Eklutna Hydroelectric Project

Draft Fish and Wildlife Program

October 2023

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Table of Contents

List of Tables

List of Figures

Appendices

Terms, Acronyms, and Abbreviations

1991 Agreement	1991 Fish and Wildlife Agreement
ADEC	Alaska Department of Environmental Conservation
ADFG	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
AEA	Alaska Energy Authority
AF	acre-feet
AL&P	Anchorage Light & Power
APU	Alaska Pacific University
ARRC	Alaska Railroad Corporation
AWWU	Anchorage Water and Wastewater Utility
cfs	cubic feet per second
Chugach	Chugach Electric Association, Inc.
CIAA	Cook Inlet Aquaculture Association
EUOC	Anchorage Assembly Enterprise and Utility Oversight Committee
Federal and State Resource Management Agencies	USFWS, NMFS, ADFG, ADEC, and ADNR
FERC	Federal Energy Regulatory Commission
ft	feet
Governor	Governor of Alaska
IIP	Initial Information Package
MEA	Matanuska Electric Association, Inc.
MOA	Municipality of Anchorage
MW	megawatt
NMFS	National Marine Fisheries Service
NVE	Native Village of Eklutna
OHA	Office of History and Archaeology
OPCC	Opinion of Probable Construction Costs
Parties	MOA, Chugach, MEA, NMFS, USFWS, and the State of Alaska
PME	protection, mitigation, and enhancement
Project	Eklutna Hydroelectric Project
Project Owners	MOA, Chugach, and MEA
RM	river mile
State	State of Alaska
State Parks	ADNR Division of Parks and Outdoor Recreation
TEK	Traditional Ecological Knowledge
Transaction Date	October 2, 1997

TU	Trout Unlimited
TWG	Technical Work Group
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

Executive Summary

The Eklutna Hydroelectric Project (Project), located approximately 30 miles northeast of downtown Anchorage, is owned by the Municipality of Anchorage (MOA), Chugach Electric Association, Inc. (Chugach), and Matanuska Electric Association, Inc. (MEA), collectively the "Project Owners." The Project is the lowest cost resource for power in Southcentral Alaska. It produces approximately 44% of MEA's renewable generation portfolio and approximately 25% of Chugach's renewable generation portfolio, increases grid reliability, and offsets approximately 72,500 metric tons of CO_2 equivalent each year.

The Project was constructed by the Federal government in the 1950s and then sold to the Project Owners in the 1990s. At that time, concerns were raised about the Project's impacts to fish and wildlife, so as part of the sale, a binding agreement was entered into by the Project Owners, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the State of Alaska (collectively the "Parties") that requires the Project Owners to develop and propose to the Governor a program to protect, mitigate damages to, and enhance fish and wildlife impacted by the Project (1991 Agreement).

The Project Owners were required to initiate the consultation and study process outlined in the 1991 Agreement by 2022. However, in order to provide ample time for meaningful consultation and a comprehensive study program, the Project Owners started more than three years early in 2019. In addition, the 1991 Agreement required the Project Owners to consult with only specific agencies; however, the Project Owners felt it was important to invite all interested stakeholders to participate in the 1991 Agreement process.

As part of this process, the Project Owners compiled and summarized all relevant existing information, identified information gaps, and developed study plans in consultation with resource agencies, the Native Village of Eklutna (NVE) and other interested entities. The Project Owners then implemented a 2-year study program, including a total of 16 environmental and engineering studies, developed study reports, and conducted a comprehensive alternatives analysis.

The Project Owners subsequently developed this Draft Fish and Wildlife Program (Draft Program) based on the study results and alternatives analysis. In the Draft Program, the Project Owners propose to utilize the existing Anchorage Water and Wastewater Utility (AWWU) water supply infrastructure to provide a year-round base flow regime to 11 out of 12 miles of the Eklutna River. This will significantly benefit all four species of salmon that are currently observed in the lower river while implementing measures to protect the public water supply and minimizing impacts to ratepayers, taxpayers, carbon emissions, and recreation. The

Draft Program also proposes periodic peak flows to maintain downstream fish habitat, construction of eight new bridges for the AWWU water supply access road, a funding commitment for monitoring studies, and an adaptive management framework. Due to the significant costs, impacts, and uncertainty regarding the viability of introducing anadromous species above the Project dam, no fish passage related facilities or changes in operations are proposed at this time.

The Parties to the 1991 Agreement and NVE will have 30 days to review this Draft Program and provide comments to the Project Owners. The Project Owners will then meet with each of the Parties and NVE to attempt to resolve any differences giving due weight to their recommendations, expertise, and statutory responsibilities. During the week of January 15, 2024, the Project Owners will hold public meetings in Anchorage and the Matanuska Valley. The public meetings will be held in an open house style, and members of the public will have an opportunity to submit comments to the Project Owners.

The Project Owners plan to submit their Final Proposed Fish and Wildlife Program (Final Proposed Program) to the Governor in April 2024 along with all supporting information, including a summary of all comments received. The Parties will have an opportunity to provide comments directly to the Governor. The Project Owners will then have an opportunity to provide any final information to the Governor for consideration. When reviewing the Final Proposed Program, the Governor must give equal consideration to:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The preservation of other aspects of environmental quality
7. Other beneficial public uses
8. Other requirements of State law

The Project Owners anticipate the Governor's issuance of a Final Fish and Wildlife Program by October 2024.

1.0 Introduction

Since it was constructed by the Federal government in the 1950s, the Eklutna Hydroelectric Project (Project) has been operated to maximize the generation of cost-effective, carbon-free, flexible hydroelectric energy for the electric customers in Southcentral Alaska.

In 1997, the Project was sold to and is currently owned by the Municipality of Anchorage (MOA), Chugach Electric Association, Inc. (Chugach), and Matanuska Electric Association, Inc. (MEA), collectively the "Project Owners." MOA's ownership share of the Project is 53.33%, Chugach's ownership share is 30%, and MEA's ownership share is 16.67%.[1] Both Chugach and MEA are non-profit cooperatives, formed to serve and provide affordable energy to their member-owners. The history of development in the Eklutna Basin and Project tailrace area is described in the Initial Information Package (IIP) developed for the Project and available on the Project website (www.eklutnahydro.com).

As part of the sale of the Project, a binding agreement was entered into by the Project Owners, National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), and the State of Alaska (collectively the "Parties") that requires the Project Owners to develop and propose to the Governor a program to protect, mitigate damages to, and enhance fish and wildlife impacted by the development of the Project (1991 Agreement). The Parties agreed that the process outlined in the 1991 Agreement obviated the need for the Project Owners to obtain a license from the Federal Energy Regulatory Commission (FERC). The 1991 Agreement was explicitly approved by Congress and was granted direction and authorization under federal law in the Alaska Power Administration Asset Sale and Termination Act of 1995 (APA Asset Sale Act).[2] The APA Asset Sale Act expressly maintained the Project's exemption from the Federal Power Act's hydropower licensing requirements (e.g., Federal Energy Regulatory Commission jurisdiction) and authorized the 1991 Agreement's framework.

As required under the 1991 Agreement, the efforts undertaken by the Project Owners have been designed to generate information to allow the Governor to make a public interest determination to ensure that the Project is best adapted for power generation and other beneficial public uses. This document presents the Project Owners' Draft Fish and Wildlife Program (Draft Program) for the Eklutna Hydroelectric Project for review and comment. The Project Owners developed this Draft Program over a four-year period in accordance with guidance provided in and requirements of the 1991 Agreement. This document describes the

[1] The ownership share percentages differ from the current cost sharing agreement amongst the Project Owners.
[2] Public Law 104-58, 109 Stat 557 (1995).

process the Project Owners undertook to develop the Draft Program and contains supporting rationale for their draft proposal described herein.

1.1 Existing Project Facilities and Operations

The 40-megawatt (MW) Project is located in Southcentral Alaska, approximately 30 miles northeast of downtown Anchorage near the Native Village of Eklutna (NVE). The U.S. Bureau of Reclamation (USBR) constructed the Project in 1955, which included rehabilitation of the old dam at the outlet of Eklutna Lake. The rehabilitated dam was damaged in the 1964 earthquake, at which point a new and taller embankment dam was constructed just downstream. This new dam (the existing dam) is an earth and rockfill structure 815 feet long and 41 feet high with a rectangular concrete spillway that runs through the dam.

