset is non-functional, requires major repair, rebuild or replacement to restore operation.

a Roof could show minimal apparent flaws.

i Check along the sides and intersections look at all flashings to be sure that they are sealed.

ii If tile there could be few cracked or broken tiles

iii Shingles could be missing or show some rolled edges.

b Brick, tile and masonry could have some cracks in the joints or in the masonry.

c There may be signs of stress, cracking, bending, warping.

d Seals between components have failed but with signs of material fracture.
    i Pay close attention to the severity of cracking along edges of these components due to over stressed conditions.
e There could be missing or cracked fasteners.
f All rails are no longer strong and straight and they are showing signs of corrosion
g Concrete could show signs of severe cracking or deterioration.
h There are signs of severely exposed aggregate on concrete walls
i Supporting structures may have sever cracks with rebar showing
j There is severe efflorescence.
k Stairways are not solid with signs of deterioration or corrosion, and/or missing hardware.
l There may be signs of corrosion on handrails but at no time are there missing assemblies or rails.
m Guard rails are not solid and temporary guards are missing.
n Walkways are severely deteriorating there are obstructions and missing or damaged panels.
o Seal on concrete is severely deteriorated with missing, cracked and/or chipped ends.
    i Pay special attention to water flow lines and areas where chemical attack is most probable.
    ii Rebar is exposed.
p There are flows in access hatches, man-ways and manholes.
q Locks are not working
r Lifting no longer works.
s Warning signs missing.
t Ladders are missing or they are missing rungs.
u Hinge hardware does not work properly.
v There are signs of abuse
    i Hammering, chipping, over stressing fasteners and other hardware.
w Hardware is not in good shape.
x Access hatch seals are missing, not sealing, cracked, or they are made of improper materials not intended for the sealing purpose.

0 **Abandoned:** asset is abandoned in place; this equipment may only need minimal maintenance to be placed in service.

Appendix D

Stephl Engineering/CDM Smith – Raw Water Tunnel and Pipeline Condition Assessment Proposal (December 2016)

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To: Mike Hyland, P.E., CDM Smith
From: Matt Stephl P.E.
Subject: Raw Water Pipe Condition Assessment Update
Project: Eklutna WTF Facility Plan and Asset Management Plan
Date: December 16, 2016

3900 Arctic Blvd., Suite 204
Anchorage, Alaska 99503
Ph: 907-562-1468
mstephl@stephleng.com

DRAFT 12-16-16

SECTION 1
BACKGROUND AND PURPOSE

The 40,873-foot-long Eklutna WTF raw water conveyance system was completed in 1988 and has a hydraulic design capacity of 100 million gallons per day (MGD).

The raw water system consists of seven major components:

- Intake at Eklutna Lake
- Existing power plant tunnel that conveys water from the intake (approx. 500 LF)
- Intake Valve Shaft at the connection of the power plant tunnel and the Lake Diversion Tunnel
- Lake Diversion Tunnel (8,620 LF)
- Portal Valve Shaft located at the downstream end of the Lake Diversion Tunnel
- P-4 Raw Water Transmission Pipe (32,253 LF)
- Energy Recovery Station located at the lower end of P-4 and at the headworks of the WTF

This memorandum will focus on the two major components of the raw water system: 1) the Lake Diversion Tunnel pipeline, and 2) the P-4 Raw Water Transmission pipeline. The purpose of this memorandum is to present proposed procedures for determining the condition of the pipes and the estimated cost of this work.

SECTION 2
LAKE DIVERSION TUNNEL

Description
The 8,620 LF (linear foot) Lake Diversion Tunnel is constructed with 8,458 LF of 72-inch diameter pre-stressed concrete cylinder pipe (PCCP). The 72-inch PCCP pipe contains 119 LF of pipe with welded joints and 8,339 LF of pipe with double gasketed joints. The remainder of the Lake Diversion Tunnel pipe was built with welded steel pipe that was installed upstream of the meters at each valve shaft and includes 82 LF of 54-inch pipe at the Intake Valve Shaft and 80 LF of 54-inch pipe at the Portal Valve Shaft.

Most of the Lake Diversion Tunnel is about 200 feet below the ground surface. A tunneling machine was used to construct the 9.5-foot diameter tunnel in the existing gravel soils. As the tunneling work progressed, a steel beam and wood structure was built to support the tunnel walls. After the tunnel was built, the PCCP pipe was installed by sliplining (insertion process) it into place from the lower end of the tunnel. Cement grout was used to fill the annular space between the PCCP and the tunnel walls to help secure the PCCP water pipe. Joints in the PCCP pipe were covered with hand-applied mortar on the inside and outside of the connections.

Complications during construction led to a portion of the PCCP becoming collapsed. A 16-foot long by 60-inch diameter steel repair section was built between station 89+97 and 90+13 to cover the collapsed area. This repair is located 470 feet downstream from the Intake Valve Shaft (station 94+81).

Access for Inspection

The Lake Diversion Tunnel can be drained to perform an inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the Lake Diversion Tunnel. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Access to inspect the Lake Diversion Tunnel would be via hatches that are located at each end of the tunnel; one is in the Intake Valve Shaft structure and the other is in the Portal Valve Shaft structure. The hatches provide a 24-inch diameter access into the pipe.

A gate valve in the Intake Valve Shaft structure controls the water flow into the Lake Diversion Tunnel pipeline. Two butterfly valves in the Lake Diversion Tunnel raw water pipe are also located in the Intake Valve Shaft and the Portal Valve Shaft. When man-entry work is performed, both the gate valve and the butterfly valve in the Intake Valve Shaft must be closed.

Corrosion Monitoring Stations

Twelve corrosion monitoring stations are located periodically along the Lake Diversion Tunnel. They are used to measure the potential corrosion activity in the soil that is outside of the steel tunnel liner. They do not provide corrosion readings for the PCCP pipe. Two of the stations are located in the Intake Valve Shaft and Portal Valve Shaft (one in each valve shaft). Readings can be taken from the wall-mounted boxes in these two structures. The remaining ten corrosion monitoring stations are positioned along the 72-inch PCCP pipe. Readings from the stations inside the pipe can only be taken by dewatering the pipe and walking to each station.

In the O&M Manual, Section 302000 contains information about the monitoring stations in the tunnel. The 10 corrosion monitoring stations are used to measure the potential corrosion activity on the soil side of the steel tunnel liner. They consist of high purity zinc reference electrodes extending approximately 6 inches into the soil outside of the tunnel, with test connections terminated on the interior of the tunnel.

The O&M Manual describes the testing procedure for the diversion tunnel corrosion monitoring stations. A DC voltmeter is set at a 1-volt to 2-volt range and used to measure the voltage between the zinc electrode and the adjacent 3-inch diameter pipe coupling that is connected to the steel tunnel wall. Measurements taken are to be compared to previous readings to identify changes which may be indicative of corrosion activity. According to the O&M Manual, changes in potential measurements exceeding a 10 percent difference from previous readings could indicate possible corrosion activity.

Initial potential measurements were taken during the week of August 24, 1987. These are the only known previous readings taken from the corrosion stations inside the tunnel. The results are shown below:

Station No.	Potential Measurement (Volts) (Structure-to-Reference Electrode)
94+47	0.575
89+94	0.636
78+45	0.863
69+92	0.270
59+91	0.917
48+47	0.927
39+90	0.884
29+89	0.587
19+88	0.236
10+13	0.417

The O&M Manual recommended that the electrode test stations in the Lake Diversion Tunnel be checked and tested periodically. No regularly scheduled sequence for this testing work was required.

SECTION 3
P-4 RAW WATER TRANSMISSION PIPELINE

Description

The P-4 Raw Water Transmission pipeline was installed using the traditional trench excavating and backfill method. The 32,253 LF mortar lined and coated steel pipeline (MLCP or CML&C steel) contains 16,199 LF of 54-inch diameter pipe and 16,148 LF of 60-inch diameter pipe. The pipe joints are welded and covered with mortar/grout in the field. The MLCP is constructed with a steel core that is wrapped on the outside with wire reinforcement. Cement mortar covers both the inside and the outside of the steel.

In 2016, AWWU staff cleared and graded the access road along the P-4 pipeline. The entire pipeline route can now be traveled with a 4-wheel drive vehicle.

Access for Inspection

The P-4 Raw Water Transmission pipeline can be drained to perform an internal inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the pipe. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Approximately 23,000 feet (70%) of the P-4 raw water pipe that is located along the creek bottom will not drain by gravity into the Energy Recovery Station. To drain this portion of the P-4 pipe, a blow off valve must be opened. The blow off valve is located approximately 4,400 feet upstream of the Energy Recovery Station at the low point of the P-4 pipeline.

Access to inspect the inside of P-4 would be via 17 hatches that are located along the pipeline; one is in the Portal Valve Shaft structure, one is in the Energy Recovery Station structure and 15 underground hatches are spaced out along the P-4 pipe. The hatches provide a 24-inch diameter access into the pipe.

Digging an excavation approximately 13 feet deep would be required to reach the 15 hatches that are spaced out along the pipeline. The locations of the buried access hatches are marked on the surface with two vertical 6-inch diameter marker pipes.

Corrosion Test Stations

Standard two-wire corrosion test stations are installed at approximately 1,500 foot intervals along the P-4 pipeline. A total of 22 test stations are connected to the pipe. Test station readings have been recorded by AWWU staff a total of seven times for the years 1990, 1992, 1998, 2000, 2002, 2004 and 2006. No readings have been taken since 2006.

The Elkutna WTF O&M Manual recommends a two-year interval to measure and record potential at the corrosion test stations along the P-4 Raw Water Transmission pipeline. The Manual also recommends that at least twice a year the pipeline should be inspected for minor leaks by walking the pipeline route during dry weather and looking for water emitting from the ground or wet spots above the pipe.

SECTION 4
PROPOSED LAKE DIVERSION TUNNEL CONDITION ASSESSMENT PROGRAM

On September 26, 2016, a meeting was held at AWWU's engineering office to discuss and select a plan for assessing the condition of the raw water pipeline. In attendance were AWWU management, engineering and operations staff, Eklutna WTF staff and engineers from CDM and Stephl Engineering.

During the meeting, a condition assessment program that included Pure Technologies assistance for an overall estimated cost of $1.57 million was evaluated (see August 18, 2016 technical memorandum prepared by Stephl/CDM). It was decided that an abbreviated assessment would be completed and that the inspection and evaluation by Pure would not be utilized at this time.

A description of the proposed condition assessment program for the raw water pipe is presented below:

Lake Diversion Tunnel Inspection Program

An assessment of the raw water pipe in the tunnel would be accomplished by taking the 8,620 LF by 72-inch diameter pipe out of service (dewatering) and performing a man-entry visual inspection of the pipe interior.

During the internal inspection the following tasks would be performed:

- Readings would be taken from the 12 corrosion monitor stations.
- The PCCP joints and the mortar coating over them would be inspected.
- The PCCP pipe interior mortar coating would be inspected for cracks.
- Hollow areas of the inner core would be identified by sounding with a light hammer.
- The 16-foot long by 60-inch diameter steel repair section between station 89+97 and 90+13 would be inspected.

The results of the inspection and defects observed would be documented in photographs and video recordings and in written logs. The location of the inspection data would be identified by horizontal stationing along the pipe and by clock position.

The proposed roles and responsibilities to accomplish the man-entry inspection are described below:

- AWWU staff would be responsible for providing access to the site, providing access into the two shafts, closing the two water valves, operating AWWU owned equipment, dewatering the Lake Diversion Tunnel pipe, removing the access hatch in the Portal Valve Shaft, installing improvements to the shaft structures as needed to improve access for rescue work and preparing the shafts for the man-entry inspection.
- CDM would provide overall project management and senior staff oversight and review.
- CDM and/or Stephl Engineering staff would perform the man-entry inspection work and prepare the assessment report.
- Corrosion specialists with Taku Engineering, LLC would enter the pipe and take readings from the corrosion monitor stations and assist with preparation of the assessment report.
- Fairweather LLC would provide safety and rescue support.

<u>Internal PCCP Inspection Description and Limitations</u>
The purpose of the internal inspection is to locate visible cracks on the pipe surface and joints and to find hollow areas in the inner core by sounding with a hammer (1 to 2 pounds). This method of inspection has been used since the late 1980's.

Based on past results, internal inspections of this type have been successful in identifying pipes with severe loss of structural support, i.e. wire or cylinder breaks. This method has not proven to be very accurate at detecting distressed pipes that are not on the verge of failure. This method has also resulted in false indications that a pipe is failing (*EPA Best Practices Manual for Prestressed Concrete Pipe Condition Assessment: What Works? What Doesn't? What's Next? 2012).*

The simultaneous occurrence of longitudinal cracks and hollow soundings at the same location are usually indications of significant pipe distress. When these conditions occur independently, it is less likely that significant distress is occurring. AWWA C301-07 considers cracks in the inner core less than 0.060 inches in width as acceptable. Circumferential cracks exceeding 0.060 inches in width, multiple closely spaced cracks near bends or settlement areas or cracks showing signs of corrosion are considered as serious and usually result in doing additional more detailed investigations of the pipe with electromagnetic inspection equipment or similar.

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- Significant loss of structural support (significant pipe distress) can be reliably identified.
- The cost of this type of inspection is lower than electronic type inspections.
- The results of the inspection can be used as a baseline for describing anomalies found on the pipe interior and can be compared to the results of future similar inspections to determine if the pipe interior is changing.

The disadvantages of an internal inspection are:

- Pipes with low level structural problems that do not cause longitudinal cracking and simultaneous hollow soundings cannot be reliably detected.
- Misleading hollow soundings can be caused by differential shrinkage of the inner concrete core, dents in the cylinder or other anomalies.
- Pipes with hollow sounding areas that are the caused by factors other than wire or steel core failure may be incorrectly identified.
- Internal inspections do not provide an accurate estimate of broken wires.

The *EPA Best Practices Manual for Prestressed Concrete Pipe Condition Assessment: What Works? What Doesn't? What's Next?* contains several examples where the results of an internal visual inspection and soundings were completed and these were compared to the results of an electromagnetic inspection.

<u>Internal PCCP Inspection, Interpreting the Results</u>
During the proposed Intake Tunnel Pipe man-entry inspection, if longitudinal cracking and hollow soundings are observed at the same location in the PCCP pipe, it is very likely that a follow up electromagnetic investigation will be recommended. Observations of this type would be interpreted as potential significant defects in the pipe, as discussed above.

If cracking in the surface is not substantial and if hollow soundings are found in separate locations from surface cracking, it is likely that further electromagnetic inspections will not be recommended. However, future periodic internal inspections would likely be recommended to confirm if the cracks were increasing or getting worse.

<u>Intake Tunnel Corrosion Monitor Station Readings</u>
Taku Engineering, LLC would be responsible for obtaining voltage readings from the existing corrosion monitor stations. This would be completed by man-entry when the pipe is empty for inspection.

Taku is assuming that the electrical connection between the 3-inch diameter steel pipes and the steel tunnel liner (as recommended in the O&M Manual) may not be adequate for obtaining accurate voltage readings. Electrical contact with the tunnel would be made at the access point to the tunnel/pipe. They proposed running a light gauge CIS wire from the access port into the raw water pipe to provide continuous electrical contact to each of the 10 internal reference cells (corrosion monitor stations).

<u>Intake Tunnel Man-Entry Safety Procedures</u>
The proper safety and confined space entry procedures would be followed during the man-entry inspection work. Fairweather LLC, a health and safety company in Alaska, would provide these services.

Fairweather has proposed that the following tasks be accomplished:

- A confined space permit document would be completed and kept onsite at all times. AWWU would review the document.
- An analysis of the occupational risks and mitigation would be completed.

- Both the upstream gate valve and upstream butterfly valve would be closed and would be tagged-out and locked-out. This would provide the required dual-valve protection for man-entry work.
- Entry to the pipe would be in one location only, via the access port located in the Portal Valve Shaft at the downstream end of the Lake Diversion Tunnel.
- An escape/retrieval plan would be developed and emergency retrieval personnel would be onsite full-time and prepared to accomplish this task.
- Full-time fresh air ventilation through the 72-inch pipe would be provided.
- Each person on the inspection team and the retrieval team would carry or have SCBA's (self-contained breathing apparatus) and be trained and certified in their use.
- Oxygen levels within the pipe would be continuously monitored during the inspection.
- A communications system would be set up to provide continuous contact between the man-entry staff and the support team on the ground surface.

Personnel and Equipment for Manned Inspection Work

Two personnel would perform the inspection work along the pipeline (inspector and primary attendant) and a third person (downhole attendant) would physically be in the pipe at the entrance hatch and would be in direct communication with the two person inspection team and the above grade team who are operating the ventilation system and providing other support tasks.

Customized equipment would be used to travel up and down the pipe and carry the tools. Carts or modified bicycles have been used successfully on other similar pipe inspections. Headlamps and video cameras and still photo cameras would be used to document the conditions. A laser beam or tape would be used to measure distances. Other equipment would include boots with grip type soles, helmets, knee pads, helmet mounted cameras, etc.

Final Report

Findings from the man-entry inspection and testing would be documented in an assessment report. The report would compare the new data to past information. If significant defects are observed, recommendations would be provided regarding the need for additional near-term testing or inspections. Recommendations for future periodic testing or monitoring would be provided. A draft report would be prepared for review and a final report would be completed after review comments are received and addressed.

Data and readings acquired by AWWU staff for the P-4 transmission main would be added to this report. The results would be reviewed by CDM/Stephl/Taku staff and recommendations made.

Timing of the Assessment Work

The field work to assess the Lake Diversion Tunnel raw water pipe must be complete before April 1, 2017, when upgrade work on the Ship Creek WTF is planned to begin. It is estimated that the tunnel will be shut down for up to four weeks to prepare for, and accomplish, the man-entry inspection and go through the pipeline startup procedures. If this could not be accomplished, the work could be completed later in 2017 or 2018.

SECTION 5
PROPOSED P-4 TRANSMISSION PIPELINE CONDITION ASSESSMENT PROGRAM

AWWU staff would perform the assessment data gathering work on the P-4 pipeline. The 32,253 LF 54-inch and 60-inch diameter P-4 raw water pipe will not be dewatered. A man-entry inspection of this pipe will not be performed.

An assessment of the P-4 raw water pipeline would consist of the following:
- AWWU staff would take readings from the 22 corrosion test stations located along the pipeline.
- AWWU staff would inspect the ground surface along the pipeline to look for leaks.
- AWWU staff would inspect the ground surface along the pipeline to look for soil loss or erosion.

It is recommended that the P-4 transmission pipe data collection assessment work be completed during summer conditions when the ground is not covered with snow. This is expected to occur in late May or early June of 2017.

Data acquired by AWWU staff would be compiled and delivered to CDM. This information would be added to the assessment report prepared for the Lake Diversion Tunnel. The new corrosion test station readings would be compared to past readings and recommendations would be provided regarding the results.

Appendix C

Raw Water Pipe Condition Assessment Proposal

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AS-2 Raw Water Pipe Condition Assessment

The Contractor will perform condition assessment services outlined in the attached December 16, 2016 memorandum from Stephl Engineering.

This subtask will be led primarily by Stephl Engineering and its third-tier subconsultants/sub-contractors.

Deliverables:

- The findings of this subtask would be summarized in a stand-alone technical memorandum (TM) that would ultimately be included as an Appendix to the Facility Plan document produced under Task 500.