Eklutna Lake (the Project reservoir) is approximately seven miles long and one mile wide and is located within Chugach State Park. The lake is the source of water for the Project. The reservoir also provides almost 90 percent of the domestic water supply for the Municipality of Anchorage to the Anchorage Water and Wastewater Utility (AWWU) through the Project intake. Typically, the reservoir fills during the summer months from snow and glacial melt and is drained during the winter months to generate power. The reservoir is generally at its lowest elevation in May and peaks in September.

The Project facilities and operation are designed to minimize release of water to the Eklutna River from the existing dam by capturing runoff during late spring/summer and taking that water out of the storage reservoir/Eklutna Lake over the course of the year and sending it through the powerhouse located on the Knik Arm. The Project water right requires the Project Owners to operate the Project to fully utilize the water in Eklutna Lake for hydroelectric power production, except for the water that may be diverted for public water supply. The Project also provides other important benefits to electric customers including spinning reserve, frequency and voltage regulation, load following, and firming up electric generation from intermittent renewables. Additionally, the Project tailrace below the powerhouse provides a popular put-and-take Chinook and coho fishery. This fishery is public and handicap accessible.

Figure 1-1 below shows the Project location, legislative boundary for Chugach State Park, and the current extent of anadromy in the Eklutna River. The existing hydro project facilities are shown as red dots, an old hydropower project constructed in 1929 is represented by purple dots, and other non-project features such as the Eklutna Lake Campground, Eklutna Tailrace Day-Use Fishing Access Site, AWWU Water Treatment Plant, and the Native Village of Eklutna are represented by green dots. Other AWWU infrastructure shown in the figure includes the AWWU tunnel, portal valve, and buried pipeline. All three bridges in the lower river are also shown in Figure 1-1.

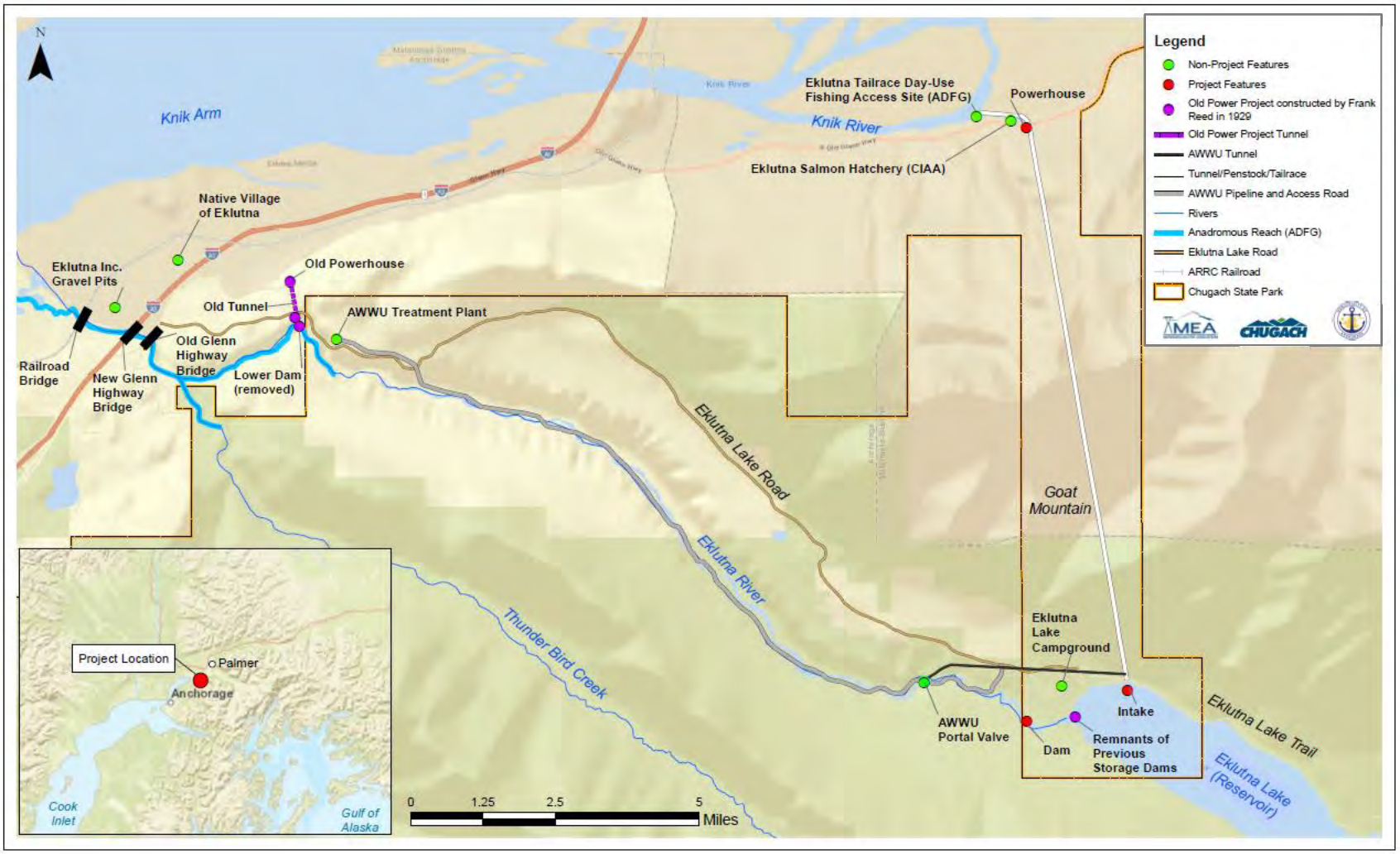

Figure 1-1. Project Location.

1.1.1 Existing Project Facilities

The Project consists of several components that allow water from Eklutna Lake to be diverted through a 4.5-mile-long tunnel to the powerhouse and eventually discharged into the Knik River for the purpose of power generation. The Project facilities and AWWU water supply infrastructure that is connected to Project facilities are briefly described below. More detailed information on Project facilities is provided in the IIP document available on the Project website (www.eklutnahydro.com).

1.1.1.1 Dam and Spillway

The existing dam is located approximately 1,400 feet downstream of the natural outlet of Eklutna Lake. It is an earth and rock fill embankment dam with a crest length of 815 feet, a crest width of 30 feet, and a crest elevation (El.) of 891 feet[3]. The crest of the dam is finished with crushed rock material to form a stable road surface (Figure 1-2). An ungated overflow spillway is incorporated within the middle of the dam. The spillway crest is El. 871 feet and the crest length is 18 feet. The dam allows for storage of water in Eklutna Lake for use throughout the year for power generation. The dam also prevents water from flowing into the Eklutna River unless the lake level exceeds the spillway crest elevation and water "spills" from the lake into the river via the spillway (see Section 1.1.2.3).

Figure 1-2. Dam crest and ungated overflow spillway, looking north.

There is a natural glacial moraine at the outlet of Eklutna Lake. When the lake level is below the crest of the moraine (El. 860 feet), a pond is created between the moraine and the current dam (Figure 1-3). The water level in the pond is not monitored; however, the pond level can

[3] Multiple vertical survey datums are reported in and around the main features of the Project. Throughout this document, the elevation datum that shall be used is the "local datum" tied to the crest of Eklutna Dam. Engineering documentation and design drawings, as presented in Appendix E utilizes the NAVD88, GEOID12B datum for consistency purposes throughout all of the Project Features, which is offset from the Local Datum by approximately 3.6-feet.

differ from the lake level by up to 30 feet in an average year. A small tributary entering the pond approximately 400-ft upstream of the dam keeps the water level steady in the pond when the lake is disconnected from the dam, with a small outflow leaving the pond and entering Eklutna Lake.

There is a 30-inch by 30-inch drainage outlet gate in the base of the spillway crest at El. 852 feet that was designed to drain the pond when water becomes trapped there during late fall or early winter. At the time, it was thought that this water would cause detrimental frost action against the toe of the current dam and at the spillway inlet. However, no detrimental frost action has been observed, and the gate is currently not used for this purpose. This cast iron gate was replaced in 2021 with a stainless-steel gate to allow for study flow releases that same year.

Figure 1-3. Pond between the natural glacial moraine and existing dam in May 2020.

1.1.1.2 Reservoir

Eklutna Lake is a natural lake formed by the retreating Eklutna glacier. It is approximately 7 miles long, one mile wide, and 200 feet deep at its deepest. The natural lake elevation is El. 850 feet.