Assumptions:

- CDM Smith senior pipeline engineers/reviewers will provide input remotely by phone/email
- See attached December 16, 2016 for additional assumptions and activities to be completed by AWWU as part of this effort

To: Mike Hyland, P.E., CDM Smith
From: Matt Stephl P.E.
Subject: Raw Water Pipe Condition Assessment Update
Project: Eklutna WTF Facility Plan and Asset Management Plan
Date: December 16, 2016

3900 Arctic Blvd., Suite 204
Anchorage, Alaska 99503
Ph: 907-562-1468
mstephl@stephleng.com

DRAFT 12-16-16

SECTION 1
BACKGROUND AND PURPOSE

The 40,873-foot-long Eklutna WTF raw water conveyance system was completed in 1988 and has a hydraulic design capacity of 100 million gallons per day (MGD).

The raw water system consists of seven major components:

- Intake at Eklutna Lake
- Existing power plant tunnel that conveys water from the intake (approx. 500 LF)
- Intake Valve Shaft at the connection of the power plant tunnel and the Lake Diversion Tunnel
- Lake Diversion Tunnel (8,620 LF)
- Portal Valve Shaft located at the downstream end of the Lake Diversion Tunnel
- P-4 Raw Water Transmission Pipe (32,253 LF)
- Energy Recovery Station located at the lower end of P-4 and at the headworks of the WTF

This memorandum will focus on the two major components of the raw water system: 1) the Lake Diversion Tunnel pipeline, and 2) the P-4 Raw Water Transmission pipeline. The purpose of this memorandum is to present proposed procedures for determining the condition of the pipes and the estimated cost of this work.

SECTION 2
LAKE DIVERSION TUNNEL

Description

The 8,620 LF (linear foot) Lake Diversion Tunnel is constructed with 8,458 LF of 72-inch diameter pre-stressed concrete cylinder pipe (PCCP). The 72-inch PCCP pipe contains 119 LF of pipe with welded joints and 8,339 LF of pipe with double gasketed joints. The remainder of the Lake Diversion Tunnel pipe was built with welded steel pipe that was installed upstream of the meters at each valve shaft and includes 82 LF of 54-inch pipe at the Intake Valve Shaft and 80 LF of 54-inch pipe at the Portal Valve Shaft.

Most of the Lake Diversion Tunnel is about 200 feet below the ground surface. A tunneling machine was used to construct the 9.5-foot diameter tunnel in the existing gravel soils. As the tunneling work progressed, a steel beam and wood structure was built to support the tunnel walls. After the tunnel was built, the PCCP pipe was installed by sliplining (insertion process) it into place from the lower end of the tunnel. Cement grout was used to fill the annular space between the PCCP and the tunnel walls to help secure the PCCP water pipe. Joints in the PCCP pipe were covered with hand-applied mortar on the inside and outside of the connections.

Complications during construction led to a portion of the PCCP becoming collapsed. A 16-foot long by 60-inch diameter steel repair section was built between station 89+97 and 90+13 to cover the collapsed area. This repair is located 470 feet downstream from the Intake Valve Shaft (station 94+81).

Access for Inspection

The Lake Diversion Tunnel can be drained to perform an inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the Lake Diversion Tunnel. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Access to inspect the Lake Diversion Tunnel would be via hatches that are located at each end of the tunnel; one is in the Intake Valve Shaft structure and the other is in the Portal Valve Shaft structure. The hatches provide a 24-inch diameter access into the pipe.

A gate valve in the Intake Valve Shaft structure controls the water flow into the Lake Diversion Tunnel pipeline. Two butterfly valves in the Lake Diversion Tunnel raw water pipe are also located in the Intake Valve Shaft and the Portal Valve Shaft. When man-entry work is performed, both the gate valve and the butterfly valve in the Intake Valve Shaft must be closed.

Corrosion Monitoring Stations

Twelve corrosion monitoring stations are located periodically along the Lake Diversion Tunnel. They are used to measure the potential corrosion activity in the soil that is outside of the steel tunnel liner. They do not provide corrosion readings for the PCCP pipe. Two of the stations are located in the Intake Valve Shaft and Portal Valve Shaft (one in each valve shaft). Readings can be taken from the wall-mounted boxes in these two structures. The remaining ten corrosion monitoring stations are positioned along the 72-inch PCCP pipe. Readings from the stations inside the pipe can only be taken by dewatering the pipe and walking to each station.

In the O&M Manual, Section 302000 contains information about the monitoring stations in the tunnel. The 10 corrosion monitoring stations are used to measure the potential corrosion activity on the soil side of the steel tunnel liner. They consist of high purity zinc reference electrodes extending approximately 6 inches into the soil outside of the tunnel, with test connections terminated on the interior of the tunnel.

The O&M Manual describes the testing procedure for the diversion tunnel corrosion monitoring stations. A DC voltmeter is set at a 1-volt to 2-volt range and used to measure the voltage between the zinc electrode and the adjacent 3-inch diameter pipe coupling that is connected to the steel tunnel wall. Measurements taken are to be compared to previous readings to identify changes which may be indicative of corrosion activity. According to the O&M Manual, changes in potential measurements exceeding a 10 percent difference from previous readings could indicate possible corrosion activity.

Initial potential measurements were taken during the week of August 24, 1987. These are the only known previous readings taken from the corrosion stations inside the tunnel. The results are shown below:

Station No.	Potential Measurement (Volts) (Structure-to-Reference Electrode)
94+47	0.575
89+94	0.636
78+45	0.863
69+92	0.270
59+91	0.917
48+47	0.927
39+90	0.884
29+89	0.587
19+88	0.236
10+13	0.417

The O&M Manual recommended that the electrode test stations in the Lake Diversion Tunnel be checked and tested periodically. No regularly scheduled sequence for this testing work was required.

SECTION 3
P-4 RAW WATER TRANSMISSION PIPELINE

Description

The P-4 Raw Water Transmission pipeline was installed using the traditional trench excavating and backfill method. The 32,253 LF mortar lined and coated steel pipeline (MLCP or CML&C steel) contains 16,199 LF of 54-inch diameter pipe and 16,148 LF of 60-inch diameter pipe. The pipe joints are welded and covered with mortar/grout in the field. The MLCP is constructed with a steel core that is wrapped on the outside with wire reinforcement. Cement mortar covers both the inside and the outside of the steel.

In 2016, AWWU staff cleared and graded the access road along the P-4 pipeline. The entire pipeline route can now be traveled with a 4-wheel drive vehicle.

Access for Inspection

The P-4 Raw Water Transmission pipeline can be drained to perform an internal inspection. The Operations and Maintenance (O&M) Manual contains the procedure for shutting down and dewatering the pipe. When the pipe is dewatered, the Eklutna WTF is shut down and the Ship Creek WTF is turned on to provide water to the AWWU distribution system.

Approximately 23,000 feet (70%) of the P-4 raw water pipe that is located along the creek bottom will not drain by gravity into the Energy Recovery Station. To drain this portion of the P-4 pipe, a blow off valve must be opened. The blow off valve is located approximately 4,400 feet upstream of the Energy Recovery Station at the low point of the P-4 pipeline.

Access to inspect the inside of P-4 would be via 17 hatches that are located along the pipeline; one is in the Portal Valve Shaft structure, one is in the Energy Recovery Station structure and 15 underground hatches are spaced out along the P-4 pipe. The hatches provide a 24-inch diameter access into the pipe.

Digging an excavation approximately 13 feet deep would be required to reach the 15 hatches that are spaced out along the pipeline. The locations of the buried access hatches are marked on the surface with two vertical 6-inch diameter marker pipes.

Corrosion Test Stations
Standard two-wire corrosion test stations are installed at approximately 1,500 foot intervals along the P-4 pipeline. A total of 22 test stations are connected to the pipe. Test station readings have been recorded by AWWU staff a total of seven times for the years 1990, 1992, 1998, 2000, 2002, 2004 and 2006. No readings have been taken since 2006.

The Elkutna WTF O&M Manual recommends a two-year interval to measure and record potential at the corrosion test stations along the P-4 Raw Water Transmission pipeline. The Manual also recommends that at least twice a year the pipeline should be inspected for minor leaks by walking the pipeline route during dry weather and looking for water emitting from the ground or wet spots above the pipe.

SECTION 4
PROPOSED LAKE DIVERSION TUNNEL CONDITION ASSESSMENT PROGRAM

On September 26, 2016, a meeting was held at AWWU's engineering office to discuss and select a plan for assessing the condition of the raw water pipeline. In attendance were AWWU management, engineering and operations staff, Eklutna WTF staff and engineers from CDM and Stephl Engineering.

During the meeting, a condition assessment program that included Pure Technologies assistance for an overall estimated cost of $1.57 million was evaluated (see August 18, 2016 technical memorandum prepared by Stephl/CDM). It was decided that an abbreviated assessment would be completed and that the inspection and evaluation by Pure would not be utilized at this time.

A description of the proposed condition assessment program for the raw water pipe is presented below:

Lake Diversion Tunnel Inspection Program
An assessment of the raw water pipe in the tunnel would be accomplished by taking the 8,620 LF by 72-inch diameter pipe out of service (dewatering) and performing a man-entry visual inspection of the pipe interior.

During the internal inspection the following tasks would be performed:

- Readings would be taken from the 12 corrosion monitor stations.
- The PCCP joints and the mortar coating over them would be inspected.
- The PCCP pipe interior mortar coating would be inspected for cracks.
- Hollow areas of the inner core would be identified by sounding with a light hammer.
- The 16-foot long by 60-inch diameter steel repair section between station 89+97 and 90+13 would be inspected.

The results of the inspection and defects observed would be documented in photographs and video recordings and in written logs. The location of the inspection data would be identified by horizontal stationing along the pipe and by clock position.

The proposed roles and responsibilities to accomplish the man-entry inspection are described below:

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- CDM would provide overall project management and senior staff oversight and review.
- CDM and/or Stephl Engineering staff would perform the man-entry inspection work and prepare the assessment report.
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<u>Internal PCCP Inspection Description and Limitations</u>

The purpose of the internal inspection is to locate visible cracks on the pipe surface and joints and to find hollow areas in the inner core by sounding with a hammer (1 to 2 pounds). This method of inspection has been used since the late 1980's.

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Taku Engineering, LLC would be responsible for obtaining voltage readings from the existing corrosion monitor stations. This would be completed by man-entry when the pipe is empty for inspection.

Taku is assuming that the electrical connection between the 3-inch diameter steel pipes and the steel tunnel liner (as recommended in the O&M Manual) may not be adequate for obtaining accurate voltage readings. Electrical contact with the tunnel would be made at the access point to the tunnel/pipe. They proposed running a light gauge CIS wire from the access port into the raw water pipe to provide continuous electrical contact to each of the 10 internal reference cells (corrosion monitor stations).

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The proper safety and confined space entry procedures would be followed during the man-entry inspection work. Fairweather LLC, a health and safety company in Alaska, would provide these services.

Fairweather has proposed that the following tasks be accomplished:

- A confined space permit document would be completed and kept onsite at all times. AWWU would review the document.
- An analysis of the occupational risks and mitigation would be completed.

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Personnel and Equipment for Manned Inspection Work

Two personnel would perform the inspection work along the pipeline (inspector and primary attendant) and a third person (downhole attendant) would physically be in the pipe at the entrance hatch and would be in direct communication with the two person inspection team and the above grade team who are operating the ventilation system and providing other support tasks.

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Final Report

Findings from the man-entry inspection and testing would be documented in an assessment report. The report would compare the new data to past information. If significant defects are observed, recommendations would be provided regarding the need for additional near-term testing or inspections. Recommendations for future periodic testing or monitoring would be provided. A draft report would be prepared for review and a final report would be completed after review comments are received and addressed.

Data and readings acquired by AWWU staff for the P-4 transmission main would be added to this report. The results would be reviewed by CDM/Stephl/Taku staff and recommendations made.

Timing of the Assessment Work

The field work to assess the Lake Diversion Tunnel raw water pipe must be complete before April 1, 2017, when upgrade work on the Ship Creek WTF is planned to begin. It is estimated that the tunnel will be shut down for up to four weeks to prepare for, and accomplish, the man-entry inspection and go through the pipeline startup procedures. If this could not be accomplished, the work could be completed later in 2017 or 2018.

Estimated Cost of the Inspection and Assessment Report
The proposed tasks and budget level costs are summarized below:

SECTION 5
PROPOSED P-4 TRANSMISSION PIPELINE CONDITION ASSESSMENT PROGRAM

AWWU staff would perform the assessment data gathering work on the P-4 pipeline. The 32,253 LF 54-inch and 60-inch diameter P-4 raw water pipe will not be dewatered. A man-entry inspection of this pipe will not be performed.

An assessment of the P-4 raw water pipeline would consist of the following:

- AWWU staff would take readings from the 22 corrosion test stations located along the pipeline.
- AWWU staff would inspect the ground surface along the pipeline to look for leaks.
- AWWU staff would inspect the ground surface along the pipeline to look for soil loss or erosion.

It is recommended that the P-4 transmission pipe data collection assessment work be completed during summer conditions when the ground is not covered with snow. This is expected to occur in late May or early June of 2017.

Data acquired by AWWU staff would be compiled and delivered to CDM. This information would be added to the assessment report prepared for the Lake Diversion Tunnel. The new corrosion test station readings would be compared to past readings and recommendations would be provided regarding the results.

Appendix D

Water Reliability Technical Memorandum

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EKLUTNA WATER RELIABILITY STUDY

Eklutna Lake Water Balance Spreadsheet Analysis Technical Memorandum

January 2018

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Section 1

Introduction

Located in Southcentral Alaska, Anchorage is the most populated area of the state and its economic hub, home to about 300,000 people, or about half of the state's residents. Situated 25 miles northeast of Anchorage, glacier-fed Eklutna Lake contributes freshwater resources for hydroelectric generation and drinking water for Anchorage. To better understand the water balance of this source of supply and the current and future reliability, a Water Balance Spreadsheet was developed utilizing available data on lake inflows and outflows. The spreadsheet was then used to evaluate the reliability of multiple withdrawal rates to determine the level of supply available for AWWU's use now and in the future.

1.1 Analysis Approach

The objective of this study was to understand current and future supply availability from Eklutna Lake. The study approach included the following steps:

- Documenting the current lake water balance including all inflows and outflows;
- Creating a Water Balance Spreadsheet tool and calibrating it over the historical period of 1989 through 2015 based on available data;
- Assessing the current understanding of how climate change will impact hydrology in the Eklutna Basin; and
- Evaluating current and future supply availability with and without climate change.

The analysis uses a monthly timestep to capture seasonal variations in the lake hydrology and to make use of the available data for the Eklutna watershed.

1.2 Eklutna Watershed Description

The Eklutna Basin is characterized by elevations ranging from roughly 840 feet at lake level to peaks over 6,000 feet with steep valley walls surrounding Eklutna Glacier (see **Figure 1-1**). Two sub-watersheds account for more than half the drainage basin of Eklutna Lake, feeding the lake through two main inlet streams, West Fork Eklutna River and East Fork Eklutna River. The catchment basin area of the East Fork is 40 square miles, with relatively small cirque glacier contributing approximately 12% glacier cover. The West Fork sub basin is dominated by a single large glacier, the 11-square mile Eklutna Glacier, which occupies 46.4% of the 25-square mile catchment area.

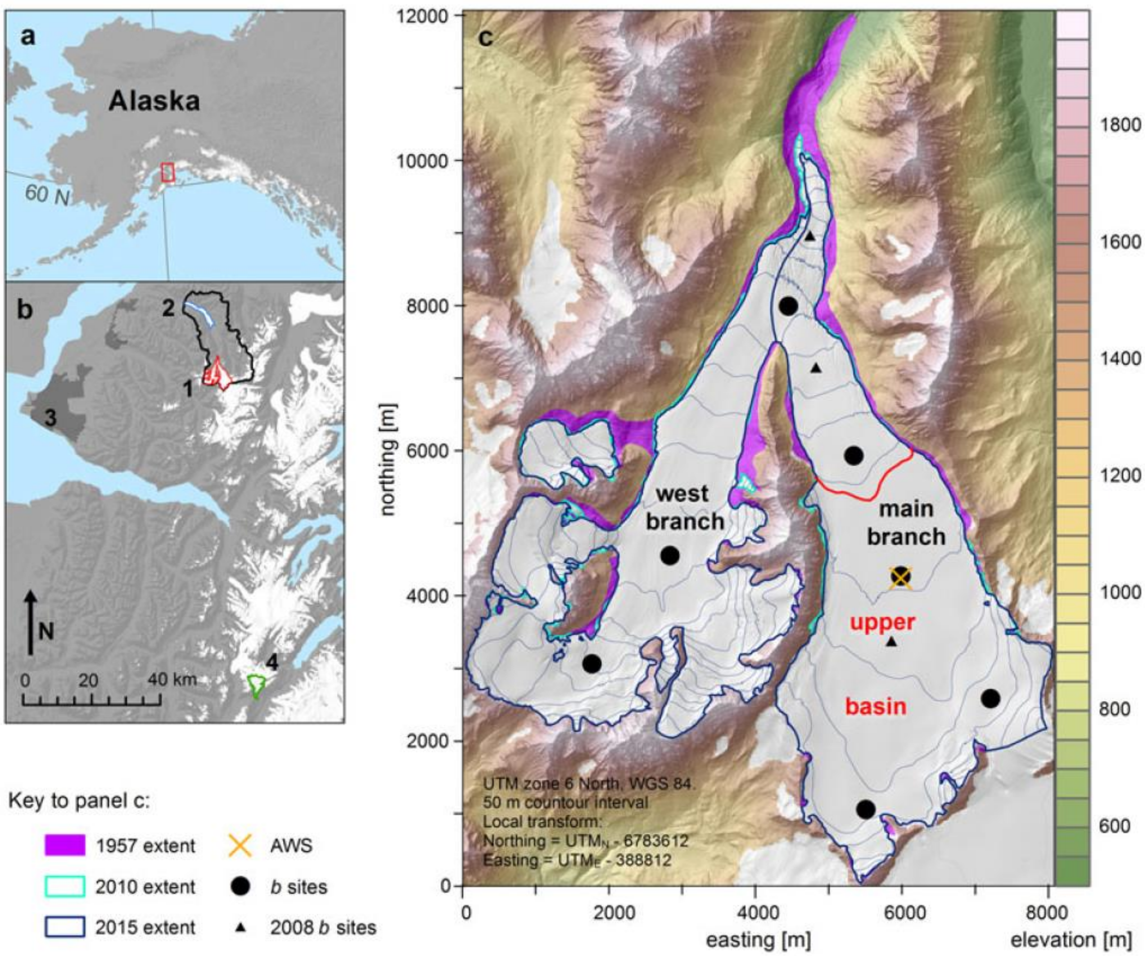

Figure 1-1
Eklutna Lake Watershed (Source: "Sass and others: Geometry, mass balance and thinning of Eklutna Glacier," Journal of Glaciology (2017).

The remaining 56 square miles of the Eklutna Lake watershed area is glacier free and comprised of many small streams that drain areas less than 5 square miles each. Streams in this portion of the watershed are ungaged, but contribute relatively little runoff to the lake because the terrain they drain is relatively low in elevation with much less rainfall that the higher elevation portions of the basin that intercept storms originating in the Gulf of Alaska. This ungaged sub basin is also comparatively well vegetated, so of the precipitation that does fall there, more is intercepted prior to runoff.

Eklutna Lake is 7 miles long and occupies an elongated, glacially incised valley. This natural lake was converted to a reservoir with the construction of the first dam in 1927 for the purposes of power generation. The current dam structure, which impounds 100% of Eklutna Lake outflow and has no outlet works, has been in place since 1965. On exceptionally wet years, when the storage capacity of the lake is exceeded, water flows over the dam and no power is harnessed from that outflow. This overflow condition does not happen very often as withdrawals are controlled to maximize use of the stored water.

From a storage point of view, the Eklutna Glacier acts as a second reservoir in the Eklutna basin, storing water seasonally (as accumulated winter snows) and over longer time periods (snow stored as ice during years of positive mass balance can then be subsequently released during wetter/drier years in which the glacier shrinks). Eklutna Glacier has an elevation range of 1,500 to 6,500 feet. Mean thickness of the glacier is approximately 500 feet with a total volume of 1 mi^3.

The climate of the Eklutna Basin is sub-arctic, characterized by a short melt-season (late May through September) and large annual temperature variations. During the winter, precipitation falls mainly as snow; in summer, precipitation falls mainly as rain but snow can occur year-round at the higher elevations.

1.3 Eklutna Lake Water Balance

The schematic diagram capturing the flows into and out of Eklutna Lake is presented in **Figure 1-2**. Inflows include runoff from the West Fork and East Fork of the Eklutna River as well as direct precipitation on the lake's surface and runoff from the watershed area surrounding the lake and downstream of the West and East Fork. Outflows include water withdrawn for water supply, water used to produce electricity, and water used for environmental flows, if needed. Minimal evaporation and spills once the lake reaches the top of the dam are also tracked as outflows. Due to the bedrock basement underlying the lake, groundwater gain and loss is pictured in the schematic but generally assumed to be negligible.

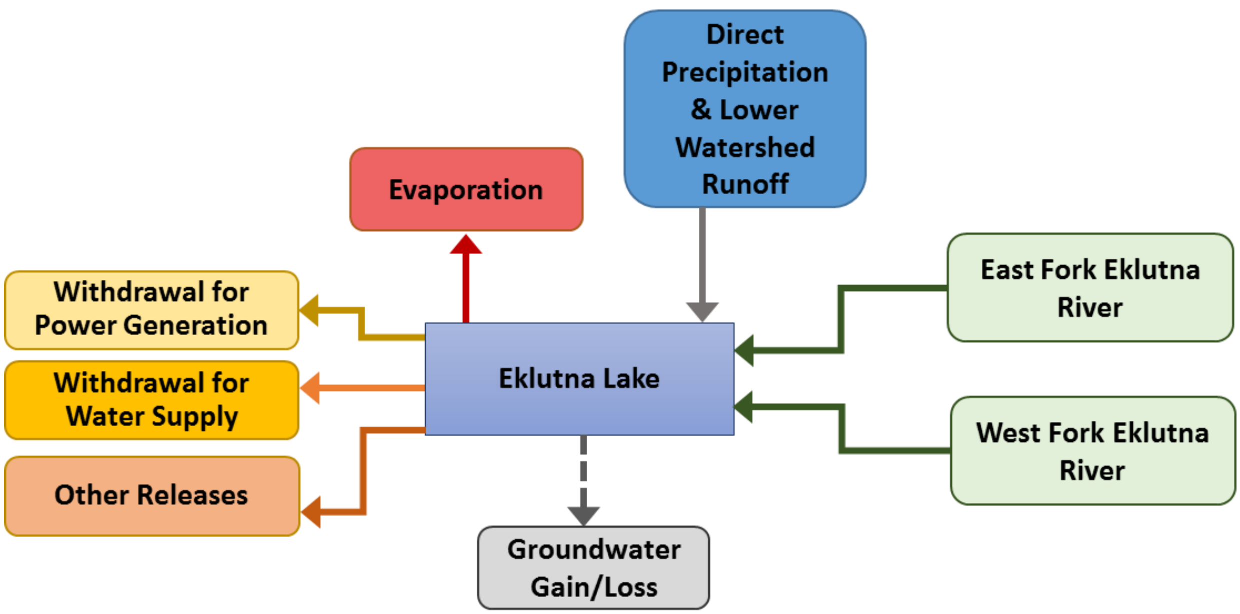

Figure 1-2
Eklutna Lake Water Balance Schematic

1.4 Previous Water Balance Results

Two primary studies on the water balance of Eklutna Lake were completed in 1993 and 2011, by Brabets at USGS and Larquier from Alaska Pacific University, respectively. These studies included field measurements of runoff and glacier gain/loss as well as assessment of other flows into and out of the lake. For water years 1986, 1987, and 1988, Brabets found that more than 75 percent of the runoff from the East Fork Eklutna basin and more than 85 percent of the runoff from the West Fork Eklutna basin occurred from June to September. The principal components of runoff were snowmelt (52-64%), rainfall (27-33%), and icemelt (6-19%). **Table 1-1** summarizes the annual total inflow and outflow of Eklutna Lake for the 1985-1988 time period. The inflow not accounted for is also provided, which is based on the storage difference between the end of the year and beginning of year lake level.

In 2009 and 2010, Larquier measured and compared melt-season stream discharge of the West and East Fork Eklutna River and found that the heavily glaciated West Fork sub basin produced twice as much specific runoff as the larger, but moderately glaciated East Fork catchment. In addition, concurrent measurements of mass balance on the glacier show that net melt contributed 24% of that basin's total discharge in 2009 and 3% in 2010. **Table 1-2** summarizes the annual total inflow and outflow of Eklutna Lake for the 2009/2010 time period.

Table 1-1: Water Balance Summary for 1985 to 1988

Year	Combined Inflow East and West Fork Eklutna River (AF)	Combined Outflow (AF)	Inflow Not Accounted For (AF)
1985	137,056	110,987	35,900
1986	179,501	212,591	39,804
1987	169,210	207,179	67,043
1988	173,773	207,229	67,806
Average[1]	**174,161**	**209,000**	**58,218**

Note 1: Partial year of 1985 not included in the long-term average.

Table 1-2: Water Balance Summary for 2009 to 2010

Year	Combined Inflow East and West Fork Eklutna River (AF)	Combined Outflow (AF)	Inflow Not Accounted For (AF)
2009	248,889	275,754	17,491
2010	222,136	226,249	25,978
Average	**235,513**	**251,002**	**21,735**

Section 2

Development of Water Balance Spreadsheet

In order to assess how flows into and out of Eklutna Lake are balanced now and into the future, a Water Balance Spreadsheet was developed using historical data where available and estimated data where data was not available. Because the measurement of lake inflows (runoff, snowmelt, etc.) are labor intensive studies on their own, the objective of this Water Balance Spreadsheet was to understand the relative contributions of different flow.

2.1 Data Compilation

Data on the water balance for Eklutna Lake was compiled from a variety of sources including the two previously mentioned studies as well as websites providing access to climatological data.

Table 2-1 documents the reports consulted for source reservoir characteristics, inflow data, and flow properties.

Table 2-1: References for Reservoir Information

Parameter	Source
Reservoir Elevation – Active Storage Relationship	Table of Active Storage vs. Elevation taken from Brabets (1993)
West and East Fork Eklutna River Runoff Estimates	Runoff measured in 1985-1988 (Brabets 1993) and 2009/2010 (Larquier 2011)
Precipitation	Monthly rainfall from Indian Pass SNOTEL station from 1989 to 2015.
Temperature	Temperature (in terms of max monthly averages) was available from the Indian Pass SNOTEL station
Withdrawals from Eklutna Lake for Water Supply	This information was provided by AWWU and compiled by the USGS; monthly data was available from August 1988 to December 2015.
Withdrawals from Eklutna Lake for Hydropower	Estimates of monthly withdrawals for hydropower were available for 2009 and 2010.
Lake Evaporation	Estimated using a modified Penman Equation and temperature data from the Indian Pass SNOTEL station
Groundwater Seepage Gain/Loss	This flow is assumed to be negligible given the bedrock underlying a large portion of the upper and lower watersheds.
Precipitation and Runoff from Watershed Downstream of West and East Fork Eklutna Rivers	No direct data available. General guidance of "inflow not accounted for" available in Tables 1-1 and 1-2. Parameter estimate and adjusted during the calibration process.

Because data was available at the beginning and end of the selected calibration period, some effort was involved in bridging the two-time periods to create a complete dataset. The sections below describe how each dataset was developed.

2.2 East and West Fork Runoff

Runoff for the East and West Fork of the Eklutna River was measured in the field as part of the Brabets and Larquier studies during 1985-1988 and in 2009/2010, respectively. The results of these studies showed that a large portion of runoff was derived from snowmelt so should be influenced by temperature. To capture this dependency, total annual runoff was compared to the average summer temperature (average of May through September) from the Indian Pass SNOTEL station. **Figure 2-1** illustrates the simple linear relationship between the two variables.

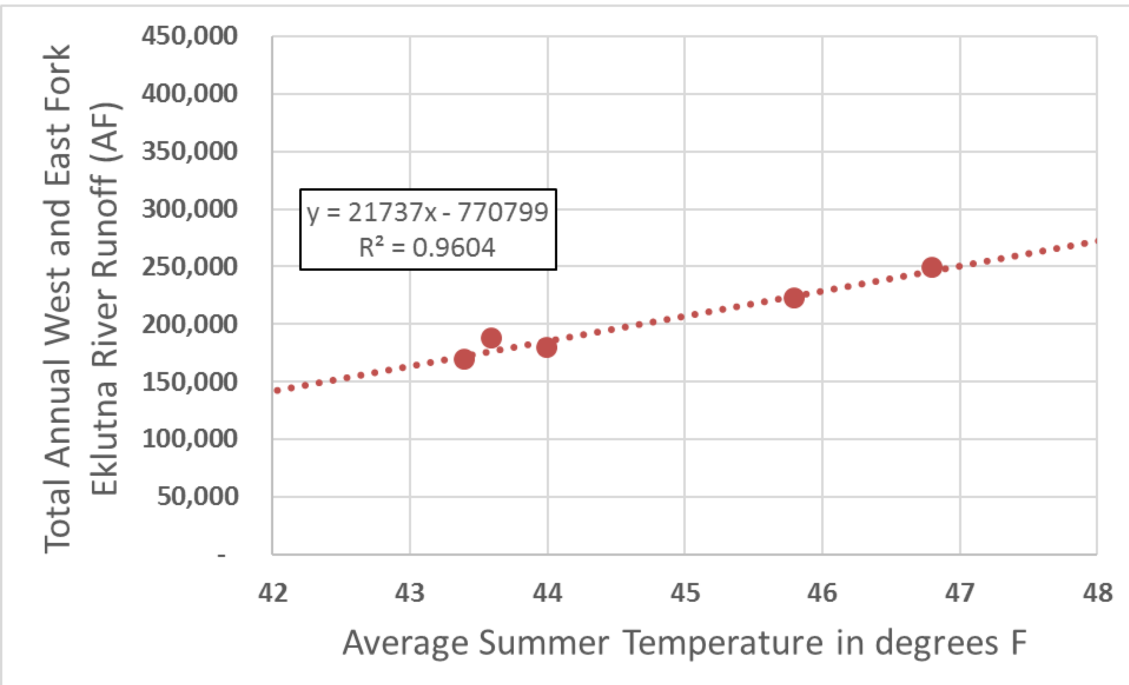

Figure 2-1
Relationship Between Total Annual Runoff and Average Summer Temperature for 1986, 1987, 1988, 2009 and 2010

Runoff between the datasets of 1985-1988 and 2009/2010 were estimated using this relationship and the monthly distribution of flows summarized in **Table 2-2**, which is derived from USGS data collected from 1961 to 1963 and 1985 to 1988.

Table 2-2: Monthly Distribution of West and East Fork Eklutna River Runoff (USGS data from 1961-1963 and 1985-1988)

Month	West Fork Eklutna River		East Fork Eklutna River	
	Average Runoff (AF)	Percentage of Annual Runoff	Average Runoff (AF)	Percentage of Annual Runoff
January	1,499	1%	84	0%
February	1,184	1%	37	0%
March	1,091	1%	0	0%
April	1,000	1%	46	0%
May	5,009	5%	1,031	1%
June	17,310	17%	9,896	12%
July	28,366	28%	29,101	35%
August	23,657	23%	28,932	35%
September	11,170	11%	11,215	13%
October	6,110	6%	2,317	3%
November	2,488	2%	486	1%
December	1,831	2%	205	0%

2.3 Eklutna Lake Evaporation

Evaporation losses were estimated indirectly using a simplified version of the Penman formula for evaporation rate [*Linacre*, 1977]. Evaporation was calculated based on monthly averages of temperature, annual and monthly ranges of temperature, and lake surface elevation and latitude, using a lapse rate of 6.5°C/1,000 m to convert temperatures at the Indian Pass SNOTEL station to temperatures at lake level [*Barry,* 1992]. This provided a monthly point measurement of evaporation which was then applied over the entire surface are of the lake.

2.4 Power Withdrawals

Data for lake withdrawals was compiled as part of the studies during the 1985 to 1989 and 2009/2010 periods. A comparison of the withdrawals in these two-time periods show an increase of approximately 20% (see Outflow in **Table 1-1** vs **Table 1-2**), which is most likely due to year-to-year variability. With much higher runoff during the 2009/2010 period, the utility may have prioritized optimizing the use of the surplus water.

Based on this observation, withdrawals for hydropower was assumed to follow either the monthly magnitude and timing of the 1985-1988 dataset or the 2009/2010 depending on the total annual runoff for a given year. In general, if a given year had more than 238,000 AFY of total runoff, then the higher estimate (2009/2010) of power withdrawals was supplied. If runoff was less than that amount, the lower estimate of power withdrawals from 1985-1988 was used. This added some variability to the year-to-year power withdrawals, which is a more realistic assumption than holding the values constant through the calibration period. During calibration, a handful of years had the power withdrawals swapped to better replicate the observed lake levels.

2.5 Water Supply Withdrawals

AWWU provides monthly estimates of withdrawals from Eklutna Lake for water supply. This data was provided by the USGS for the time period from August 1988 to December 2015. The availability of this data was the reason that the calibration period was limited to January 1989 to December 2015, to avoid starting on a partial year. **Figure 2-2** summarizes the annual total withdrawals for water supply. There is a noticeable step increase around 2000, which correlates with the time AWWU switched to using the EWTF as the primary drinking water facility serving Anchorage.

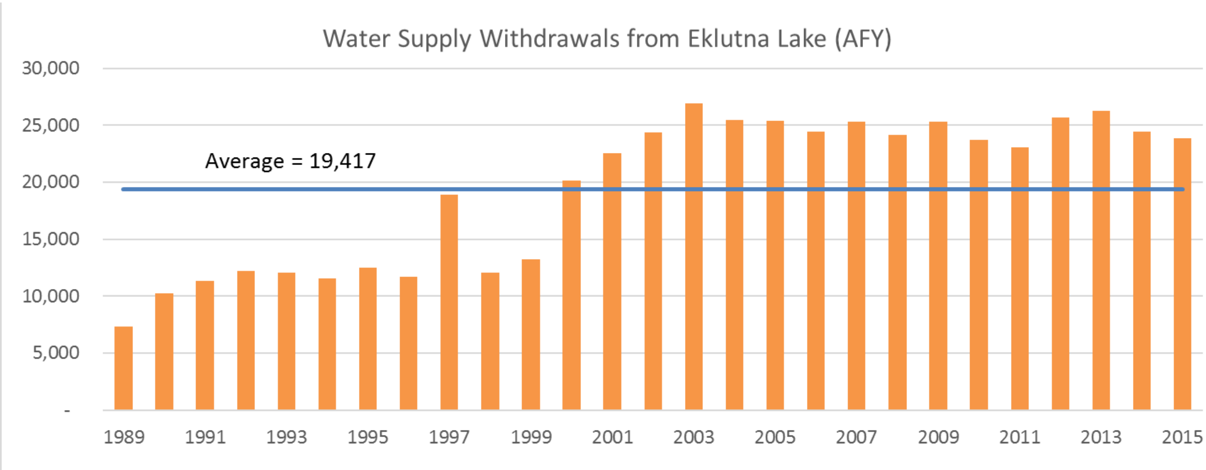

Figure 2-2
Historical Water Supply Withdrawals from Eklutna Lake

2.6 Calibration Period and Results

This section compares the Water Balance Spreadsheet results with historical lake levels for the calibration time period of 1989 to 2015. **Figure 2-3** shows the calibrated levels at Eklutna Lake compared to historical data. In general, the observed seasonal fluctuations are well represented in the simulated results. Overall, the simulated and observed water levels have a correlation factor of 0.81, which is very good considering the amount of uncertainties in the analysis. There are a few years between 1995 and 2001 where the calibration could be improved. This time period corresponds to a shift in the magnitude of withdrawals for supply as shown in **Figure 2-2**, which could have been based on related conditions that aren't fully captured in the water balance spreadsheet.

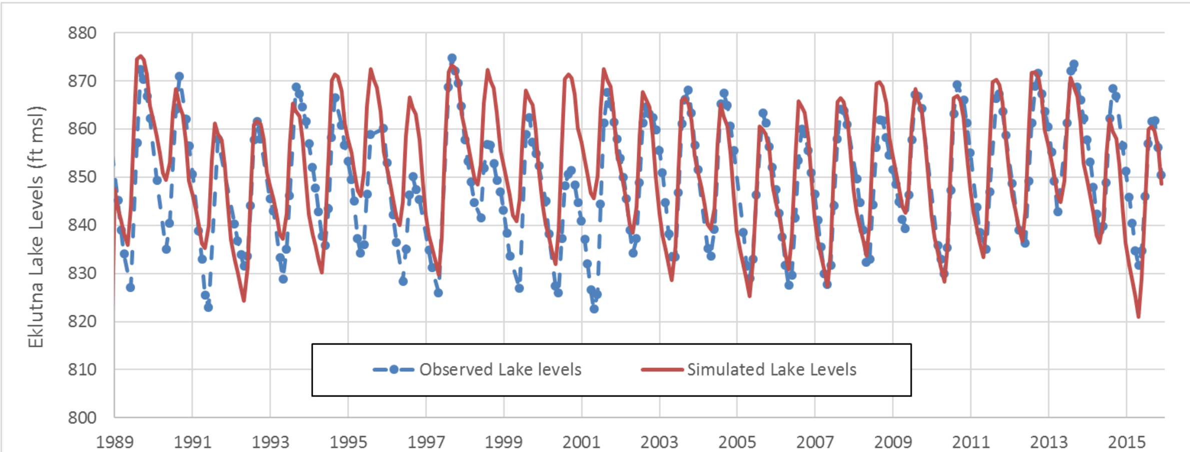

Figure 2-3
Simulated vs. Observed Eklutna Lake Water Levels During Calibration Period

2.7 Current Reliability

As summarized in **Figure 2-2**, the historical water supply withdrawals from Eklutna Lake averaged 19,417 AF over the calibration period 1989 through 2015, although the magnitude of the withdrawals did increase over time. During this period, the annual minimum lake levels were relatively stable and did not fall below 822 feet. The intake for supply corresponds to 814 feet (which is the minimum surface at which the power plant can continue to withdraw water). The amount of available storage between 822 and 814 feet is approximately 22,800 AF, leaving a fair amount of headroom available. A lower elevation (805 feet) corresponding to the 'top of structure' is noted but not used in this analysis as 814 feet is the effective minimum allowed.