The current dam raises the water level of Eklutna Lake by 21 feet to a maximum regulated lake level of El. 871 feet (the elevation of the spillway crest). At this elevation, the lake has a surface area of 3,420 acres. The minimum regulated lake level is El. 814 feet, which provides an active storage capacity of 174,800 acre-feet. Storage between the spillway crest (El. 871 feet) and the dam crest (El. 891 feet) is an additional 72,800 acre-feet.

1.1.1.3 Intake

The intake is located on the north shore of Eklutna Lake approximately one mile east of the dam. Water is diverted from the lake through an inlet channel 100 feet wide and originally about 720 feet long excavated at the lake bottom (the original intake structure and portions of the original intake conduit damaged in the 1964 earthquake remain in the intake channel). The intake channel leads to the intake structure, which consists of a rectangular reinforced concrete box structure, open and protected by trash racks on its top, front, and both sides. Elevation of the invert (i.e., the base elevation of the intake) is El. 793.6 feet.

1.1.1.4 Tunnel and Surge Tank

A 4.5-mile-long tunnel through Goat Mountain conveys water from the intake to the penstock. The tunnel is a circular, concrete-lined pressure tunnel with a 9-foot inside diameter. The tunnel terminates in a surge chamber located directly over the tunnel prior to entering the project penstock. The surge tank is used to dampen pressure surges within the conveyance during operation.

1.1.1.5 Penstock

Extending from the surge tank at the end of the tunnel is the penstock, which conveys water to the power plant turbines. The overall length of the penstock is about 1,088 feet. The penstock is a variable-diameter (91-, 83-, and 75-inch-outside-diameter) welded and coupled steel pipe encased in concrete in a tunnel extending from the surge tank to the power plant. At the powerplant, the penstock bifurcates into two 51-inch-diameter 23-foot-long branches, which are connected to the spiral cases of the turbines. A 66-inch butterfly valve is installed in each penstock branch upstream from the turbines to provide means of dewatering the turbines for servicing or maintenance. These valves also serve as emergency shutoff valves in the event of damage to the turbines.

1.1.1.6 Power Plant and Switchyard

The Eklutna Power Plant (Figure 1-4) is located on the Old Glenn Highway. It houses two vertical-shaft Francis-style hydroelectric generating units with an installed nameplate capacity

of 44.4 MW. The switchyard equipment, consisting of the power circuit breakers, disconnecting switches, and main buses, is on the roof of the Eklutna Power Plant.

Figure 1-4. Eklutna Power Plant.

1.1.1.7 Tailrace

Water discharged from the turbines in the Eklutna Power Plant enters a 209-foot-long tailrace conduit through which the water is conducted under the Old Glenn Highway to a 2,000-foot-long open tailrace channel which discharges into the Knik River (Figure 1-5). The channel has a top width of about 75 feet, a bottom width of 25 feet, and a depth of about 12 feet 6 inches.

Figure 1-5. Fisherman at the Eklutna Tailrace.

1.1.1.8 AWWU Connection to Project Tunnel

A water supply project was constructed in 1988 to supply water to Anchorage from Eklutna Lake (Eklutna Water Project). It is now the main source of drinking water for the Anchorage service area. The Eklutna Water Project diverts Eklutna Lake water from the Project tunnel to a diversion tunnel that connects to a buried pipeline. Water flows by gravity through the one-mile-long diversion tunnel and the approximately six-mile-long buried pipeline down the Eklutna River valley to a 750-kW energy recovery station at the Eklutna Water Treatment Plant (Figure 1-1).

A portal valve at the intersection of the AWWU tunnel and pipeline, located approximately one mile downstream of the existing dam, is used to shut down the pipeline for emergency or maintenance purposes. The pipeline drain valve is located approximately six miles downstream of Eklutna Dam. AWWU maintains an access road that roughly parallels the pipeline and crosses the riverbed in a series of bridges and fords. After treatment, water flows by gravity through a 23-mile-long buried pipeline to the distribution system. This system supplies water to the Anchorage service area, from Eklutna Village to Potter Marsh in South Anchorage. Approximately 10% of the water diverted from Eklutna Lake provides up to 90% of the public water supply for the Municipality of Anchorage. The remaining 90% of water diverted from Eklutna Lake is used for power production.

1.1.1.9 Water Rights

When the Project was originally authorized in the Eklutna Project Act of 1950,[4] Congress also created a federal reserved water right in Eklutna Lake and its tributaries for the purposes of operating the Project. Under federal and state law, the Project's water right dates back to December 31, 1954, when the Project began operations.[5]

Later, after Alaska statehood, the then-federal owner of the Project, the Alaska Power Administration (APA), applied for a Certificate of Appropriation from the State of Alaska in order to comply with newly-created state law. This permanent Certificate of Appropriation (Certificate) was originally granted in 1973 and is now referred to as "ADL 44944." As subsequently amended, ADL 44944 mirrors the federal reserved water right and authorizes the Project Owners to use any and all of the natural inflow to Eklutna Lake for hydroelectric power generation subject to other terms of the Certificate.

In 1984, MOA sought to use Eklutna Lake for public water supply. Typically, under Alaska law, such a new use would be disallowed due to the senior water right of the APA, but Alaska law

[4] Public Law 81-628, 64 Stat. 383 (1950).
[5] ALASKA STAT. § 46.15.050(b) (2022).

also permits the use of Alaska waters for public water supply even where there are prior appropriators given the importance of maintaining a sufficient water supply.[6] Such use is referred to as "preferred use".[7] In acknowledgement that such use can harm a prior appropriator, Alaska law requires that such use be subject to compensation in order to minimize such damage.[8] Accordingly, the MOA and the then-owner (APA) entered a compensation agreement entitled "Agreement for Public Water Supply and Energy Generation from Eklutna Lake, Alaska" dated February 17, 1984.

Further, MOA and APA worked with Congress to amend the *Eklutna Project Act* to reflect the additional public water usage of the Eklutna Lake which was otherwise reserved for the purposes of the Project.[9] MOA also obtained a 40-year license from the State of Alaska to utilize water from Eklutna Lake, referred to as "LAS 2569." LAS 2569 expires on December 31, 2025. In addition, the original 1950 federal legislation authorizing construction of the project was amended to "grant the appropriation of water for the purposes of public water supply in accordance with the same compensation agreement."[10]

Upon the sale of the Project to the Project Owners, the federal reserved water right and ADL 44944 were conveyed to the Project Owners in a quitclaim deed.[11]

1.1.2 Existing Project Operations

The Project Owners operate the Project to provide low-cost, renewable energy. Project-generated renewable energy offsets approximately 72,500 metric tons of CO_2 equivalent each year and can be used to regulate other renewable energy sources like wind and solar in the future. The Eklutna Dam allows storage of spring and summer runoff for power generation in the winter when it is needed most.

1.1.2.1 Reservoir Operations

Typical operation of the Project is to fill the reservoir during the summer and drain it during the winter months. The Project operators try to refill the reservoir as much as possible without

[6] ALASKA STAT. § 46.15.150 (2022).
[7] ALASKA STAT. § 46.15.150 (2022). "Preferred use" is further defined under Title 11 of the Alaska Administrative Code Section 93.230, which provides: "Preferred use status allows the use of water for a preferred use when adequate water is not available from the same source to supply all lawful appropriators."
[8] ALASKA ADMIN. CODE tit. 11 § 93.240 (2023).
[9] Public Law 98-552, 98 Stat. 2824 (1984).
[10] Memorandum from Gary J. Prokosch, Regional Water Officer, Alaska Dep't of Nat. Res.to LAS 2569, Finding of Fact and Conclusion of Law: Application for Preferred Use – LAS 2564 AS 46.15.150 (Nov. 19, 1985), https://eklutnahydro.com/wp-content/uploads/2020/03/ADNR-1985-AWWU-Preferred-Use-Water-Right-LAS-2569.pdf.
[11] Chugach Elec. Ass'n, Inc., Annual Report (Form 10-K) (Mar. 31, 1998), Appendix A, No. 20, Quitclaim Deed, Federal Reserved-Water Right Under the Eklutna Project Act of 1950.

spilling, and the extent of winter drawdown is based on power requirements and the operator's estimates of the winter snowpack. The lake level is generally at its lowest elevation in May and then peaks in September. As shown in Figure 1-6, the lake level is drawn down below the natural lake level (El. 850 feet) for about six months out of the year, and below the crest of the natural glacial moraine (El. 860 feet) for about 9 months out of the year.

The lake level increases as a result of inflows (mostly glacial melt) and is drawn down by operation of the tunnel/penstock system. Assuming no inflow, the lake can be drawn down by approximately four inches per day when the Eklutna Power Plant is generating at max capacity (660 cfs). Water conveyance can be closed at the lake intake structure by closing the intake bulkhead gate or by closing the turbine wicket gates or the turbine inlet valves within the powerhouse.

Flows through the Eklutna Power Plant is the primary means of controlling the water level in Eklutna Lake. In addition, the 30-inch by 30-inch drainage outlet in the base of the spillway crest (see Section 1.1.1.1) is controlled by a manually operated slide gate conduit and can release up to 190 cfs (with reservoir at the spillway crest). Operation of the spillway slide gate is checked on an annual basis and the operating mechanism lubricated.

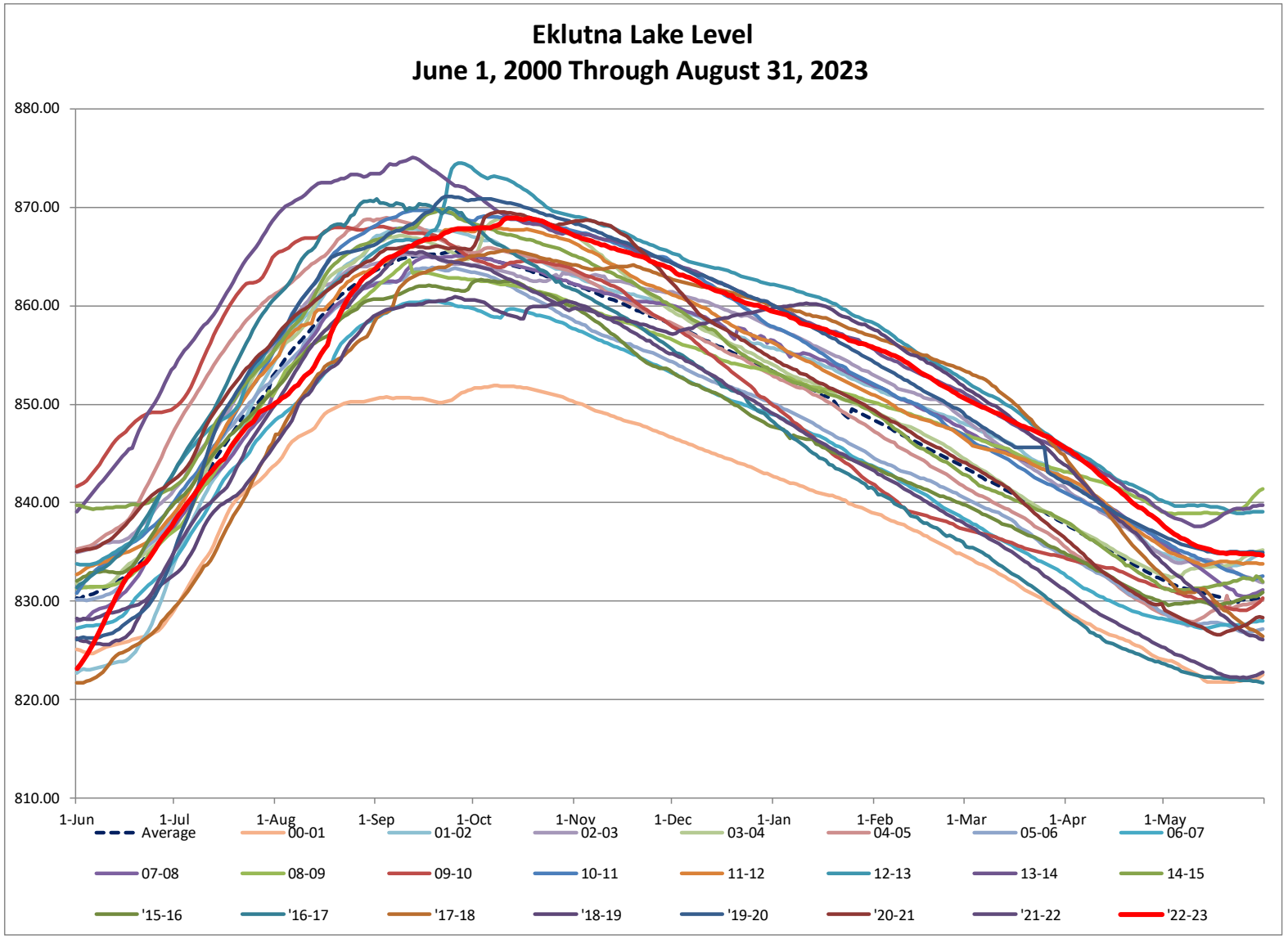

Figure 1-6. Eklutna Lake Level from June 1, 2000 through August 31, 2023.

1.1.2.2 Energy Generation and Cost of Power

The Project produces nearly 6% of the Project Owners' combined total generation portfolio, approximately 44% of MEA's renewable generation portfolio, and approximately 25% of Chugach's renewable generation portfolio. The Project is consistently the lowest-cost resource for power in the Railbelt (i.e., the inter-connected transmission line system that runs from Fairbanks to Homer) and is necessary for MEA to meet their power capacity reserve requirements. The average monthly energy generation output of the project is presented in Figure 1-7.

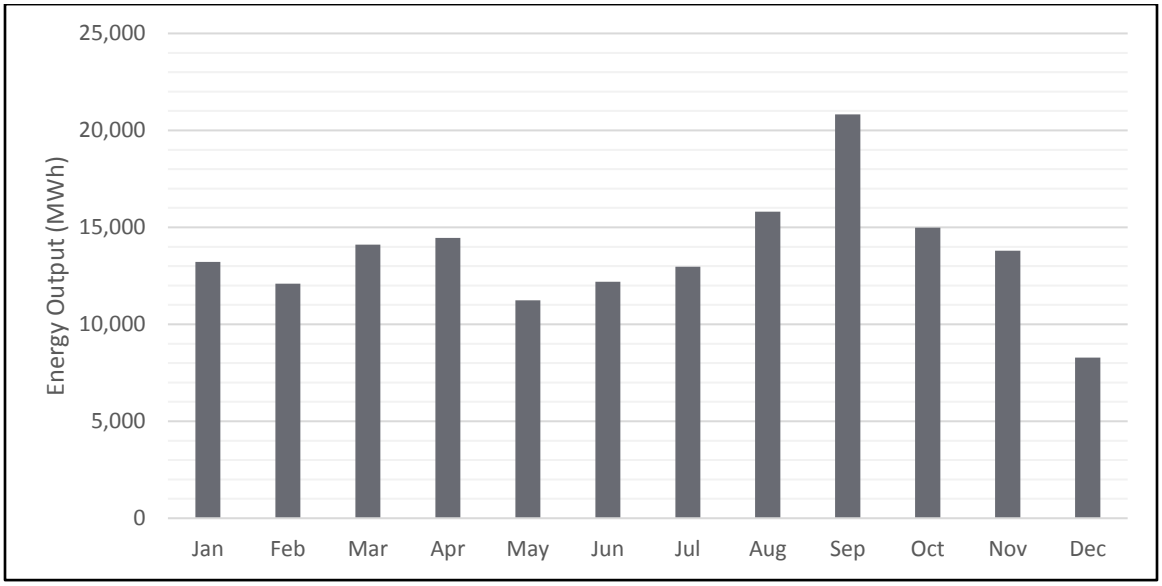

Figure 1-7. Average Monthly Energy Output – Eklutna Power Plant.

One of the other major benefits of the Project is increased grid reliability through diversification of fuel for generation. With an uncertain future regarding natural gas supply and costs, hydropower plays an important alternate energy source if there is an interruption to the availability of natural gas. In addition, Project generation offsets approximately 72,500 metric tons of CO_2 equivalent each year.

1.1.2.3 Spill Events

Spill occurs when water flows from Eklutna Lake into the Eklutna River via the ungated spillway (El. 871 feet). Since the spillway is ungated, the Project operators cannot control spill. Ten spill events have occurred since the existing dam was constructed in 1965. Table 1-1 summarizes the historical data and calculated values for each of these spill events.

Table 1-1. Summary of Spill events at Eklutna Dam from 1965 to 2023.