The reliability of supply withdrawals from Eklutna Lake depend on timing of all the other flows into and out of the lake, especially runoff. If the annual withdrawals presented in **Figure 2-2** were evenly distributed over the 1989-2015 time period, there would be shortages during the 1990's because the runoff was not large enough to support that level of withdrawals. Using an average annual withdrawal rate of 17,000 AFY, the resulting lake water levels show (see **Figure 2-4**) that the active storage is depleted 2 times in 1997 and 2000. This would be described as the long-term safe yield of the Eklutna Lake system for this time period.

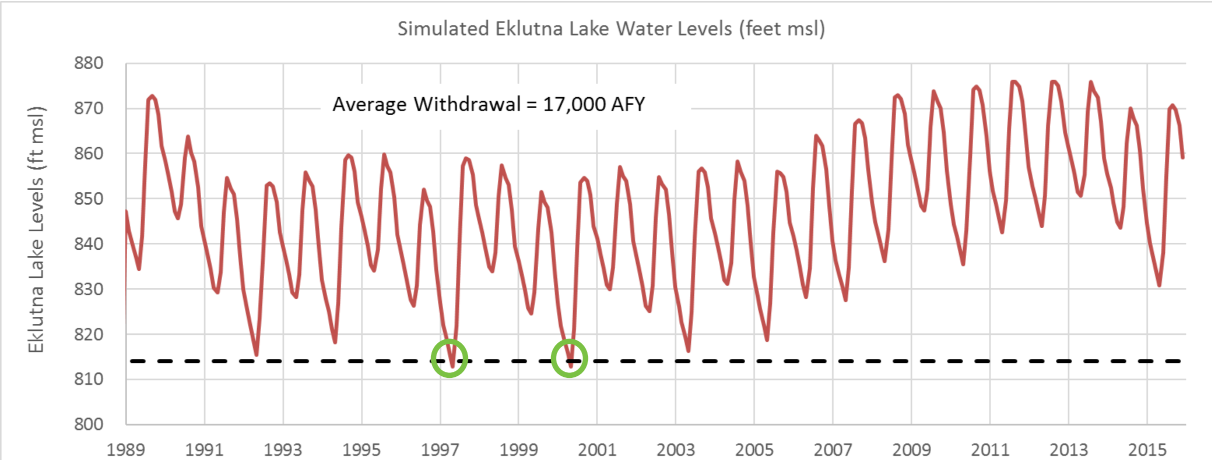

Figure 2-4
Simulated Eklutna Lake Levels with Average Water Supply Withdrawals of 17,000 AFY

When the average withdrawal rate is increased to 18,000 AFY, there are now five years where active storage is fully depleted and shortages are starting to occur. Because the simulated lake levels fall below the 814-foot minimum, this level of withdrawals would not be considered sustainable.

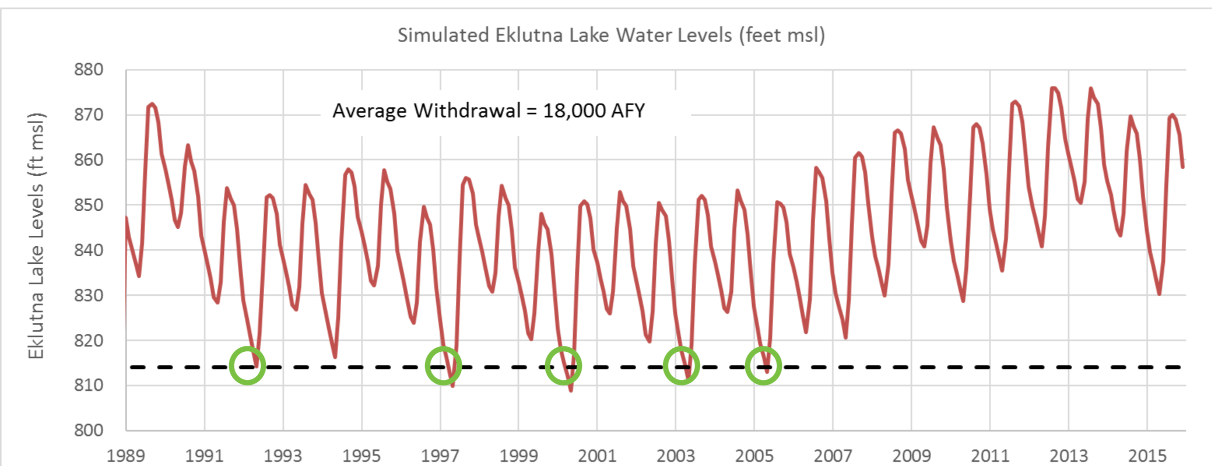

Figure 2-5
Simulated Eklutna Lake Levels with Average Water Supply Withdrawals of 18,000 AFY

Of course, if AWWU had the flexibility to optimize the withdrawals from Eklutna Lake to make more use of the surplus water after 2006, then a higher amount of withdrawals could be supported (as was the case historically). The safe yield estimates posed above provide guidance on the long-term average supply availability.

Section 3

Climate Change Impacts at Eklutna Lake

The changing of long-term weather patterns has brought increasingly warmer air towards the Earth's poles, accelerating the melting of ice in these areas. As ice is melted, more energy from the sun is absorbed, further warming these areas. Because of this rapid warming in northern latitudes, climate change impacts on Alaska are already being observed, including earlier spring snowmelt, reduced sea ice, widespread glacier retreat, warmer permafrost, drier landscapes, and more extensive insect outbreaks and wildfire across the state.

This section summarizes current research on climate change impacts in the Eklutna area and specifically how the variables that factor into the water balance like precipitation and temperature will be affected in the future.

3.1 Temperature

As a state, Alaska has warmed at more than twice the rate of the rest of the United States, with state-wide average annual temperature increasing by 3°F and average winter temperature increasing by 6°F over the past 60 years.[1] Temperature changes in Anchorage have been similar to the statewide average, with average annual temperature increasing by 3.2°F and winter temperatures increasing by 6°F since 1949. **Figure 3-1** shows the trend in mean annual temperature increasing approximately 3 degrees F from 1950 to 2014. Globally, the year 2015 was the warmest year on record. Anchorage saw its second warmest year on record in 2015, with an annual temperature 2.6°F above average.[2]

While one single year or particular event does not necessarily indicate climate change, the overall trend of warming and associated changes show that the climate in Anchorage is changing. Over the next century, average monthly temperatures are expected to increase in Anchorage during all months, but particularly during winter months. This follows the trend of the state at-large. Average annual temperatures in Alaska are projected to rise by an additional 2°F to 4°F by 2050. If global emissions continue to increase during this century, temperatures can be expected to rise 10°F to 12°F in the north, 8°F to 10°F in the interior, and 6°F to 8°F in the rest of the state. Even with substantial emissions reductions, Alaska is projected to warm by 6°F to 8°F in the north and 4°F to 6°F in the rest of the state by the end of the century with a generally even increase across the months as shown in **Figure 3-2**.[1]

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[1] F.S. Chapin III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze, "Chapter 22: Alaska. Climate Change Impacts in the United States" in The Third National Climate Assessment, ed. J. M. Melillo, T.C. Richmond, and G. W. Yohe (Washington, DC: U.S. Global Change Research Program, 2014),

[2] "Temperature Changes in Alaska," The Alaska Climate Research Center, last accessed March 25, 2016,

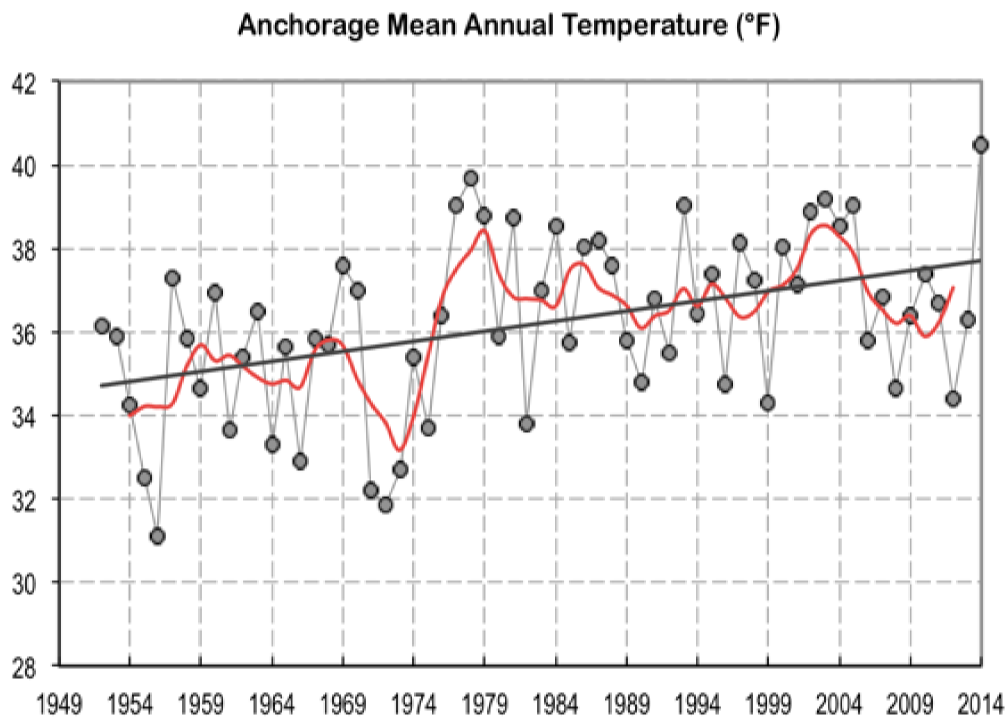

Figure 3-1
Temperature Trend in Anchorage, 1950 to 2014. Source: Alaska Climate Research Center

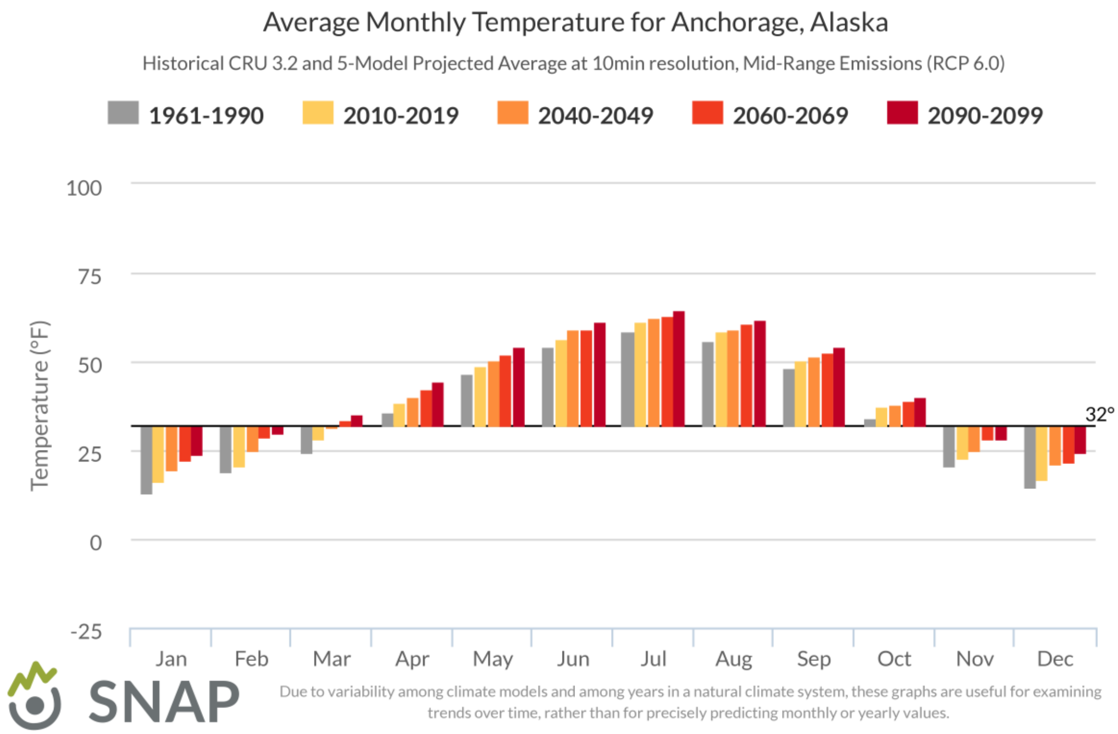

Figure 3-2
Forecasted Temperature Increases in Anchorage Through 2099. Source: "SNAP Community Charts," Scenarios Network for Alaska + Arctic Planning (SNAP).

3.2 Precipitation

As discussed in Section 3.1, the Anchorage area has seen a steady increase in temperatures over the last several decades. Temperatures increases can affect precipitation characteristics especially in areas where snowfall and glaciers provide seasonal storage of water. In 2015, while Anchorage saw higher than average precipitation (13 percent above average), most of this precipitation was rain rather than snow, and snowfall totals in Anchorage were 54 percent below average[3].

Annual precipitation in Alaska is projected to increase by about 15 percent to 30 percent by the end of this century if global emissions continue to increase. All models project increases in all four seasons. However, increases in evaporation due to higher air temperatures and longer growing seasons could reduce water availability in most of the state. Reduced water availability can lead to more extensive wildfire and insect outbreaks.[4] Average monthly precipitation is projected to increase during all months in Anchorage, with some variability from decade to decade (See **Figure 3-3**).

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[3] "The Climate of Alaska for 2015," The Alaska Climate Research Center.
[4] F.S. Chapin III, S. F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A. D. McGuire, and M. Serreze, "Chapter 22: Alaska. Climate Change Impacts in the United States" in The Third National Climate Assessment, ed. J. M. Melillo, T.C. Richmond, and G. W. Yohe (Washington, DC: U.S. Global Change Research Program, 2014),

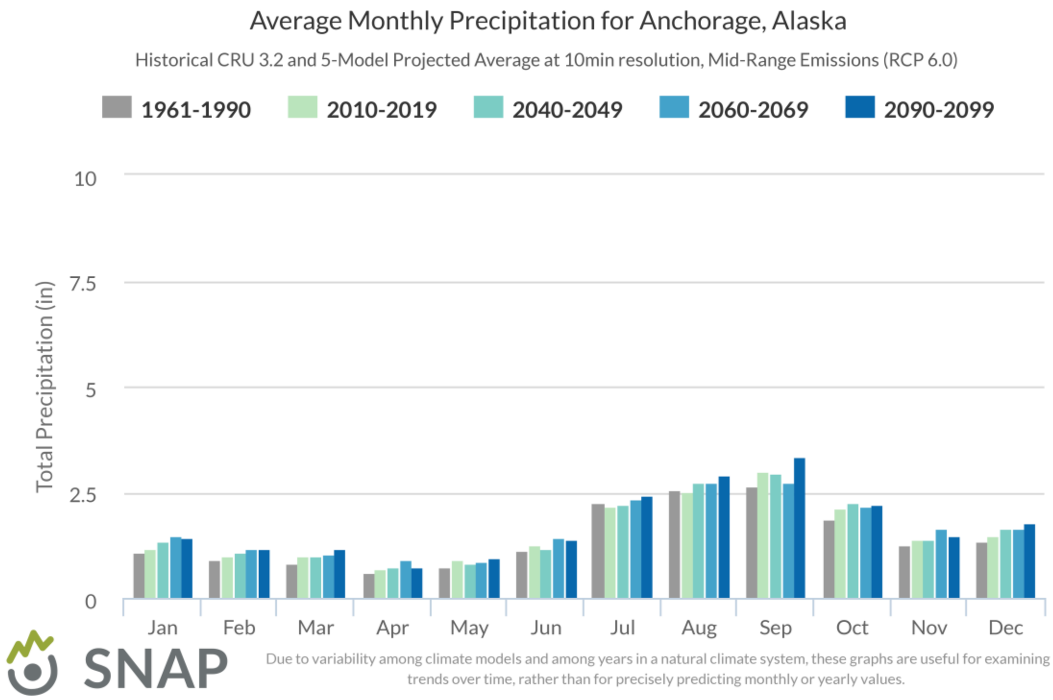

Figure 3-3
Forecasted Precipitation Increases in Anchorage Through 2099. Source: "SNAP Community Charts," Scenarios Network for Alaska + Arctic Planning (SNAP).

3.3 Thawing of Glaciers

Rising temperatures in Southcentral Alaska contributes to a loss of water storage in glaciers due to accelerated melting. This process may produce increased runoff in the near-term as more meltwater is captured as runoff in streams but the recession of glaciers and subsequent loss of water storage will negatively impact water availability long-term.

The U.S. Geological Survey studied the Eklutna watershed from 1985-1988 and concluded that glacier melt water contributed 9-19 percent of recharge to Eklutna Lake; that fine sediments were accumulating in the reservoir at 74 acre-feet/year; and that Eklutna Glacier remained in an equilibrium state.

Since that study, the Eklutna Glacier has diminished in size considerably. Ground-based GPS and airborne laser altimetry data from 2007/2008 document an area weighted average of 130 feet of surface lowering for the glacier over the last 50 years. These data, combined with measured terminus retreat of approximately 1 mile over that same period, document substantial volume reduction since 1957 topographic mapping and suggest accelerated volume reduction in the last 20 years (Larquier 2013).

Changes in ice volume have impacted total runoff in the basin, enhancing cumulative reservoir inflow by 5 ± 4% from 1957 to 2010 and 7 ± 1% from 2010 to 2015. According to their study, it is clear that negative mass balances have made at least some contribution over the long term. Annual contributions were ~13% in 2013 and 2015. This "deglaciation discharge dividend" will ultimately diminish as the shrinking glacier eventually returns to a rough equilibrium with the new climate and annual mass balances trend towards a net zero but it is difficult to determine the timeline for that (Larquier 2013).

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Section 4

Future Reliability Analysis

Based on current research predictions of changing climate, the variables of precipitation, temperature, and others were adjusted in the water balance spreadsheet to assess impacts of future climate change on supply availability from the Eklutna Watershed. **Table 4-1** outlines the variable adjustments made in this analysis.

Table 4-1: Climate Variables Adjusted to Estimate Climate Change Impact

Climate Variable	Adjustments Made in Water Balance	Impact Evaluated
Temperatures (Mean monthly)	Monthly Mean Temperatures Increased 5 degrees F	Average Evaporation Increased by 40% Average Runoff Increased by 11%
Precipitation (Monthly Total)	Monthly Total Precipitation increased by 20%	Local Precipitation/Runoff Increased by 20%
Seasonality of Flows	Not evaluated, since shortages are considered more dependent on the annual withdrawal total than the seasonal distribution	No change

Adjustments to each climate variable are discussed in the following sections.

4.1 Temperature

Current research (discussed in detail in Section 3.1) suggests that temperatures near Anchorage could warm by 4°F to 6°F by the end of the century even with substantial emissions reductions. In the Water Balance Spreadsheet, mean temperatures were increased by 5 degrees F to simulate future conditions. This temperature change increased evaporation by 40% and runoff from the West and East Forks by 11%. This increase in runoff is similar to the melt water contribution change observed over the last 50 years, as discussed in Section 3.3.

4.3 Precipitation

Based on the SNAP results presented in **Figure 3-3**, precipitation in Anchorage is forecasted to increase between 14 and 27% by the end of the century. For this analysis, a constant 20% was added to the monthly precipitation totals that drive the local precipitation/runoff (runoff from the watershed surround Eklutna Lake) variable.