Year	Spill Period	Duration (Days)	Peak Lake Level Elevation (ft)	Average Lake Level Elevation (ft)	Peak Spillway Flow (cfs)	Average Spillway Flow (cfs)	Total Volume Spilled (AF)
1967	9/20 – 10/11	22	872.99	-	160	-	-
1977	8/15 – 9/26	43	874.60	-	396	-	-
1981	8/15 – 9/23	40	873.50	-	226	-	-
1989	9/5 – 10/7	33	873.73	872.40	259	107	7,018
1990	9/12 – 9/27	16	872.31	871.78	85	43	1,370
1995	9/21 – 10/20	30	877.62	874.40	1,022	426	25,356
1997	8/19 – 10/31	74	875.51	873.33	561	242	35,591
2012	9/23 – 10/19	27	874.52	873.10	383	188	10,055
2013	8/9 – 10/1	54	874.99	873.18	464	201	21,567
2023	9/1 – 9/8	8	871.51	871.36	18	10	157

The highest lake level elevation ever recorded in Eklutna Lake was 877.62 feet on September 25, 1995. At this elevation, the flow through the spillway was calculated to be 1,022 cfs. The longest spill event at Eklutna Dam occurred in 1997 and lasted for a total of 74 days. The calculated total volume of water spilled during this time was 35,591 acre-feet.

1.2 1991 Fish and Wildlife Agreement

The 1991 Agreement is the guiding document that the Project Owners have followed during development of this Draft Program. The Project Owners recognize that there is a high level of interest in the Eklutna River and are committed to meeting their obligations as outlined in the 1991 Agreement. The overarching goal of the Project Owners is to provide the information that will allow the Governor to make an informed decision with regard to the final Fish and Wildlife Program.

The main focus of the 1991 Agreement concerns protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat) affected by hydroelectric development of the Eklutna Project. It specifies that the Project Owners are responsible for the consultation, study, and implementation provisions called for in the 1991 Agreement.

1.2.1 Procedural Requirements

The 1991 Agreement required the Project Owners to fund and conduct studies to examine and quantify, if possible, the impacts to fish and wildlife from the hydroelectric development of the Project. The studies were also designed to examine and develop proposed protection, mitigation, and enhancement (PME) measures to address those impacts. This examination also had to consider the impact of fish and wildlife measures on electric rate payers, municipal water utilities, recreational users, and adjacent land use, as well as available means to mitigate those impacts.

Per the 1991 Agreement, the study plans had to be developed by the Project Owners in consultation with the USFWS, NMFS, the Alaska Department of Fish and Game (ADFG), the Alaska Department of Environmental Conservation (ADEC), and the Alaska Department of Natural Resources (ADNR), collectively the "Federal and State Resource Management Agencies." The study plans had to include a schedule for the consultation, comment, and decision making required by the 1991 Agreement to be adopted by the Parties[12] in consultation with the Governor. Prior to implementation of the studies, the Parties had to review the study plans and concur with their scope of work.

The Project Owners were required to seek input from the Federal and State Resource Management Agencies and other interested stakeholders as the studies progressed. The Project Owners were also required to provide the Federal and State Resource Management Agencies with an opportunity to comment on the Draft Study Reports. All comments and responses had to be included in the Final Study Reports.

After the Final Study Reports were prepared, the Project Owners were required to prepare a Draft Summary of Study Results and a Draft Fish and Wildlife Program. The Draft Program must include the PME measures recommended by the Project Owners and set a tentative schedule for their implementation. The Project Owners are required to provide the Federal and State Resource Management Agencies with an opportunity to comment on the Draft Summary of Study Results and the Draft Program and/or provide recommendations. If the Federal and State Resource Management Agencies' comments or recommendations differ from those of the Project Owners, the Project Owners must attempt to resolve such differences giving due weight to the recommendations, expertise, and statutory responsibilities of the Federal and State Resource Management Agencies.

[12] The Parties to the 1991 Agreement as it pertains to the Eklutna Hydroelectric Project are Chugach Electric Association, Matanuska Electric Association, Municipality of Anchorage, National Marine Fisheries Service, U.S. Fish and Wildlife Service, and the State of Alaska.

Once comments and recommendations have been received, the Project Owners are required to hold at least one public meeting each in Anchorage and the Matanuska Valley to receive public comment on the Draft Summary of Study Results, the Draft Program, and the comments and recommendations of the Federal and State Resource Management Agencies. The Project Owners are required to prepare a summary and analysis of all comments received, develop a Proposed Final Fish and Wildlife Program, and prepare an explanatory statement describing the basis for the Proposed Final Fish and Wildlife Program. All of this information must be provided to the Parties and the Governor.

The Parties then have 60 days to submit written comments on the Proposed Final Fish and Wildlife Program, and any alternative recommendations for the protection, mitigation, and enhancement of fish and wildlife resources, to the Governor. The Project Owners then have 30 days to submit written reply comments to the Governor. The Governor is required to review the Proposed Final Program as well as any comments or recommendations for alternative PME measures while giving equal consideration to:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The protection of other aspects of environmental quality
7. Other beneficial public uses
8. Other requirements of State law

Based on his review and consideration, the Governor is required to establish a Final Fish and Wildlife Program that adequately and equitably protects, mitigates damage to, and enhances fish and wildlife resources (including affected spawning grounds and habitat) affected by the Project. The Project Owners are required to implement the Final Fish and Wildlife Program established by the Governor. Pursuant to the 1991 Agreement and APA Asset Sale Act, the Governor's decision regarding the provisions of the Final Fish and Wildlife Program is reviewable and enforceable by the Parties in the U.S District Court for the District of Alaska.

1.2.2 Schedule Requirements

The 1991 Agreement gives deadlines for specific milestones in the consultation, program development, and implementation processes. These deadlines, listed below, are all relative to the date on which ownership of the Project was officially transferred from the Federal government to the current Project Owners (October 2, 1997). This date is referred to as the Transaction Date.

- Initiate the consultation process no later than 25 years after the Transaction Date (October 2, 2022)
- Issuance of the Final Fish and Wildlife Program by the Governor at least 3 years prior to implementation (October 2, 2024)
- Begin implementation of the Final Fish and Wildlife Program no later than 30 years after the Transaction Date (October 2, 2027)
- Complete implementation of the Final Fish and Wildlife Program no later than 35 years after the Transaction Date (October 2, 2032)

The Project Owners are required to repeat the process called for in the 1991 Agreement on a recurring basis every 35 years, beginning within 25 years of the time implementation of the Final Fish and Wildlife Program has been completed for the prior consultation process. In addition, the Project Owners are required to repeat the process called for in the 1991 Agreement prior to undertaking any major structural or operational modifications substantially affecting water usage or fish and wildlife at the Project.

1.3 Compliance Efforts to Date

The Project Owners have fully met the procedural and schedule requirements of the 1991 Agreement to date. In fact, the Project Owners have gone well beyond the requirements of the 1991 Agreement in terms of consultation, documentation, and analysis of Draft Program alternatives. In terms of schedule requirements, the Project Owners began the process more than three years prior to the prescribed initiation date. The following sections describe the efforts undertaken by the Project Owners to date to comply with the 1991 Agreement and highlight the efforts that have gone beyond the requirements.

1.3.1 Early Consultation

The 1991 Agreement states that the Project Owners shall consult with the USFWS, NMFS, ADF&G, ADEC, and ADNR regarding the development of study plans and that “the

consultation process shall be initiated no later than 25 years after the Transaction Date," (i.e., October 2, 2022).

The Project Owners began the consultation process in 2019, three years earlier than required by the 1991 Agreement. Recognizing the high level of public and tribal interest in the Project, the Project Owners did not limit consultation to the five federal and state agencies identified in the 1991 Agreement, but they reached out to many other entities with an interest in the Project. Their consultation efforts included in-person meetings, quarterly calls and newsletters, technical work groups, and involvement of interested stakeholders in the alternatives analysis process. A summary of consultation undertaken by the Project Owners is included in Appendix A; early consultation efforts are highlighted below.