4.4 Seasonality of Runoff

Previous research suggests that a reduction in ice volume will also yield a shift in the peak discharge towards early summer and spring combined with a significant increase in annual runoff for several decades, followed by a longer term decrease in runoff [*Braun et al.*, 2000; *Hock et al.,* 2005; *Stahl et al.,* 2006; *Nolin et al.*, 2010]. Because it was found that shortages are more dependent on the annual withdrawal total than the seasonal distribution of flows, a shift in the seasonality of runoff was not evaluated.

4.5 Future Reliability Results

Once adjustments were made to the Water Balance Spreadsheet to reflect the above changes to climate variables, the reliability tests were re-run to assess the levels of withdrawals that the Eklutna Lake system could support when potential climate change is factored in. **Figure 4-1** presents the simulated Eklutna Lake levels under the same average withdrawal rate as in **Figure 2-4**, 18,000 AFY. Under these end-of-century climate change conditions, Eklutna Lake is spilling in most years and minimum lake levels are limited to around 835 feet msl.

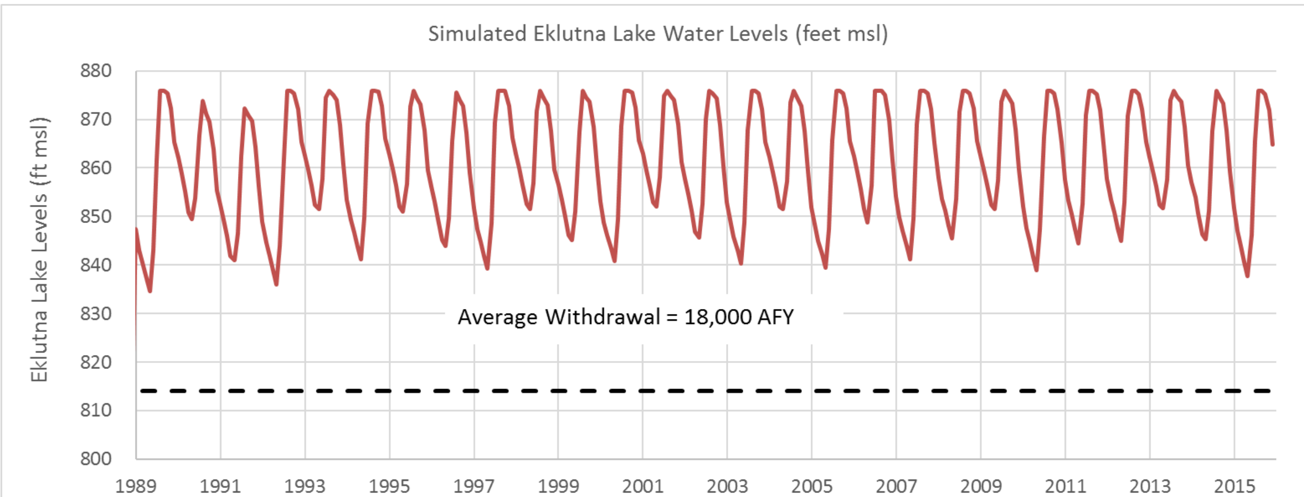

Figure 4-1
Simulated Eklutna Lake Levels with Average Water Supply Withdrawals of 18,000 AFY Under Climate Change

Under climate change conditions, available storage is not depleted until average annual withdrawals reach 40,000 AFY, more than double the current yield available from the lake. The additional 22,000 AFY available for withdrawal is sourced primarily from the increase in runoff, which is increased by 11%, or about 23,000 AFY in the climate change scenario.

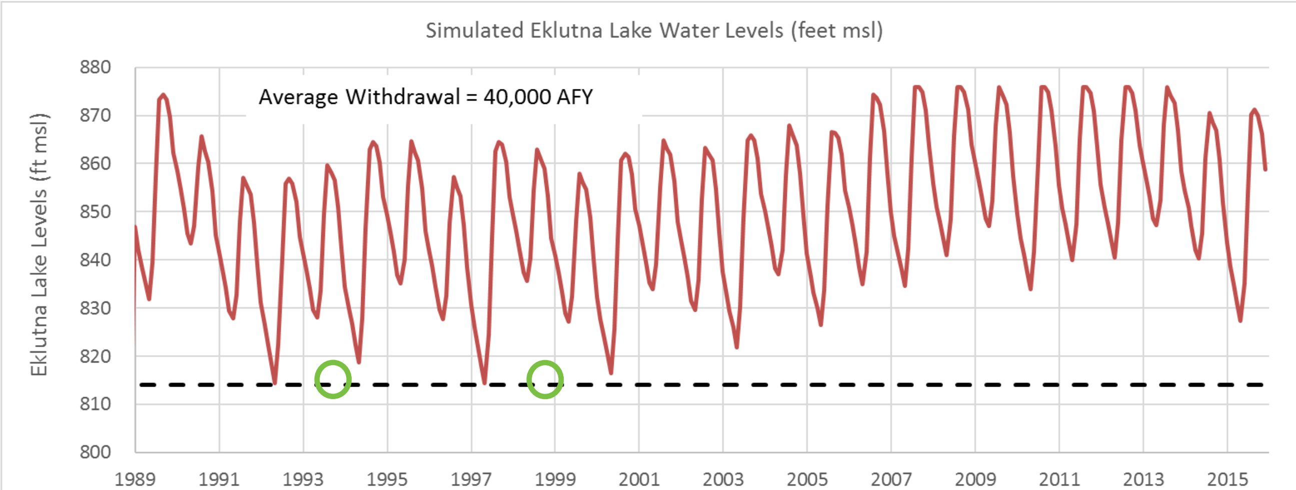

Figure 4-2
Simulated Eklutna Lake Levels with Average Water Supply Withdrawals of 40,000 AFY Under Climate Change

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Section 5

Conclusions

5.1 Summary of Results

The objective of this study was to understand current and future supply availability from Eklutna Lake. A Water Balance Spreadsheet was constructed and populated with data to support the simulation of lake water levels from 1989 to 2015. The tool was calibrated with the main calibration variables being the amount of direct precipitation and lower watershed runoff, as well as some finetuning of when higher rates of withdrawals for hydropower might have been utilized in the past. The study found the following results:

- The Eklutna Lake system provided ample water for the historical withdrawals, at an average rate of 19,417 AFY or **17.3 MGD**, without being drawn down below a lake level of 822 feet (vs. 814 feet intake);
- When applying a consistent annual withdrawal of 17,000 AFY or **15.2 MGD**, the lake levels are drawn down to the intakes due to the lower runoff and available storage in the 1990s;
- By the end of the century, precipitation in Anchorage is forecasted to increase by 15% to 30% and temperatures are expected to increase by 4°F to 6°F. The result of these changes are increased runoff and high rates of glacier melting.
- With forecasted climate change impacts, evaporation at Eklutna Lake will increase by 40%, runoff will increase by 11%, and local precipitation and lower watershed runoff will increase by 20% by the end of the century.
- This increase in runoff will allow Eklutna Lake to support a withdrawal rate of 40,000 AFY or **36 MGD** for water supply. Note that this assumes all other flows, including hydropower withdrawals will stay the same.

5.2 Future Considerations

The Water Balance Spreadsheet can be used to evaluate a wider range of issues than those initially captured by this analysis. These evaluations could include:

- Assessment of the effect of sedimentation on storage and lake yield – As long as the level of sedimentation does not interfere with the intakes for hydropower and water supply withdrawals, than this issue should not impact the system yield. Many studies are now looking at the rate of sedimentation in Eklutna Lake with one recent study finding the annual loading to be approximately 240 AFY. At that rate, it would take many decades for the intakes to be compromised.
- Updating the Water Balance Spreadsheet with studies that are now being conducted on characterizing the runoff from the West and East Fork Eklutna River, the recession of the Eklutna Glacier, and the potential re-establishment of salmon runs would prove useful in

refining the yield estimates and also try to better understand how future runoff, and glacier thinning, might stabilize. This would provide a better estimate of yield under future conditions with and without climate change.

- In a future scenario where runoff increases and more reservoir storage is available, one could use the Water Balance Spreadsheet to look at increases in hydropower withdrawals at the same time. If future population projections were incorporated, a future distribution of power and supply flows could be evaluated to meet the needs of a growing community. The Water Balance Spreadsheet could also be used to evaluate how often the dam would be overtopped with the additional runoff in a future climate change scenario.

Appendix E

EWTF Filter Media Analysis

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Stantec

Memo

To:	Mike Hyland, CDM Smith Tom Winkler, AWWU	From:	Don Spiegel
		Date:	July 7, 2017

Reference: Eklutna Water Treatment Facility Filter Media Analysis

The Anchorage Water and Wastewater Utility (AWWU) has retained the services of CDM Smith to prepare a Facility Plan and an Asset Management Plan for the Eklutna Water Treatment Facility (EWTF). As part of these services, filter media testing in terms of physical attributes and on-going performance was conducted. This memorandum documents the results of the testing efforts.

BACKGROUND INFORMATION

The EWTF is a 35 million gallon per day (mgd), expandable to 70 mgd, conventional process water treatment facility. The main process consists of flash mix, flocculation, sedimentation, dual media filtration and chlorine disinfection. The plant has been in operation since the spring of 1988 and has produced high quality drinking water for the Municipality of Anchorage for the past 29 years.

There are eight dual media filters at the EWTF. Each filter measures 40 feet long by 15 feet wide for a filter area of 600 square feet per filter. The total filter area for all eight filters is thus 4,800 square feet. The original filter media design consisted of 20 inches (depth) of anthracite above 10 inches (depth) of sand which was underlain by a gravel support bed on top of precast concrete “teepee” underdrains. The original filter media specifications were as follows:

Anthracite

- Depth = 20 inches
- Specific Gravity = 1.55 to 1.65
- Effective Size = 1.1 to 1.25 mm
- Uniformity Coefficient = less than 1.4

Sand

- Depth = 10 inches
- Specific Gravity = more than 2.60
- Effective Size = 0.53 to 0.60 mm
- Uniformity Coefficient = less than 1.4

Over the years of service, the EWTF filters have performed very well. Filter throughput are typically 7 million gallons in winter and 6 million gallons in summer and the filter effluent turbidity is below 0.05 NTU virtually all of the time. A recently completed project that added filter-to-waste capability to the filters will further ensure turbidity levels below 0.05 NTU for an even larger percentage of time. Recent discussion with operations staff confirmed that presently there are no concerning issues either physically or performance-based with any of the eight filters. During the 29 years of service, anthracite has been added to the filters periodically to regain the original depth of anthracite media.

FILTER MEDIA SAMPLING PROGRAM

On Monday April 10. 2017, three filters at the EWTF were entered from the top and filter media samples were collected in accordance with the general procedures provided in **Appendix A**. The filters had been previously backwashed, drained and taken out of service by EWTF operations staff. First, Filter # 1 was entered, followed by Filter # 4 and Filter # 8. These filters represent the two end filters (#1 and #8) and one center filter (#4). Operations staff confirmed that there are no discernible differences in filter performance between filters so sampling the two end filters and one center filter seemed appropriate. In Filter #1, a visual inspection tube (clear PVC tube) was first inserted into the filter media to obtain information on media depth and the transition zone within the media between the anthracite and sand. Observations made as a result of insertion of the clear tube are as follows:

- The top 12 inches of media is almost pure anthracite
- At about 12 inches down a small sprinkling of sand can be found mixed with the anthracite
- From about 14 inches down to 22 inches down, the sand is intermixed with the anthracite with significantly more anthracite at the 14" mark gradually changing to significantly more sand at the 22" mark.
- The bottom 8 inches is almost pure sand.

Although the clear tube was not inserted into Filter # 4 or Filter # 8, the media profile observations listed above were almost identical in those filters based on the samples obtained for later analysis.

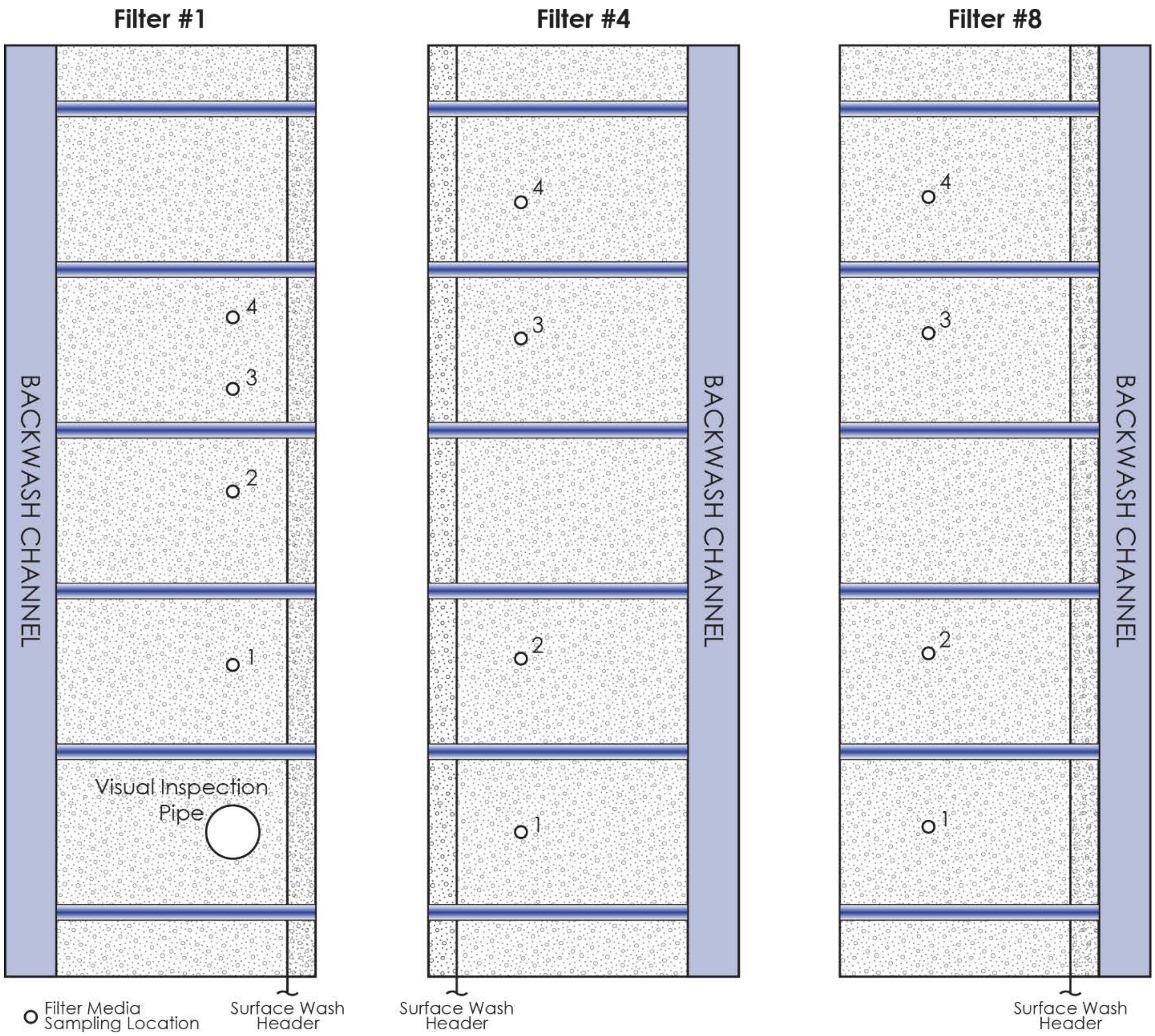
Prior to starting sampling work, plywood sheets were judiciously placed on top of the dried filter media bed so as not to disturb the media during sample collection. Filter media sampling for each of the three filters then proceeded as follows:

1. At each of four representative location within each filter, media samples were taken at the following depth intervals:
   - 0 to 2 inches
   - 2 to 6 inches
   - 6 to 12 inches
   - 12 to 18 inches
   - 18 to 24 inches
   - 24 to 30 inches

Reference: Eklutna Water Treatment Facility Filter Media Analysis

2. Within each filter and for each depth interval, the samples were combined to obtain an "average condition" for that depth interval.
3. The samples were then placed into plastic gallon bags and labeled as to filter number and depth interval.
4. The samples were then taken to HDL Engineering Consultants in Anchorage for laboratory testing to determine specific gravity, effective size and uniformity coefficient in accordance with American Water Works Association (AWWA) Standard B-100.

The sampling locations in each of the three filters are diagrammed below:



Reference: Eklutna Water Treatment Facility Filter Media Analysis

LABORATORY TESTING RESULTS

Laboratory testing results were provided by HDL Engineering Consultants of Anchorage and are provided in **Appendix B**. A summary of the results along with some comments consistent with the rest of this memorandum are presented in Table 1.

ANALYSIS

Typically, there are five areas of concern when comparing aged filter media to the original filter media design:

1. Are the filter media depths (individual layers and total depth) similar to the original design?
2. Are the physical characteristics of the media (effective size, uniformity coefficient, and specific gravity) similar to the original design?
3. Does the top surface of the anthracite have very small sized anthracite particles due to attrition and wear of the anthracite?
4. What is the depth interval for the anthracite/sand transition zone and does it gradually change from a predominately anthracite/sand mix to a predominantly sand/anthracite mix?
5. Is the appropriate backwash rate for the anthracite layer and the sand layer still match within about ten percent?

These questions and typical concerns are discussed below.

Filter Media Depth

The originally specified depth of media is 20 inches of anthracite above 10 inches of sand for a total filter media depth of 30 inches. These depths appear to be the same today based on the clear PVC observation tube first inserted and also based on the 12 samples (four samples per filter for three filters) collected for the filters. The total depth remains at 30 inches and although there is about an 8 inch transition zone between the anthracite and sand, the individual layers have about the same depth as originally specified.

Reference: Eklutna Water Treatment Facility Filter Media Analysis

Table 1
Filter Media Test Results

	Filter #1	Filter #4	Filter #8	Average	Original Specification	Comments
Depth Interval • ES • UC • SG	0-2 inches • 1.0 mm • 1.4 • 1.55	0-2 inches • 1.1 mm • 1.45 • 1.62	0-2 inches • 1.0 mm • 1.3 • 1.61	0-2 inches • 1.03 mm • 1.38 • 1.59	**0-20 inches** 1.1 - 1.25 mm Less than 1.4 1.55 - 1.65	Although the anthracite is slightly smaller than the 1.1 mm originally specified, a 1.03 mm size in the top 2 inches will not create filter blinding conditions.
Depth Interval • ES • UC • SG	2-6 inches • 1.3 mm • 1.38 • 1.59	2-6 inches • 1.1 mm • 1.36 • 1.63	2-6 inches • 1.2 mm • 1.25 • 1.57	2-6 inches • 1.1 mm • 1.33 • 1.60	**0-20 inches** 1.1 - 1.25 mm Less than 1.4 1.55 - 1.65	Matches the original anthracite specification.
Depth Interval • ES • UC • SG	6-12 inches • 1.1 mm • 1.45 • 1.63	6-12 inches • 1.2 mm • 1.33 • 1.55	6-12 inches • 1.2 mm • 1.33 • 1.58	6-12 inches • 1.17 mm • 1.37 • 1.59	**0-20 inches** 1.1 - 1.25 mm Less than 1.4 1.55 - 1.65	Matches the original anthracite specification.
Depth Interval • ES • UC • SG	12-18 inches • 0.61 mm • 2.31 • 2.11	12-18 inches • 0.6 mm • 2.67 • 1.82	12-18 inches • 0.6 mm • 2.5 • 2.11	12-18 inches • 0.6 mm • 2.49 • 2.01	**0-20 inches** 1.1 - 1.25 mm Less than 1.4 1.55 - 1.65	The uniformity coefficient and specific gravity values show a transition zone between the two media types.
Depth Interval • ES • UC • SG	18-24 inches • 0.6 mm • 1.33 • 2.48	18-24 inches • 0.6 mm • 1.33 • 2.51	18-24 inches • 0.6 mm • 1.33 • 2.54	18-24 inches • 0.6 mm • 1.33 • 2.51	**20-30 inches** 0.53 - 0.6 mm Less than 1.4 Greater than 2.6	Matches the original sand specification except for specific gravity. The specific gravity of the sand first installed may have been a bit lower than specified in order to better match the installed anthracite at the time. Today, at this time, the sand and anthracite are very well matched in terms of appropriate backwash rate.
Depth Interval • ES • UC • SG	24-30 inches • 0.6 mm • 1.5 • 2.53	24-30 inches • 0.6 mm • 1.33 • 2.51	24-30 inches • 0.6 mm • 1.5 • 2.51	24-30 inches • 0.6 mm • 1.43 • 2.52	**20-30 inches** 0.53 - 0.6 mm Less than 1.4 Greater than 2.6	Matches the original sand specification except for specific gravity. The specific gravity of the sand first installed may have been a bit lower than specified in order to better match the installed anthracite at the time. Today, at this time, the sand and anthracite are very well matched in terms of appropriate backwash rate.

Reference: Eklutna Water Treatment Facility Filter Media Analysis

Filter Media Physical Characteristics

As can be seen from Table 1 above, the numbers at each sampling interval are very close to the original specification. Other items to note are as follows:

- The top 2 inches of anthracite (0-2" depth interval) are a little smaller in effective size than originally designed but this is to be expected after many years of service. However, the effective size is still above 1.0 mm which is quite close to the 1.1 mm originally specified; thus there is no concern at this time with filter blinding due to a very fine top layer of anthracite.
- The 2-6" depth interval shows a consistent layer of anthracite that meets the original design requirements.
- The 6 to 12" depth interval shows a consistent layer of anthracite that closely meets the original design requirements.
- The 12 to 18" depth interval shows a mixed media layer as is evidenced by the uniformity coefficient and specific gravity values that indicate an anthracite/sand mixture.
- The 18 to 24" depth interval shows a predominance of sand in this layer with little influence of anthracite. The specific gravity value for the sand, however, is a little low from specified but it was likely originally installed that way to better match the filter media (see discussion below in the Media Appropriate Backwash Rate paragraph).
- The 24 to 30" depth interval shows a consistent layer of sand that closely parallels the original specification except for the somewhat low specific gravity value. Again, the lower specific gravity number does not present any problem as is discussed under the Media Appropriate Backwash Rate paragraph below.

Top Surface of Anthracite

As mentioned above, the top 2 inches of the anthracite has an effective size and a uniformity coefficient that is very close to the original specified values for the anthracite. Also, from visual observation, there is no layer of anthracite fines that rest on the top of the media that could, in turn, cause filter blinding problems during filtration.

Transition Zone from Anthracite to Sand

From the numbers in the laboratory testing results and based on observations during sampling, the transition zone begins at about a depth of 14 inches and ends at a depth of about 22 inches for a total transition zone depth of about 8 inches. This varies slightly from filter to filter. The transition zone gradually changes from a predominance of anthracite at the top (14" depth) to a predominance of sand at the bottom (22" depth). The uniformity coefficient and specific gravity values at these depths support the presence of the transition zone. A transition zone can be of concern if too much of the filter bed has a combined anthracite/sand zone rather than distinct zones because void ratios are different in the combined zone which, in turn, can promote floc retention and reduced filter performance. Based on recent performance information and based on discussions with operations staff, filtered water quality has been consistently high for many years with no indication of reduced performance.

Matching Appropriate Backwash Rates. The analysis for matching filter media characteristics considers media grain size (effective size and uniformity coefficient) and media grain weight (specific gravity). Individual layers of interspersed media types are not important unless the individual media grains are enlarged via physical attachment to one another (in essence stuck together). For dual media (or tri-media) filters, it is important to specify media characteristics that are closely matched so that each media type is properly washed and adequately cleaned at a similar backwash rate. If an inappropriate combination of media is used, part of the bed may not be properly washed (if too low a backwash rate is employed) or some of the media may be over-washed and thus subject to attrition, wear and eventual loss over time (if too high a backwash rate is employed). It should be noted that matching filter media for backwash conditions focuses on individual grain size and grain weight because a filter bed is fluidized during backwash in order to optimize removal of captured particles from the dirty filter bed.

Based on the information in Table 1, the appropriate backwash rates for the individual anthracite grains and the individual sand grains at the EWTF are very closely matched. The numbers to support the close match are given below:

Anthracite Backwash Information

- Anthracite effective size (average): 1.1 mm
- Anthracite uniformity coefficient (average): 1.36
- Anthracite 60 percent weight particle size (ES x UC): 1.5
- Anthracite specific gravity: 1.60
- Anthracite appropriate backwash rate at 68 degrees F water temperature: 18.5 gpm/sf
- Anthracite appropriate backwash rate at 50 degrees F water temperature: 16.5 gpm/sf
- Anthracite appropriate backwash rate at 38 degrees F water temperature: 15.7 gpm/sf

Sand Backwash Information

- Sand effective size (average): 0.6 mm
- Sand uniformity coefficient (average): 1.38
- Sand 60 percent weight particle size (ES x UC): 0.83
- Sand specific gravity: 2.51
- Sand appropriate backwash rate at 68 degrees F water temperature: 19.1 gpm/sf
- Sand appropriate backwash rate at 50 degrees F water temperature: 17.2 gpm/sf

Reference: Eklutna Water Treatment Facility Filter Media Analysis

- Sand appropriate backwash rate at 38 degrees F water temperature: 16.2 gpm/sf

From the above information, the appropriate backwash rates (at 68 degrees F water temperature) for the anthracite and sand are very closely matched at 18.5 gpm/sf and 19.1 gpm/sf, respectively. This represents a filter media match of within 3.2 percent (0.6/18.5 = 0.032 or 3.2%) which is an excellent match.

SUMMARY AND RECOMMENDATIONS

In summary, the exiting filter media, although having 29 years of service, is in good condition and poses no operational risk to the EWTF or AWWU. The media has physical characteristics that are very close to the installed characteristics, has well matched anthracite and sand layers in terms of appropriate backwash rates, and has continually produced excellent filtered water quality. No capping or replacement of media is recommended at this time.

In terms of continued media monitoring, the following recommendations are made:

1. The clear PVC observation tube should be placed in one filter annually to monitor the depth of the transition layer of anthracite and sand. This was done for Filter # 1 and it was observed that the transition zone was prevalent from about 14 inches down to about 22 inches down. This was also confirmed by the media sampling in Filter # 4 and Filter # 8. Next year, Filter # 2 should be observed to see if the transition zone in that filter is about the same as in Filter # 1. If it is, then Filter # 3 should be observed in 2019, Filter # 5 in 2020, Filter # 6 in 2021 and Filter # 7 in 2022. If it is not, perhaps the non-sampled filters should all be observed and compared in 2018.

2. Filter coring, sampling and testing should be repeated in five years (in 2022) or if filter performance in one or more filters deteriorates in terms of throughput or filtered water turbidity.

Don Spiegel
Senior Vice President
Phone: 916-418-8273
Fax: 916-924-9102
donald.spiegel@stantec.com

Appendix A – Filter Media Core Sampling Plan

Eklutna Water Treatment Facility

Filter Media Core Sampling Plan

April 10, 2017

1. The existing filter media was designed as a 20" anthracite/10" sand dual media. The anthracite and sand were specified as provided below.
2. Original Anthracite Specifications:
    - Depth = 20"
    - Effective Size = 1.1 to 1.25 mm
    - Uniformity Coefficient = less than 1.4
    - Apparent Specific Gravity = 1.55 to 1.65
3. Original Sand Specifications:
    - Depth = 10"
    - Effective Size = 0.53 to 0.60 mm
    - Uniformity Coefficient = less than 1.4
    - Specific Gravity = greater than 2.60
4. Select three filters to be sampled (I suggest the two end filters 1 and 8 and one middle filter 4 or 5). Ask operations staff if there is one or more lower performing filters that should be sampled instead of those mentioned herein.
5. Backwash filter to be sampled.
6. Isolate and drain filter to be sampled.
7. Working off plywood, and using sampling core and pre-labeled plastic bags, sample filter at three to four representative locations within the filter box.
8. Obtain samples in the following depth intervals:
    - 0 to 2" (anthracite)
    - 2" to 6" (anthracite)
    - 6" to 12" (anthracite)
    - 12" to 18" (anthracite; likely need to adjust depth at bottom at sand interface)
    - 18" to 24" (sand; likely need to adjust depth at top at anthracite interface)
    - 24" to 30" (or refusal if 30" cannot be reached; sand)
9. Mix together the samples from the three to four sampling locations for each depth interval.
10. Send samples to laboratory for analysis of ES, UC and SG in accordance with the methods of AWWA Standard B-100.
11. List of Materials:
    - Ladder, temporary lighting and small whisk broom or dustpan broom
    - 3 sheets of plywood; two to walk on and one to use to place and quarter samples
    - Knee pads and working gloves for 2 people
    - Clear PVC (6") tube – Beauchamp from Ship Creek
    - 2" coring tool – Spiegel from Sacramento
    - Tape measures (2)
    - Box of ziplock gallon bags (I believe they have 38 per box) and indelible markers (2)
    - Pail and rope for lowering/raising items into/out of filters

Appendix B – Filter Media Core Testing Results

HDL ENGINEERING Consultants

May 5, 2017

Mr. Tom Winkler
Anchorage Water & Wastewater Utility
3000 Arctic Boulevard
Anchorage, AK 99503

RE: Laboratory Test Results
Filters 1, 4, and 8

Dear Mr. Winkler:

CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING

TRANSPORTATION ENGINEERING

ENVIRONMENTAL SERVICES

PLANNING

SURVEYING & MAPPING

CONSTRUCTION ADMINISTRATION

MATERIAL TESTING

RIGHT-OF-WAY SERVICES

HDL Engineering Consultants, LLC (HDL) is pleased to provide the results of the laboratory tests conducted on the treatment filter media.

The tests included Specific Gravity (ASTM C128) and Gradation Analysis (ASTM C136 as modified by AWWA B100). In addition, a modified loss on ignition test was performed on several samples to estimate the percentage of anthracite in the sample. The laboratory results are summarized on the attached table. See the attached laboratory test reports for further details.

Please feel free to contact me at dsimon@hdlalaska.com or 907.564.2150 if you have any questions or need further assistance.

Sincerely,

HDL Engineering Consultants, LLC

Doug P. Simon, PE
Geotechnical Services Manager

attach: Laboratory Testing Summary (1 page)
Laboratory Test Results (18 Pages)

Anchorage | 3335 Arctic Boulevard, Suite 100, Anchorage 99503 | 907.564.2120
Mat-Su | 202 West Elmwood Avenue, Palmer 99645 | 907.746.5230
Kenai Peninsula | 10735 Spur Highway, Suite 1B, Kenai 99611 | 907.283.2051

SOIL SAMPLES - LABORATORY TESTING SUMMARY

HDL ENGINEERING CONSULTANTS, LLC
3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
(907) 564-2120

CLIENT: AWWU — PROJECT: FILTER MEDIA
DATE: 5/5/2017 — PROJ NO.: 17-110

SAMPLE NO.	SAMP NO.	DEPTH (IN)	%GRAVEL	%SAND	% SILT	BULK SPG	ORG %	LL	PL	PI	CLASS	FROST
P21	F1-1	0-2	0.0	100.0	0.0	1.553					SP	
P22	F1-2	2-6	0.1	99.9	0.0	1.590					SP	
P23	F1-3	6-12	0.0	100.0	0.0	1.630	73.0				SP	
P24	F1-4	12-18	0.0	100.0	0.0	2.109	26.1				SP	
P25	F1-5	18-24	0.0	100.0	0.0	2.478	12.8				SP	
P26	F1-6	24-30	2.5	97.5	0.0	2.532	7.5				SP	
P27	F4-1	0-2	0.0	100.0	0.0	1.619					SP	
P28	F4-2	2-6	0.0	100.0	0.0	1.630					SP	
P29	F4-3	6-12	0.0	100.0	0.0	1.551	88.5				SP	
P30	F4-4	12-18	0.0	100.0	0.0	1.820	65.1				SP	
P31	F4-5	18-24	0.0	100.0	0.0	2.508	16.1				SP	
P32	F4-6	24-30	1.5	98.5	0.0	2.512	7.6				SP	
P33	F8-1	0-2	0.0	100.0	0.0	1.605					SP	
P34	F8-2	2-6	0.0	100.0	0.0	1.570	92.1				SP	
P35	F8-3	6-12	0.0	100.0	0.0	1.582	88.7				SP	
P36	F8-4	12-18	0.0	100.0	0.0	2.106	41.8				SP	
P37	F8-5	18-24	0.0	100.0	0.0	2.536	10.3				SP	
P38	F8-6	24-30	1.8	98.1	0.0	2.507	12.4				SP	

COMMENTS: Note that the "SP" provided on anthracite samples is based on the gradation, not mineral composition

HDL ENGINEERING Consultants

3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/28/2017
CLIENT:	AWWU	**TESTED BY:**	PC
SAMPLE NO.:	P21-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S1	**DESCRIPTION:**	0-2 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	100
#12	1.7	98
#14	1.4	72
#16	1.18	32
#18	1.00	9
#30	0.6	0
#40	0.425	0
#50	0.3	0
#100	0.15	0
#200	0.075	0.0

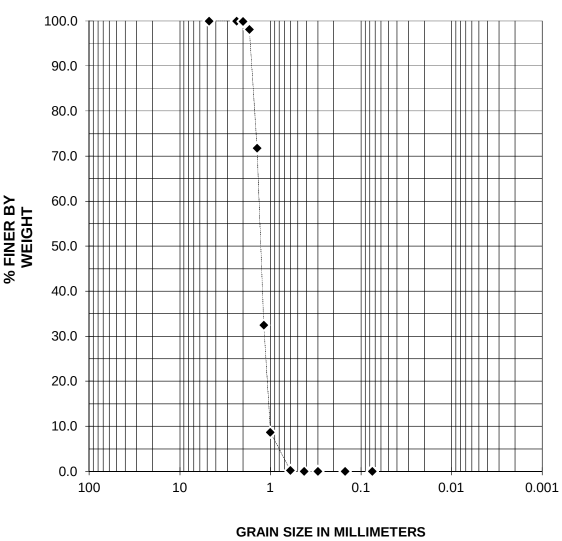
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.4
D30=	1.2
D10=	1.0
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	12.4
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM C127)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D854)	
Bulk SpG=	1.553
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
SpG (assumed) =	
Test Method =	

HYDROMETER TEST

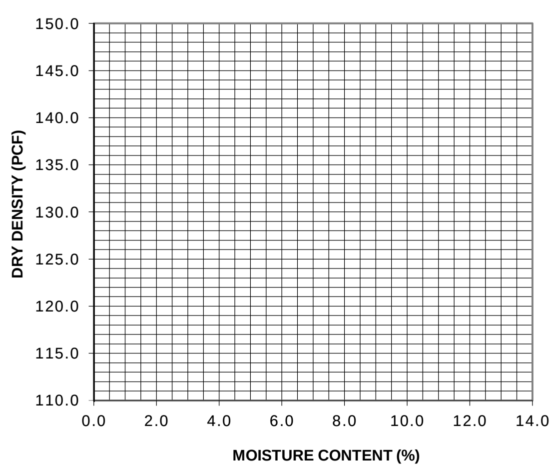
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS:

HDL ENGINEERING Consultants
3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P22-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S2	**DESCRIPTION:**	2-6 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	100
#4	4.75	100
#8	2.36	99
#10	2.0	87
#12	1.7	40
#14	1.4	14
#16	1.18	4
#18	1.00	1
#20	0.85	0
#30	0.6	0
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

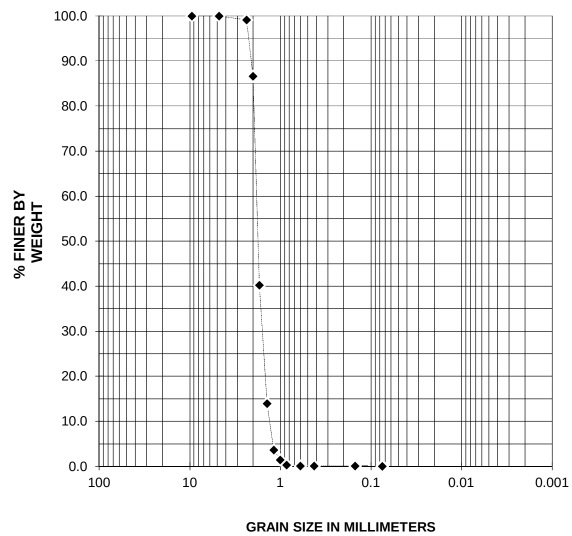
% GRAVEL:	0.0
% SAND:	99.9
% FINES:	0.0
D60=	1.8
D30=	1.6
D10=	1.3
Cu=	1.4
Cc=	1.0
% .02 mm	
% Moist.:=	12.8
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.590
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
)G (assumed) =	
) Test Method =	

HYDROMETER TEST

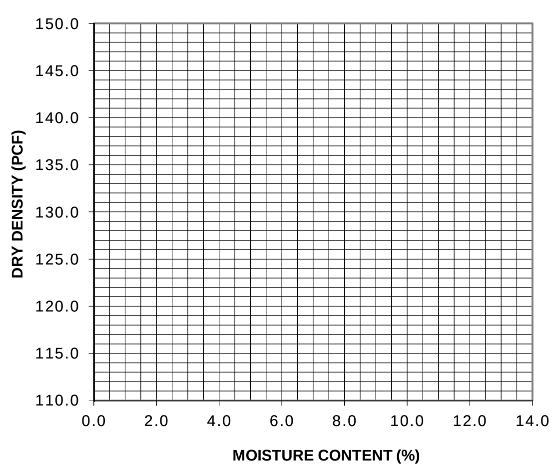
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS:

HDL ENGINEERING Consultants

3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P23	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S3	**DESCRIPTION:**	6-12 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	97
#12	1.7	71
#14	1.4	26
#16	1.18	11
#18	1.00	6
#30	0.6	2
#40	0.425	0
#50	0.3	0
#100	0.15	0
#200	0.075	0.0

% GRAVEL: 0.0
% SAND: 100.0
% FINES: 0.0
D60= 1.6
D30= 1.4
D10= 1.1
Cu= 1.4
Cc= 1.1
% .02 mm
% Moist.:= 12.9
Fine Modulus:=

(ASTM D4318)

Liquid Limit.=
Plastic Limit.=
Plastic Index. =

(ASTM D854)

Bulk SpG=
SSD SpG=
Apparent SpG=
% Absorption=

(ASTM C128)

Bulk SpG= 1.630
SSD SpG=
Apparent SpG=
% Absorption=

(ASTM D1557)