1.3.1.1 Initial Consultation Meetings

In March and April of 2019, three years before the requirement of the 1991 Agreement, the Project Owners conducted in-person initial consultation meetings with multiple agencies and interested stakeholders. In total, the Project Owners met with 14 agencies and interested stakeholders as part of their initial consultation efforts, including:

- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (USFWS)
- Alaska Department of Fish and Game (ADFG)
- Alaska Department of Environmental Conservation (ADEC)
- Alaska Department of Natural Resources (ADNR), including:
    - Division of Mining, Land, and Water
    - Division of Parks and Outdoor Recreation (State Parks)
    - Office of History and Archaeology (OHA)
- Alaska Department of Transportation & Public Facilities (ADOT&PF)
- Alaska Railroad Corporation (ARRC)
- Anchorage Water and Wastewater Utility (AWWU)
- U.S. Army Corps of Engineers (USACE)

- Eklutna, Inc.
- Native Village of Eklutna (NVE)
- The Conservation Fund

After these initial consultation meetings, the Project Owners identified additional interested stakeholders and consulted with them as appropriate, including Cook Inlet Region, Inc. (CIRI), Cook Inlet Aquaculture Association (CIAA), The Alaska Center, Trout Unlimited (TU), the Alaska Energy Authority (AEA), the Alaska Institute for Climate and Energy (ALICE), staff from Alaska Pacific University (APU), the Anchorage Watershed and Natural Resources Advisory Commission (WNRC), and the U.S. Bureau of Land Management (BLM).

Some entities, while interested in the Project, declined to participate in the consultation process, including the U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), National Weather Service (NWS), and the Anchorage Waterways Council.

1.3.1.2 Group Stakeholder Meeting

During the initial consultation meetings, several entities requested a follow-up group meeting to promote technical discussion amongst the agencies and interested stakeholders. In response to those requests, the Owners conducted an in-person follow-up group meeting on July 16, 2019. Discussion topics included a review of the contact list and existing information gathered to date, updates on on-going data collection by others, an overview of current Project operations, discussion regarding the initial comments and concerns of agencies and interested stakeholders, and next steps.

1.3.1.3 Project Website

In 2019 the Project Owners developed and launched a Project website, www.eklutnahydro.com. The purpose of this website is to provide information on the efforts being undertaken by the Project Owners to comply with the 1991 Fish and Wildlife Agreement, including background information, the Project schedule, Project updates, reference and final documents, frequently asked questions, and a contact form.

1.3.1.4 Quarterly Update Calls

During the July 2019 Group Stakeholder Meeting, it was suggested that the Project Owners conduct quarterly calls to update the agencies and interested stakeholders on Project activities. The Project Owners conducted the first quarterly update call in November 2019, and since that time, have continued to conduct these calls approximately every three months.

1.3.1.5 Anchorage Assembly Updates

In February 2020, the Project Owners were invited to give a brief presentation to the Anchorage Assembly at a work session regarding the Eklutna River. The Project Owners have continued to provide subsequent updates to the Anchorage Assembly's Enterprise and Utility Oversight Committee on a quarterly basis.

1.3.1.6 Project Newsletter

In December 2020, the Project Owners published their first newsletter to continue to provide information and updates regarding the Project. These newsletters contain current information on the status of the Project Owners' effort under the 1991 Agreement and include pictures, maps, and a Project timeline. They have been published quarterly and are all available on the Project website (www.eklutnahydro.com).

1.3.1.7 Engagement with NVE

The Native Village of Eklutna (NVE) is located near the mouth of the Eklutna River. NVE's historical and current presence in the area is described in the IIP. The Project Owners first met with NVE as part of their initial consultation efforts (Section 1.3.1.1) and have continued to engage with NVE throughout this process.

In April 2020, NVE requested formal recognition as a consulting government, with their Land and Environment Department analogous to other governmental signatories, for purpose and processes of the 1991 Agreement applicable to the Project. In a May 2020 letter to the Project Owners, NVE recognized that amending the 1991 Agreement may entail substantial time and effort, and as an alternative invited a joint letter from the Project Owners to the effect that the Project Owners will act in good faith to help mitigate impacts to the Eklutna River and that the Project Owners will recognize NVE as a consulting government on a basis comparable to the governmental signatories to the 1991 Agreement.

In June 2020, the Project Owners responded to NVE's request by committing to a review and participation framework that ensures information NVE and its members share regarding the Eklutna River and development of the Fish and Wildlife Program is appropriately considered and addressed. This includes:

- Providing significance and due weight to NVE's expertise throughout the development of the Fish and Wildlife Program
- Recognizing and including traditional ecological knowledge (TEK) in the review and development of the study plans and Fish and Wildlife Program

- Working with NVE to schedule additional meetings with the goal of hearing input from NVE and its members (one after the study program is completed and another following the development of the Draft Program) and coordinating with NVE on developing the agenda items for these meetings

- Recommitting to sharing all study plans, data, reports, and comments directly with NVE when developed to seek feedback

- Submitting an NVE-specific comment summary to the Governor for consideration along with the Project Owners' Proposed Final Fish and Wildlife Program

The Project Owners' letter also stated: "We value the unique perspectives of NVE's members regarding the Eklutna River, and we also understand that NVE is primarily interested in the presence of both water and salmon in the lower Eklutna River. While we are contractually and legally bound by the terms of the Agreement, please know that if the process set forth in the Agreement bears out the release of water from Eklutna Lake and the addition of salmon into the Eklutna River as part of the Fish and Wildlife Program, we will be prepared to support it."

Since then, NVE has been involved in all four Technical Work Groups (TWGs) (Section 1.3.3) and every alternatives analysis meeting (Section 2.3). The Project Owners have also met with the NVE Tribal Council on several occasions, including meetings with the Boards of Directors for both CEA and MEA and the Anchorage Assembly (Appendix A).

1.3.2 Initial Information Package

Although not required by the 1991 Agreement, the Project Owners developed an Initial Information Package (IIP) document. The IIP established a baseline of existing information and informed the study planning process required by the 1991 Agreement. A draft IIP was distributed in March 2020, and interested stakeholders were invited to comment on the draft. Comments were received from 10 entities. After revising the document based on comments received, the final IIP was issued in September 2020. The IIP and reference documents used in preparation of the IIP are available on the Project website (www.eklutnahydro.com).

1.3.3 Technical Working Groups

In April 2020, a Technical Working Group (TWG) was established to ensure transparency and input at each stage of the planning process and scientific analysis. In 2021, the original TWG, with its focus on aquatics-related resources, became the Aquatics TWG, and three more TWGs were established as new studies were added to address additional resources. The new TWGs included the Terrestrial TWG, Cultural TWG, and Recreation TWG. Table 1-2 shows which entities participated in each of the TWGs.

Table 1-2. Technical Working Group Members.

Entity	Aquatics	Terrestrial	Recreation	Cultural
Native Village of Eklutna	x	x	x	x
Alaska Department of Fish and Game	x	x	x	
ADNR Chugach State Park			x	
ADNR Office of History and Archaeology				x
U.S. Fish and Wildlife Service	x	x		x
National Marine Fisheries Service	x			
Trout Unlimited	x		x	
Alaska Pacific University	x	x		
Project Owners	x	x	x	x

The TWGs met regularly to assist in study planning and review technical information developed by the study program and by others. Over 20 TWG meetings were held during the study program and alternatives analysis leading up to the development of the Project Owners' Draft Program (Appendix A).

1.3.4 Study Program

Implementation of a study program was a requirement of the 1991 Agreement. Specifically, it required the Project Owners to fund studies to examine and quantify, if possible, the impacts to fish and wildlife from the Project. Per the 1991 Agreement, the studies had to examine and develop proposed PME measures to address those impacts. This examination had to also consider the impact of potential fish and wildlife measures on electric rate payers, municipal water utilities, recreational users, and adjacent land use, as well as available means to mitigate these impacts.

Beginning in 2020, the Project Owners consulted with agencies and interested stakeholders regarding development of a study program. The study program that was developed by the Project Owners, agencies, and other interested stakeholders consisted of two primary years of studies and information gathering (2021 and 2022).

During the same time period that the Project Owners were developing and implementing their study program, several other entities were also conducting studies in the Eklutna basin. These studies included:

- Aquatic habitat monitoring conducted by ADFG, previously under an agreement with Eklutna Inc., now under a new agreement with Trout Unlimited

- Sediment transport monitoring at the highway and railroad bridges conducted by Eklutna, Inc.
- Adult salmon spawner surveys conducted by NVE
- Minnow trapping in the lower Eklutna River conducted by NVE
- Habitat assessment of the East and West Forks of Eklutna Creek conducted by NVE
- Glacier related study and stream gaging in the East and West Forks of Eklutna Creek conducted by APU
- State-wide Pumped Hydro Study conducted by AEA
- Pumped hydro system flow analysis and animation conducted by ALICE in coordination with NVE
- Formal TEK assessment of the historic and cultural importance of the Eklutna River conducted by NVE in partnership with TU

The Project Owners coordinated with each of these entities during study plan development regarding relevant study methodologies, monitoring locations, etc. When available, the Project Owners incorporated the results of these other studies in their study reports. Of note, NVE shared their fish survey and habitat study data with the Project Owners, which are included in the Fish Species Composition and Distribution Study Report and Eklutna Lake Aquatic Habitat and Fish Utilization Study Report.