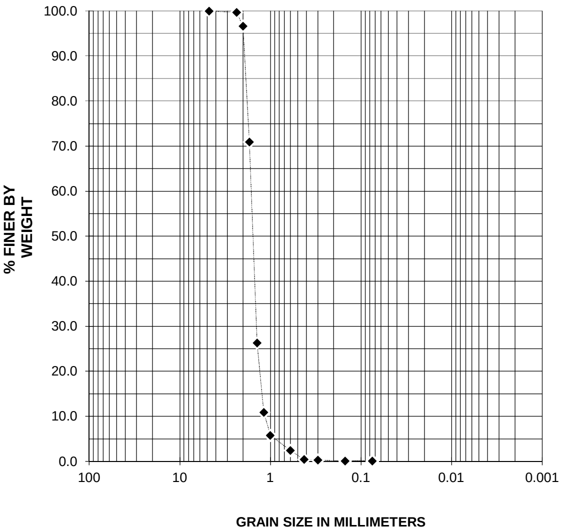
Dry Den (U) =
Dry Den (C) =
M % (U) =
M % (C) =
pG (assumed) =
) Test Method =

HYDROMETER TEST

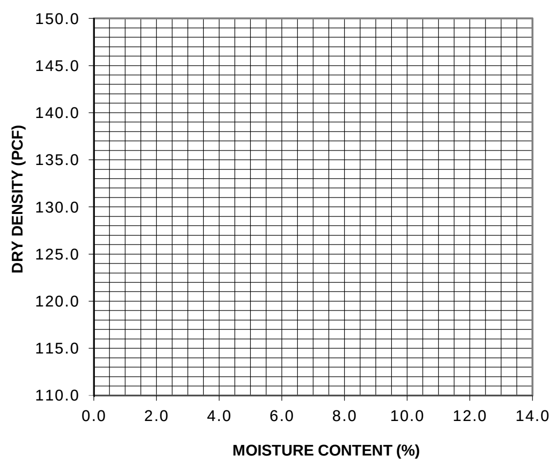
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS: **ORG % = 73%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P24	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S4	**DESCRIPTION:**	12-18 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	99
#10	2.0	95
#12	1.7	78
#14	1.4	59
#16	1.18	54
#18	1.00	52
#20	0.85	47
#30	0.6	9
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

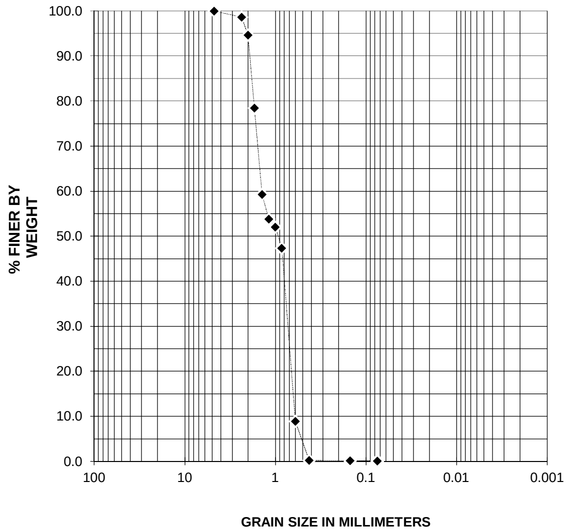
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.41
D30=	0.74
D10=	0.61
Cu=	2.3
Cc=	0.6
% .02 mm	
% Moist.:=	8.3
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.109
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
G (assumed) =	
Test Method =	

HYDROMETER TEST

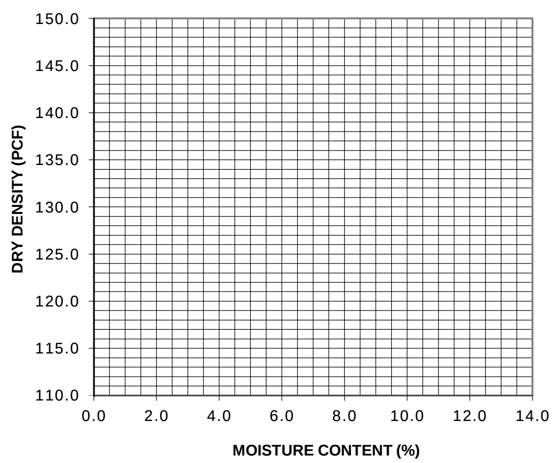
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION:	Poorly Graded Sand
USC:	SP
FROST CLASS:	
COMMENTS:	**ORG % = 26.1%**

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Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P25-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S5	**DESCRIPTION:**	18-24 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	99
#10	2.0	97
#12	1.7	92
#14	1.4	84
#16	1.18	82
#18	1.00	80
#20	0.85	66
#30	0.6	4
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

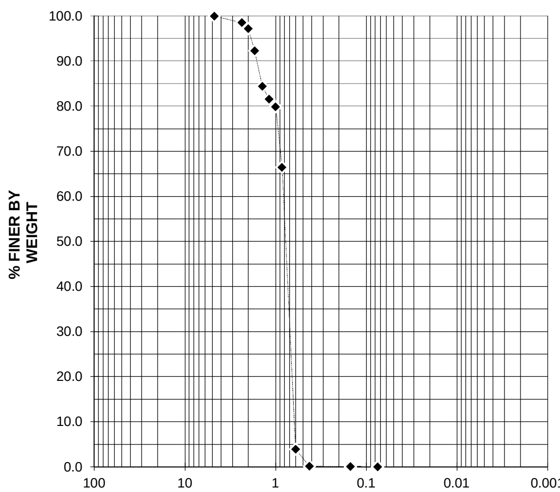
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	0.8
D30=	0.7
D10=	0.6
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	5.8
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.478
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

HYDROMETER TEST

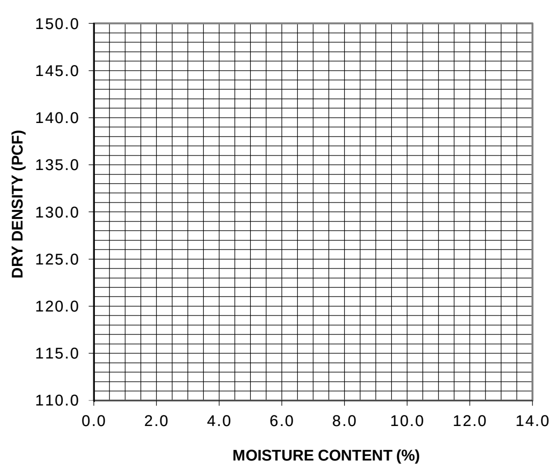
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS: **ORG % = 12.8%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P26-3	**REVIEWED BY:**	JAB
LOCATION:	FILTER 1, S6	**DESCRIPTION:**	24-30 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	100
#4	4.75	98
#8	2.36	91
#10	2.0	89
#12	1.7	84
#14	1.4	77
#16	1.18	74
#18	1.00	72
#20	0.85	59
#30	0.6	4
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

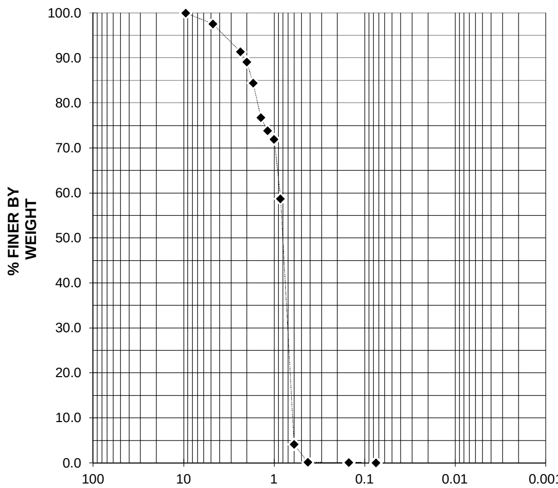
% GRAVEL:	2.5
% SAND:	97.5
% FINES:	0.0
D60=	0.9
D30=	0.7
D10=	0.6
Cu=	1.4
Cc=	1.0
% .02 mm	
% Moist.:=	5.3
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.532
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
SpG (assumed) =	
Test Method =	

HYDROMETER TEST

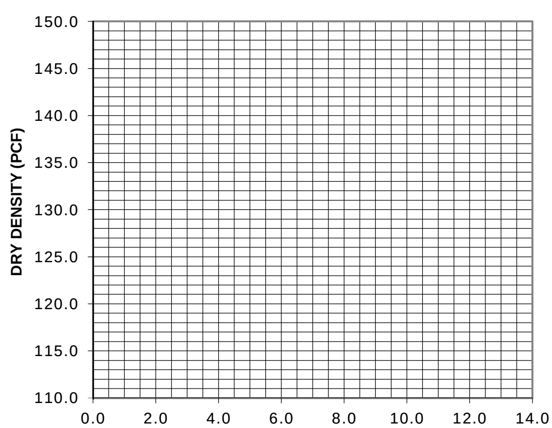
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS: **ORG % = 7.5%**

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Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P27-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S1	**DESCRIPTION:**	0-2 IN

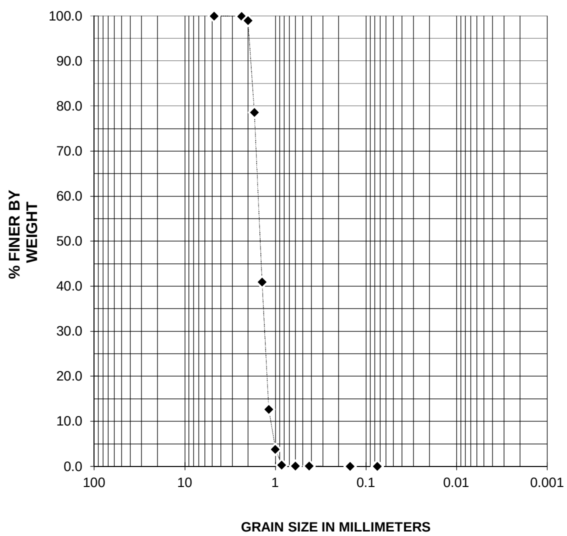
SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	99
#12	1.7	79
#14	1.4	41
#16	1.18	13
#18	1.00	4
#20	0.85	0
#30	0.6	0
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.6
D30=	1.3
D10=	1.1
Cu=	1.4
Cc=	1.0
% .02 mm	
% Moist.:=	22.0
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.619
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

GRAIN SIZE DISTRIBUTION

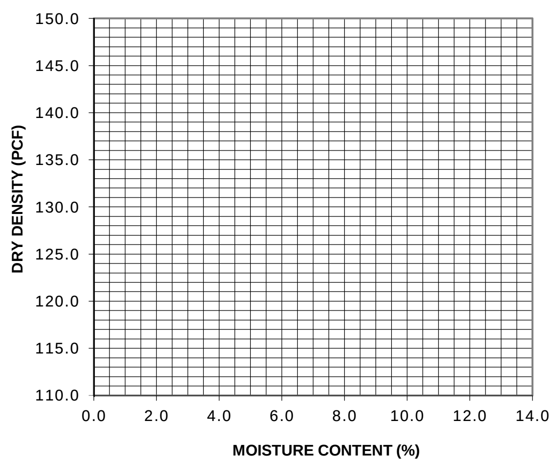


HYDROMETER TEST

(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS:

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P28	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S2	**DESCRIPTION:**	2-6 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	100
#12	1.7	93
#14	1.4	53
#16	1.18	19
#18	1.00	5
#20	0.85	2
#30	0.6	0
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

% GRAVEL: 0.0
% SAND: 100.0
% FINES: 0.0
D60= 1.5
D30= 1.3
D10= 1.1
Cu= 1.4
Cc= 1.0
% .02 mm
% Moist.:= 22.0
Fine Modulus:=

(ASTM D4318)
Liquid Limit.=
Plastic Limit.=
Plastic Index. =

(ASTM D854)
Bulk SpG= 1.630
SSD SpG=
Apparent SpG=
% Absorption=

HYDROMETER TEST

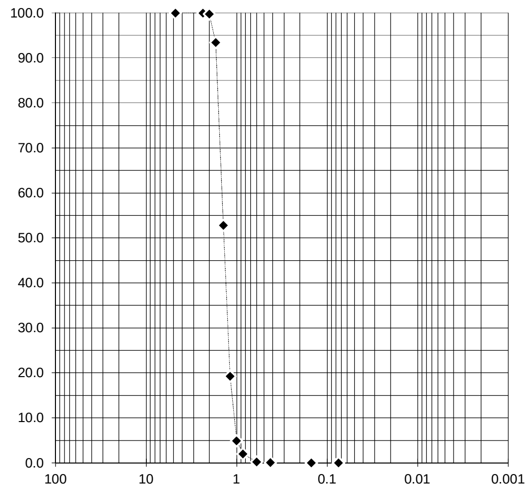
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

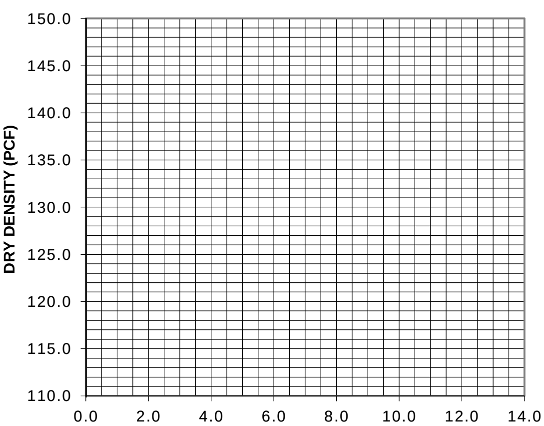
(ASTM C128)
Bulk SpG=
SSD SpG=
Apparent SpG=
% Absorption=

(ASTM D1557)
Dry Den (U) =
Dry Den (C) =
M % (U) =
M % (C) =
›G (assumed) =
› Test Method =

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS:

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Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P29-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S3	**DESCRIPTION:**	6-12 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	99
#12	1.7	79
#14	1.4	28
#16	1.18	8
#18	1.00	3
#20	0.85	2
#30	0.6	1
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

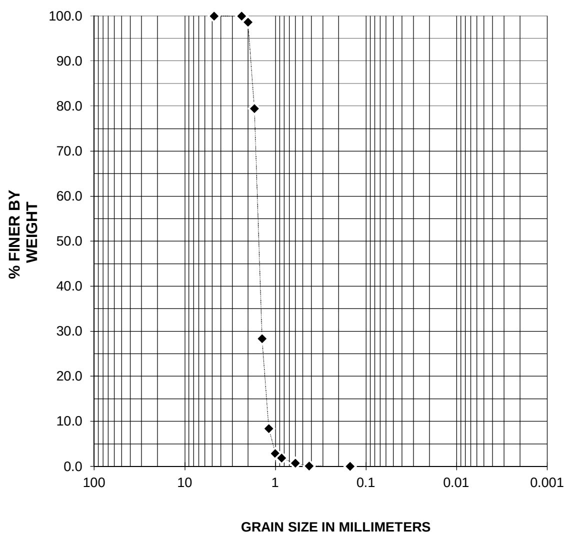
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.6
D30=	1.4
D10=	1.2
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	13.9
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.551
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
Test Method =	

HYDROMETER TEST

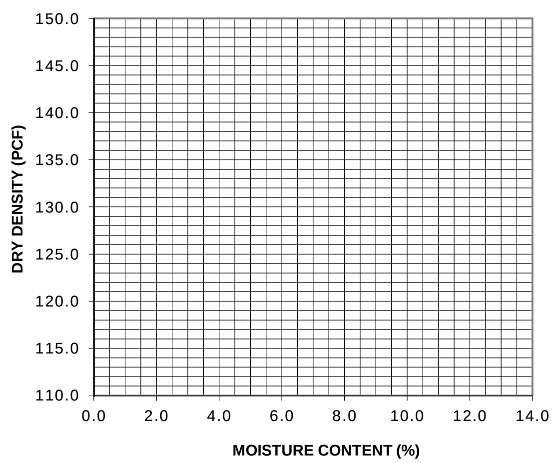
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS: **ORG % = 88.5%**

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Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P30-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S4	**DESCRIPTION:**	12-18 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	99
#10	2.0	96
#12	1.7	73
#14	1.4	37
#16	1.18	27
#18	1.00	24
#20	0.85	23
#30	0.6	9
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.6
D30=	1.2
D10=	0.6
Cu=	2.6
Cc=	1.6
% .02 mm	
% Moist.:=	11.3
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.820
SSD SpG=	
Apparent SpG=	
% Absorption=	

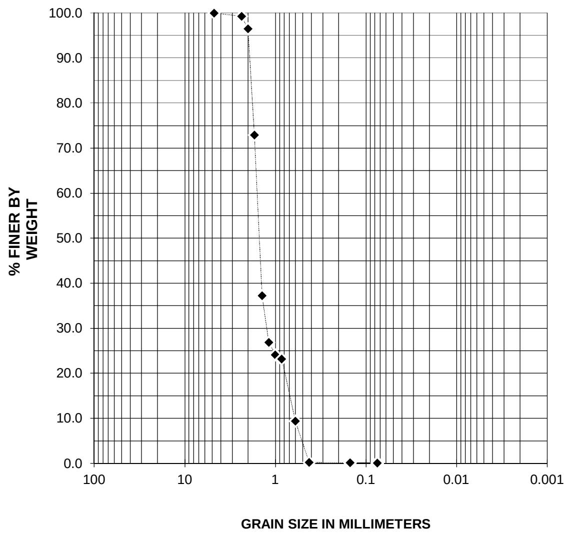
HYDROMETER TEST

(ASTM D422)

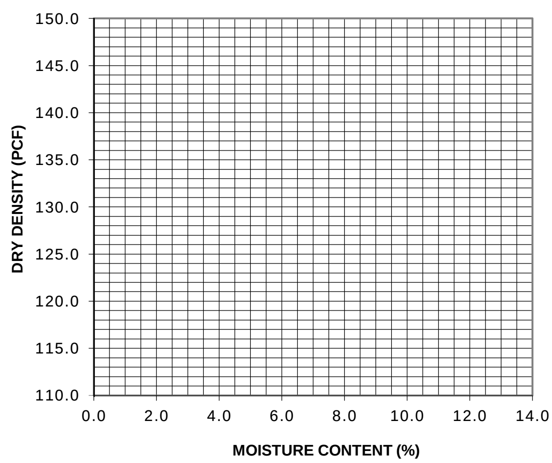
ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION:	Poorly Graded Sand
USC:	SP
FROST CLASS:	
COMMENTS:	**ORG % = 65.1%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P31-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S5	**DESCRIPTION:**	18-24 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	99
#12	1.7	94
#14	1.4	85
#16	1.18	81
#18	1.00	79
#20	0.85	67
#30	0.6	6
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

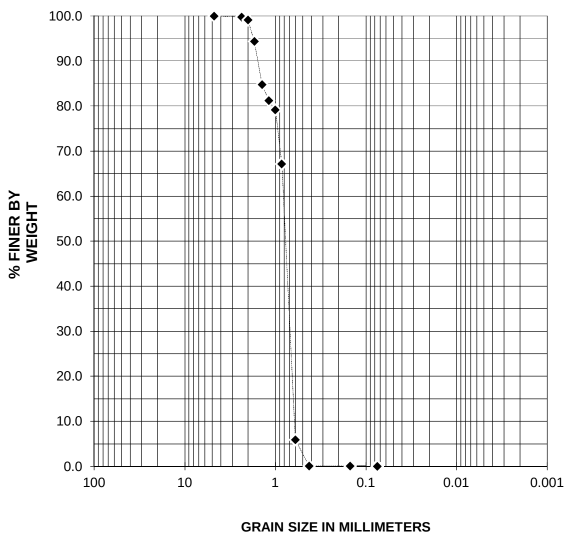
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	0.8
D30=	0.7
D10=	0.6
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	6.2
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.508
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
G (assumed) =	
) Test Method =	

HYDROMETER TEST

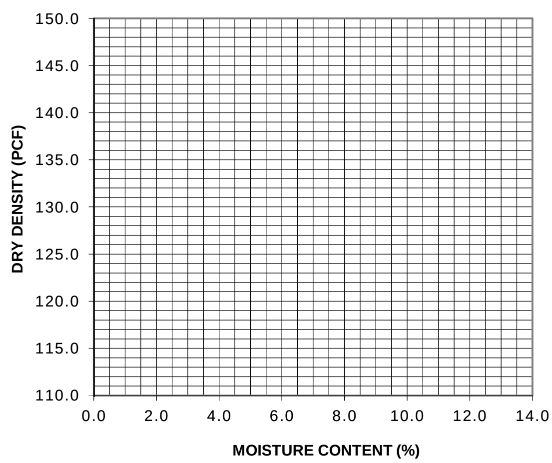
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS: **ORG % = 16.1%**

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3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P32-3	**REVIEWED BY:**	JAB
LOCATION:	FILTER 4, S6	**DESCRIPTION:**	24-30 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	100
#4	4.75	99
#8	2.36	94
#10	2.0	92
#12	1.7	88
#14	1.4	81
#16	1.18	78
#18	1.00	76
#20	0.85	62
#30	0.6	5
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

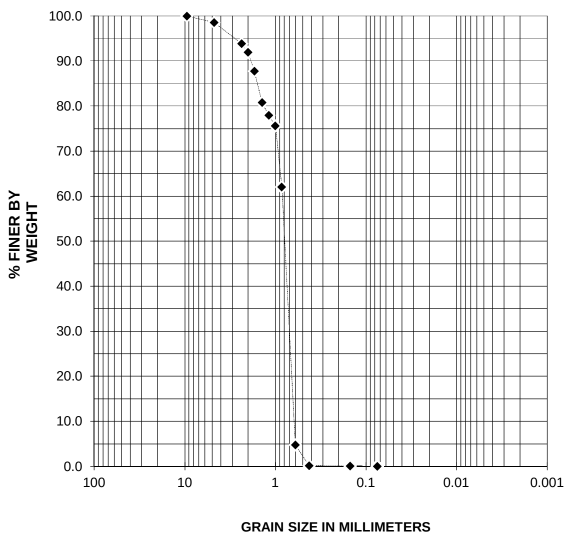
% GRAVEL:	1.5
% SAND:	98.5
% FINES:	0.0
D60=	0.8
D30=	0.7
D10=	0.6
Cu=	1.4
Cc=	1.0
% .02 mm	
% Moist.:=	5.6
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.512
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
›G (assumed) =	
› Test Method =	

HYDROMETER TEST

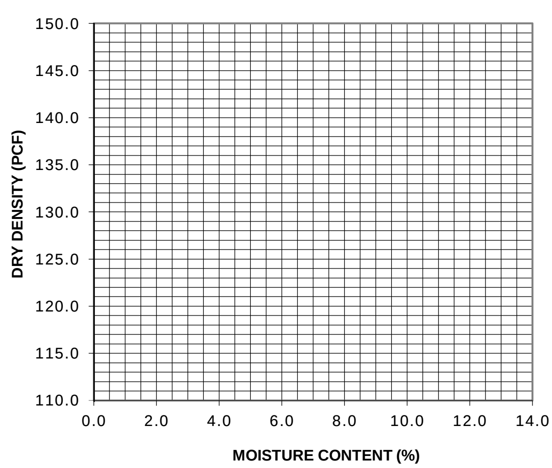
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS: **ORG % = 7.6%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P33-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S1	**DESCRIPTION:**	0-2 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	100
#12	1.7	98
#14	1.4	70
#16	1.18	34
#18	1.00	11
#20	0.85	4
#30	0.6	1
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

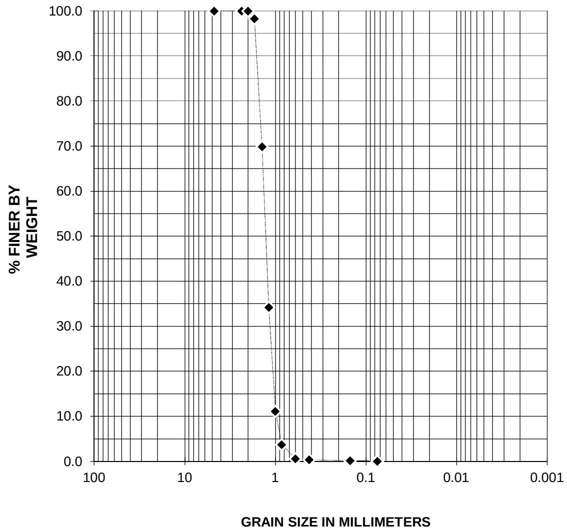
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.3
D30=	1.1
D10=	1.0
Cu=	1.4
Cc=	1.0
% .02 mm	
% Moist.:=	14.5
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.605
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

HYDROMETER TEST

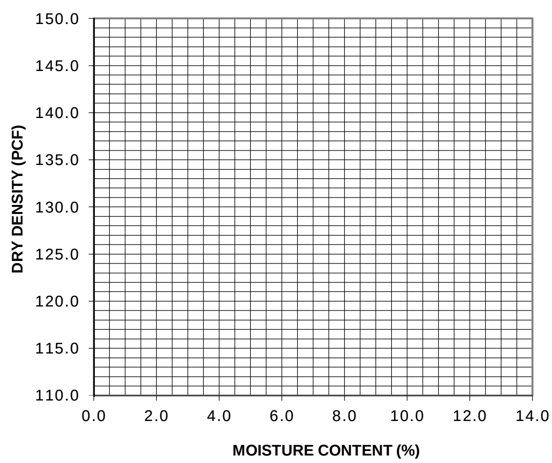
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS:

HDL ENGINEERING Consultants
3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P34-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S2	**DESCRIPTION:**	2-6 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	99
#12	1.7	88
#14	1.4	35
#16	1.18	11
#18	1.00	4
#20	0.85	2
#30	0.6	0
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

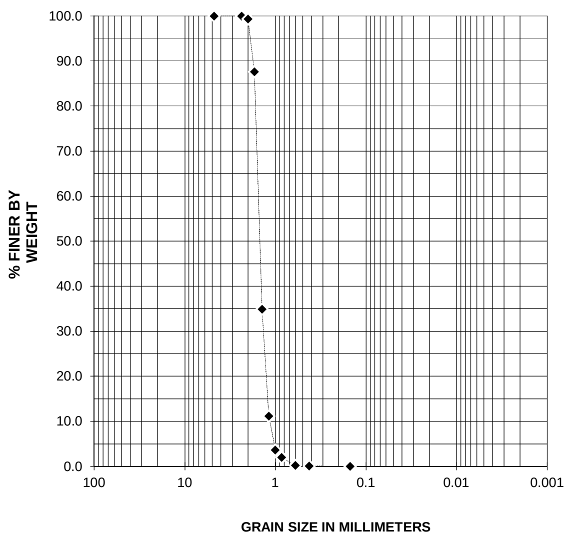
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.5
D30=	1.4
D10=	1.2
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	13.4
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.570
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

HYDROMETER TEST

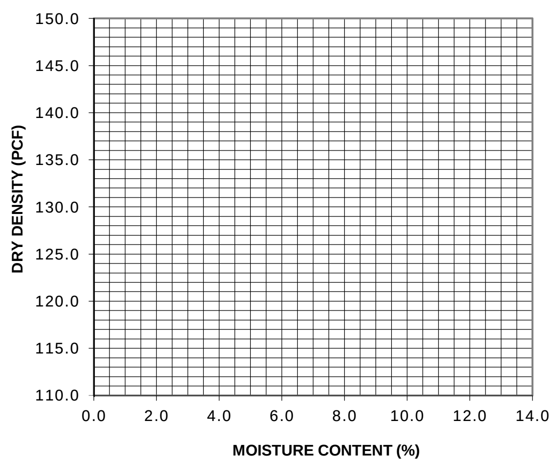
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand
USC: SP
FROST CLASS:
COMMENTS: **ORG % = 92.1%**

HDL ENGINEERING Consultants

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P35-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S3	**DESCRIPTION:**	6-12 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	100
#10	2.0	97
#12	1.7	76
#14	1.4	24
#16	1.18	8
#18	1.00	3
#20	0.85	2
#30	0.6	1
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

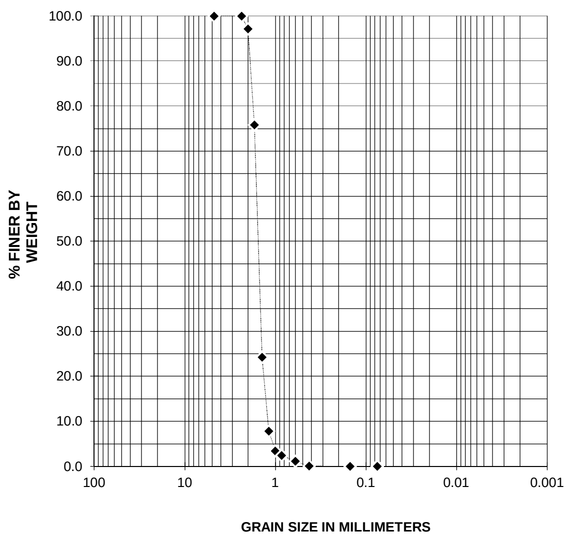
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.6
D30=	1.4
D10=	1.2
Cu=	1.3
Cc=	1.1
% .02 mm	
% Moist.:=	13.4
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	1.582
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
bG (assumed) =	
) Test Method =	

HYDROMETER TEST

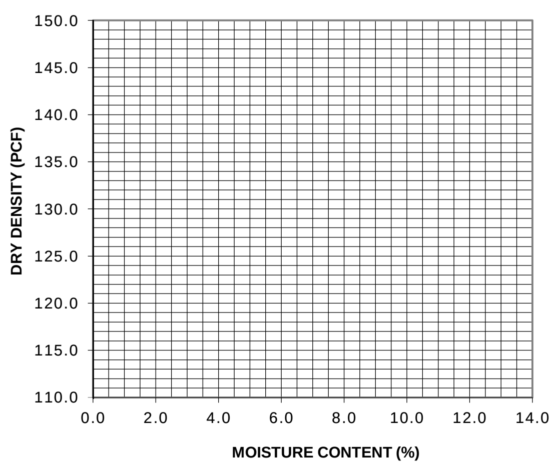
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS: **ORG % = 88.7%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P36-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S4	**DESCRIPTION:**	12-18 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	98
#10	2.0	93
#12	1.7	76
#14	1.4	51
#16	1.18	44
#18	1.00	42
#20	0.85	39
#30	0.6	9
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

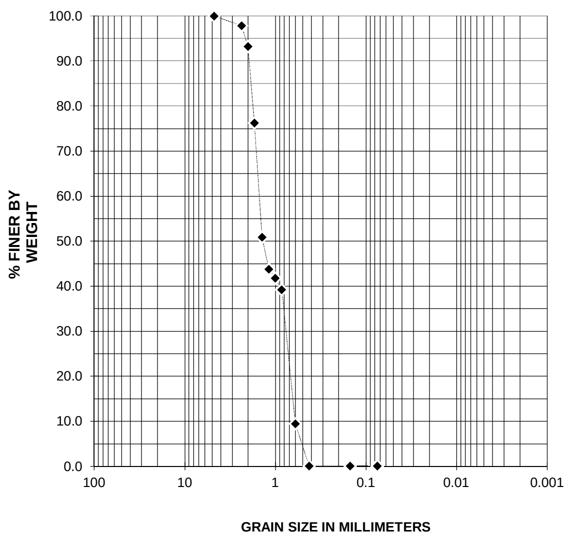
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	1.5
D30=	0.8
D10=	0.6
Cu=	2.5
Cc=	0.7
% .02 mm	
% Moist.:=	9.1
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.106
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

HYDROMETER TEST

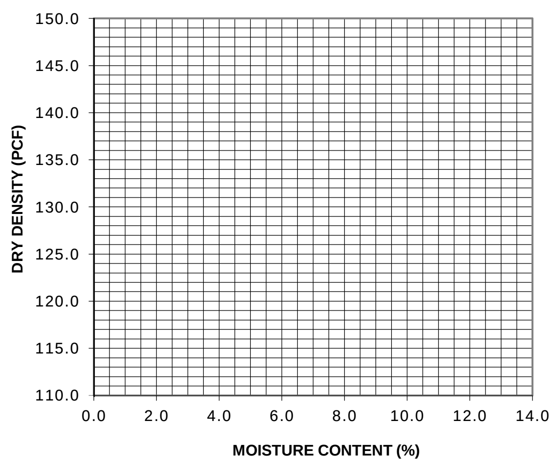
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS: **ORG % = 41.8%**

HDL ENGINEERING Consultants

3335 ARCTIC BLVD, SUITE 100, ANCHORAGE, AK 99503
Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P37-2	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S5	**DESCRIPTION:**	18-24 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	
#4	4.75	100
#8	2.36	99
#10	2.0	98
#12	1.7	93
#14	1.4	85
#16	1.18	82
#18	1.00	80
#20	0.85	67
#30	0.6	6
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

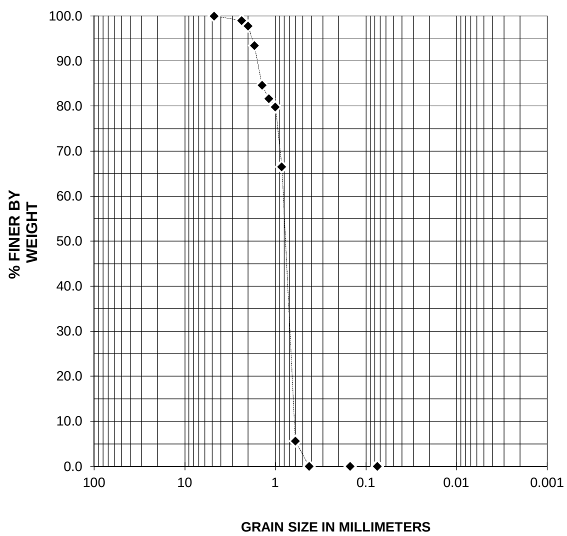
% GRAVEL:	0.0
% SAND:	100.0
% FINES:	0.0
D60=	0.8
D30=	0.7
D10=	0.6
Cu=	1.3
Cc=	1.0
% .02 mm	
% Moist.:=	6.0
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.536
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
Test Method =	

HYDROMETER TEST

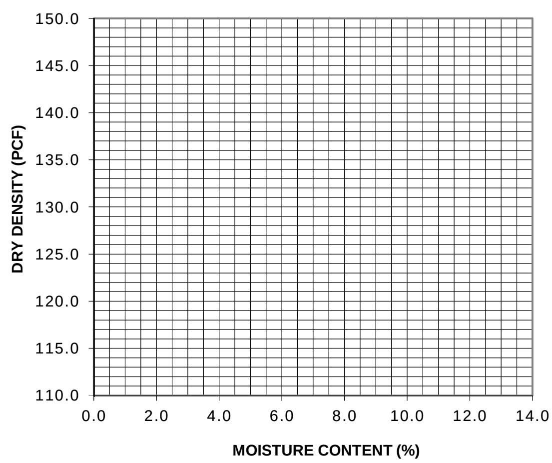
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION: Poorly Graded Sand

USC: SP

FROST CLASS:

COMMENTS: **ORG % = 10.3%**

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Phone: (907) 564-2120
Fax: (907) 564-2122

AGGREGATE/SOILS TEST REPORT

PROJECT NAME:	FILTER MATERIAL	**DATE TAKEN:**	4/14/2017
PROJECT NO.:	17-110	**DATE TESTED:**	4/15/2017
CLIENT:	AWWU	**TESTED BY:**	JAB
SAMPLE NO.:	P38-3	**REVIEWED BY:**	JAB
LOCATION:	FILTER 8, S6	**DESCRIPTION:**	24-30 IN

SIEVE ANALYSIS TEST

(ASTM D422)

SIEVE SIZE	DIAMETER (mm)	TOTAL % PASSING
3/4"	19	
1/2"	12.7	
3/8"	9.5	100
#4	4.75	98
#8	2.36	90
#10	2.0	86
#12	1.7	81
#14	1.4	72
#16	1.18	69
#18	1.00	67
#20	0.85	55
#30	0.6	5
#40	0.425	0
#100	0.15	0
#200	0.075	0.0

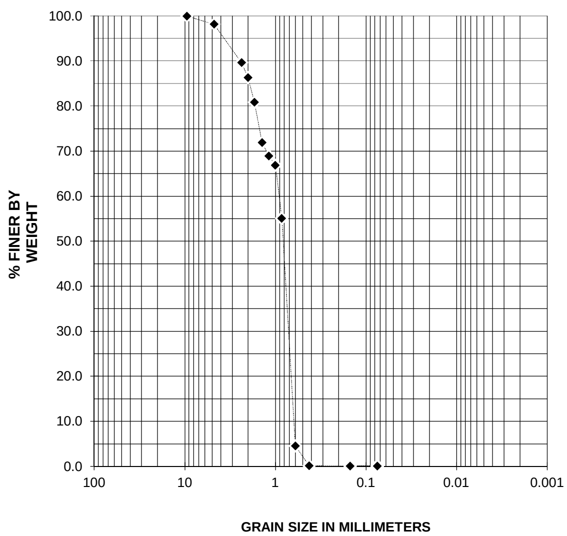
% GRAVEL:	1.8
% SAND:	98.1
% FINES:	0.0
D60=	0.9
D30=	0.7
D10=	0.6
Cu=	1.5
Cc=	0.9
% .02 mm	
% Moist.:=	5.4
Fine Modulus:=	
(ASTM D4318)	
Liquid Limit.=	
Plastic Limit.=	
Plastic Index. =	
(ASTM D854)	
Bulk SpG=	2.507
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM C128)	
Bulk SpG=	
SSD SpG=	
Apparent SpG=	
% Absorption=	
(ASTM D1557)	
Dry Den (U) =	
Dry Den (C) =	
M % (U) =	
M % (C) =	
pG (assumed) =	
) Test Method =	

HYDROMETER TEST

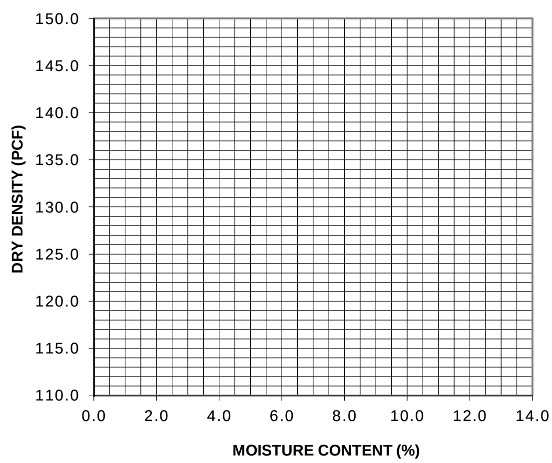
(ASTM D422)

ELAPSED TIME	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1		
2		
4		
8		
15		
30		
60		
250		
2706		
6838		

GRAIN SIZE DISTRIBUTION



MOISTURE-DENSITY RELATIONSHIP



CLASSIFICATION:	Poorly Graded Sand
USC:	SP
FROST CLASS:	
COMMENTS:	**ORG % = 12.4%**