1.3.4.1 Early Study Efforts

Study program development began in earnest in 2020. In May 2020 the Project Owners acquired aerial imagery, spherical videography, and LiDAR of the entire Eklutna River as well as the northeastern shoreline of Eklutna Lake along the lakeside trail. The spherical videography is available on the project website and at https://biglook360.com/eklutna/.

In July 2020, the Project Owners conducted a site reconnaissance with ADFG staff to support study planning efforts. The Aquatics TWG met on July 23, 2020, to review the observations made during the site reconnaissance and to kick-off the study planning process. This meeting included initial discussions regarding the planned Instream Flow Study, potential study methods, and associated challenges.

In August 2020, the Project Owners conducted an initial condition assessment of the drainage outlet gate at the base of the spillway and established several monitoring transects and

installed scour monitors in the Eklutna River in advance of any potential unplanned spill events to allow for subsequent data collection that could benefit the study program. There were no spill events in 2020; however, the established transects and scour monitors were later utilized during the Geomorphology and Sediment Transport Study to assess erosion and sediment transport through the Eklutna River downstream from Eklutna Lake and to help calibrate the sediment transport model.

1.3.4.2 Year 1 Study Planning and Implementation

Based on this early work, the Project Owners developed a Proposed Study Program Framework and presented it to Aquatics TWG on September 3, 2020. This meeting included discussion regarding how study efforts would occur over a two-year period, the goals and objectives, general study area, proposed methods for each study, the study plan outline, and the study planning schedule.

Draft Study Plans were distributed to the Aquatics TWG on October 26, 2020, for review and comment. The deadline for written comments was November 25, 2020. The Project Owners received comments from NVE, ADFG, USFWS, NMFS, TU, Erin Larson and Jason Geck with APU, and Brett Jokela with the WNRC. Two meetings were held with the Aquatics TWG on November 30, 2020, and December 21, 2020, to review and address the Aquatics TWG's comments on the Draft Study Plans.

The Project Owners revised the Draft Study Plans based on the other comments received, and the Revised Draft Study Plans were distributed to the Aquatics TWG on January 18, 2021, for review and comment. The deadline for written comments on the Revised Draft Study Plans was January 29, 2021.

Since several of the Aquatics TWG's comments on the Draft Study Plans were questions related to the operational capabilities of the Project, the Project Owners decided to start developing the proposed hydro operations model and presented the preliminary modeling results to the Aquatics TWG at a meeting on January 26, 2021, to help inform the Aquatics TWG's comments on the Revised Draft Study Plans. The Project Owners also addressed additional clarifying questions from the Aquatics TWG at the January meeting in advance of the comment deadline.

The Project Owners received comments from ADFG, NMFS, TU, and Erin Larson with APU and revised the study plans again based on comments received. As required by the 1991 Agreement, the Proposed Final Study Plans were distributed to the Parties on February 24, 2021, for review and concurrence on the scope of work.

A meeting amongst the State agencies involved in the Project was held on February 25, 2021 to determine how the State of Alaska, as a party to the 1991 Agreement, would concur on the scope of work in the study plans. The State agencies determined that it would be most appropriate for the Commissioners of each State agency (ADFG, ADEC, ADNR, and ADOT&PF) to sign a letter stating that they concur on the scope of work in the study plans, and then the Project Owners would send those concurrence letters to AEA, the Governor's representative, with the study plans for review and feedback.

The Project Owners received concurrence letters from all of the state and federal agencies, including the NMFS, USFWS, ADFG, ADEC, ADNR, and ADOT&PF. The State agency concurrence letters and the Proposed Final Study Plans were sent to AEA as the Governor's representative for review and feedback; however, the Project Owners did not receive any additional feedback from AEA.

Studies initiated during the 2021 field season included the following:

- **Instream Flow Study** – *informed how much habitat would be created by a range of potential flows for various species (Chinook, coho, sockeye) and life stages (spawning and rearing).*
- **Geomorphology and Sediment Transport Study** – *informed what peak flows might be needed in conjunction with year-round instream flows.*
- **Fish Species Composition and Distribution Study** – *identified what fish species were present in the Eklutna River, what habitat they were utilizing, and when.*
- **Water Quality Study** – *monitored various water quality parameters (temperature, dissolved oxygen, pH, turbidity, nutrients, etc.) in both the Eklutna River and Eklutna Lake.*
- **Macroinvertebrate Study** – *assessed the baseline community of aquatic organisms at three locations in the Eklutna River.*
- **Stream Gaging** – *collected continuous flow data at various points in the Eklutna River and select tributaries to Eklutna Lake.*
- **Lake Aquatic Habitat and Fish Utilization Study** – *examined the presence and health of fish in Eklutna Lake, as well as the availability of potential spawning habitat around the lake shoreline and in its tributaries.*
- **Lakeside Trail Erosion Study** – *identified areas along the Eklutna Lakeside Trail that were experiencing shoreline erosion and the potential causes.*

- **Hydro Operations Model Development** – *allows the assessment of different potential operational scenarios for the hydroelectric project.*

- **Existing Infrastructure Assessment** – evaluated the condition and hydraulic capacity of downstream infrastructure, including the AWWU infrastructure, railroad bridge, and highway bridges.

One of the major components of the year 1 study program was the need to conduct study flow releases for both the Instream Flow Study and the Geomorphology and Sediment Transport Study. With the current infrastructure, the drainage outlet gate at the base of spillway in the dam is the only mechanism for providing controlled flow releases from the lake into the river. However, this gate had not been used regularly, and upon inspection, it was determined that the gate needed to be replaced. The Project Owners were able to design, procure, permit, and install the new drainage outlet gate during the summer of 2021 before the planned study flow releases in the fall of 2021, which ranged from 150 cfs to 25 cfs over 3 weeks.

It should be noted that in 2018, another dam (non-operational since 1955) was removed from the lower stretch of the Eklutna River by Eklutna, Inc. After the removal of this lower dam, a significant portion of the sediment wedge that had accumulated behind the lower dam for decades was left in the river. During year 1 study planning, some TWG members requested a flushing flow as part of this study program to flush the remaining sediment from behind the lower dam site. It was determined that this flushing flow was not necessary for study purposes. However, the Project Owners did commit to evaluating the need for conducting a higher calibration flow as part of the second study year.

In June 2021, before the study flow releases, the Project Owners organized a site visit with the Aquatics TWG to identify and establish transect locations (Figure 1-8). A total of 30 transects were established throughout the river for the Instream Flow Study in relatively stable areas of the river that were not likely to change significantly as a result of the study flow releases. Additional transects were established throughout the river for the Geomorphology and Sediment Transport Study in relatively dynamic areas of the river that were more likely to change significantly as a result of the study flow releases.

Figure 1-8. Site Visit with the Aquatics TWG in June 2021.

In preparation for study flow releases, the Project Owners also requested consent and waiver of liability for the planned study flows and potential movement of Eklutna Inc.'s sediment wedge from the principal landowners downstream of the Project: Eklutna, Inc., The Alaska Department of Transportation and Public Facilities (ADOT&PF), Alaska Railroad Corporation (ARRC), and the MOA/AWWU. Among them, only the MOA/AWWU consented and waived such potential liability. ADOT&PF's, ARRC's, and Eklutna, Inc.'s refusals to consent and waive liability for study flows and movement of Eklutna, Inc.'s sediment was noted in the Project Owners' decisions to proceed with study flow releases.

1.3.4.3 Year 2 Study Planning and Implementation

Based on observations during the September/October 2021 site visits and preliminary results from the first year of studies, the Project Owners revised the Study Program Framework for year 2 and presented it to the TWGs on November 8-9, 2021. These meetings included discussion regarding preliminary results from Year 1 (if applicable), what studies were being proposed for Year 2 (Table 1-3), and the goals, general study area, and proposed methods for each study.

Table 1-3. Year 2 Study Program.

Studies Continued from Year 1 (2021)	Studies Initiated in Year 2 (2022)
Instream Flow Study	Engineering Feasibility and Cost Assessment
Geomorphology and Sediment Transport Study	Hydropower Valuation Study
Fish Species Composition and Distribution Study	Wetland and Wildlife Habitat Study
Lake Aquatic Habitat and Fish Utilization Study	Terrestrial Wildlife Study
Water Quality Study	Recreation Study
Stream Gaging	Cultural Resources Study
	LiDAR and Ortho Imagery Acquisition

Following their commitment in 2021, the Project Owners evaluated the need for a higher calibration flow in 2022. However, based on the data collected in year 1, it was determined that reasonably reliable models could be developed using the collected data, and that a higher calibration flow in 2022 was not necessary for study purposes.

The Draft Year 2 Study Plans were distributed to the Parties and TWGs on February 11, 2022, for review and comment. The deadline for written comments on the Draft Year 2 Study Plans was March 11, 2022. The Project Owners received comments from NVE, USFWS, NMFS, ADFG, ADEC, OHA, TU, and The Conservation Fund.

Meetings with the TWGs were held the week of March 21, 2022, to address substantive comments on the Draft Year 2 Study Plans that required further discussion. The Project Owners revised the study plans based on comments received, and the Proposed Final Year 2 Study Plans were distributed to the Parties on April 1, 2022, for review and concurrence.

The Project Owners again received concurrence letters from each of the state agencies. The NMFS and USFWS also provided concurrence letters but only concurred with 10 of the 12 study plans. The federal agencies did not concur with the Geomorphology and Sediment Transport Study Plan or the Instream Flow Study Plan due to their uncertainty about the Project Owners ability to model higher flows without a significantly higher calibration flow.[13] The Project Owners documented this area of non-agreement and distributed the Proposed Final Year 2 Study Plans and state concurrence letters to AEA as the Governor's representative for review and feedback; however, the Project Owners did not receive any additional feedback from AEA.

[13] The Project Owners acknowledge the uncertainty associated with any modeling effort. And after reviewing the modeling results, both federal agencies have confirmed the validity of both models.

1.3.4.4 Study Reporting

Study reports were prepared for each of the Year 1 and Year 2 studies. Interested stakeholders were invited to review and comment on each of the individual draft reports. The study reports were then revised and finalized based on comments received. To facilitate the review of the draft reports, the Project Owners held TWG meetings to provide an opportunity for questions and discussion (see Appendix A for a listing of TWG meetings). The draft study plans and reports, comments, and final study plans and reports for each of the Year 1 and Year 2 studies are all available on the Project website (www.eklutnahydro.com).

In addition to the individual study reports, a Draft Summary of Study Results document was prepared per the requirement of the 1991 Agreement. This document, which accompanies this Draft Program, provides a summary of the study program results for each of the resources studied.

2.0 Alternatives Analysis

The study program showed the benefits of releasing water back into the Eklutna River, particularly in terms of providing fish habitat. Therefore, early in the alternatives analysis process, the Project Owners made a commitment to release water into the Eklutna River as part of the future Fish and Wildlife Program. Based on this commitment, primary considerations during the alternatives analysis were determining how to release water into the Eklutna River and how much water to release for both year-round flows and periodic channel maintenance flows.

The alternatives analysis process conducted by the Project Owners with the other Parties and stakeholders was not required by the 1991 Agreement; however, the Project Owners felt that it was necessary to bridge the gap between study reporting and issuance of a Draft Program as a means of ensuring that a broad range of alternatives were considered, and the evaluation would be conducted on a consistent basis of information.

The alternatives analysis process consisted of soliciting comprehensive alternatives from the Project stakeholders and analyzing each one from a cost/benefit perspective. Each alternative measure was developed to a conceptual level (5%) engineering design and coupled with a Class 5 Opinion of Probable Construction Costs (OPCC) with an accuracy range of -50% to +100%. The ecological lift in terms of gains in salmon spawning and rearing habitat was determined for each alternative based on the measure proposed and the flow levels released in the river.

The process helped to narrow down the list of comprehensive alternatives by removing those that either did not provide a significant ecological lift, or where multiple alternatives provided a similar ecological lift, those that were more costly could be removed from consideration. The following subsections detail the participants of the alternatives analysis process, the process used for analysis, and a summary of the alternatives analysis meetings held by the Project Owners.

2.1 Participation

The Project Owners reached out to the Parties, the TWGs, and other stakeholders to participate in the alternatives analysis process. The following entities participated in one or more of the alternatives analysis meetings.

- Alaska Energy Authority (AEA)
- Alaska Department of Fish and Game (ADFG)

- Alaska Department of Natural Resources (ADNR)
    - Water Section
    - Chugach State Park
    - Office of History and Archaeology
- National Marine Fisheries Service (NMFS)
- U.S. Fish and Wildlife Service (USFWS)
- Native Village of Eklutna (NVE)
- Eklutna, Inc.
- Anchorage Water and Wastewater Utility (AWWU)
- Trout Unlimited (TU)
- The Conservation Fund
- Project Owners

2.2 Cost Effectiveness / Incremental Cost Analysis Model

As part of the alternatives analysis process, a cost effectiveness and incremental cost analysis was performed to assess the relative benefits and costs of habitat improvement measures to help inform decision making. This method of analysis is an industry standard, developed by the U.S. Army Corp of Engineers (USACE) to compare environmental outputs and the economic costs of alternative plans for environmental restoration or mitigation projects. The cost effectiveness analysis compares the annual cost of a proposed alternative with the ecological lift it provides to help identify the least cost alternatives for a given level of environmental benefits. For the purposes of the Draft Program, the ecological lift used as a basis for comparison was the improvements in spawning and rearing habitat for Chinook, coho, and sockeye salmon as a result of providing flow to the Eklutna River, adding fish passage into and out of the lake, changing operation of the lake levels to provide additional lakeshore spawning habitat, or some combination of these measures. The specific gains in habitat were determined as part of the instream flow studies as well as the lake and river habitat studies.

To determine the costs of each proposed alternative, the total capital costs, operations and maintenance costs, and replacement energy costs were combined and annualized over 35 years with appropriate escalation factors as described in Appendix D.

2.3 Meetings

The alternatives analysis took place during a series of five meetings held monthly between April and August 2023. The general discussion topics for each meeting are summarized below, and the presentations from each meeting are available on the Project website (www.eklutnahydro.com).

2.3.1 Meeting 1

The first alternatives analysis meeting was held on April 6, 2023. At this meeting, options for instream flow regimes were presented. Seven year-round flow levels that address minimum winter flow, minimum flow for barrier passage, and Chinook and coho spawning flow were considered. Seven channel maintenance flow levels that correspond to the seven year-round flow levels were also considered. The cost effectiveness and incremental cost analysis was also described (a detailed description is found in Appendix D). The analysis compares capital expenditure costs, annual operation and maintenance costs, and replacement energy costs to acres of habitat improvement for each target species at each life stage. At the end of the meeting, participants were asked to submit their suggested comprehensive alternatives for analysis before the next meeting. A form was provided to the participants that identified flow regime and infrastructure options for selection. A copy of the form is available in Appendix C.

2.3.2 Meeting 2

The second alternatives analysis meeting was held on May 17, 2023. The meeting began with a presentation of the conceptual engineering for a replacement dam. Consideration of a replacement dam was requested by NVE in March 2023. The conceptual engineering and Class 5 OPCC for the other infrastructure options had been presented at TWG meetings in the fall of 2022, but since a replacement dam had been suggested late and the engineering was a considerable undertaking, it was presented at the beginning of Meeting 2. Geomorphic considerations were also discussed. Channel maintenance flow regimes identified by participants in their alternatives were modeled to assess effects on substrate and results were presented to the group.

In response to their request for comprehensive alternatives for analysis at Meeting 1, the Project Owners received more than 33 alternatives from 8 entities (including the Project Owners' alternatives). Each alternative was reviewed and discussed at Meeting 2, including the results of the cost effectiveness and incremental cost analysis. Based on the information provided and discussed about each alternative, participants were provided an opportunity to revise their alternatives and resubmit them for analysis and discussion at Meeting 3.

2.3.3 Meeting 3

The third alternatives analysis meeting was held on June 14, 2023. The meeting began with a review of downstream fish migration options and fish habitat in Eklutna Lake and its tributaries in response to questions that had arisen about these topics.

The request for revisions to alternatives at Meeting 2 resulted in 36 alternatives received by the Project Owners. Three of the entities had no changes to their alternatives, but five entities submitted revisions, including the Project Owners. Because the cost effectiveness and incremental cost analysis showed that one of their alternatives, flow release from the lower end of the AWWU pipeline, was not cost effective for the habitat gained, the Project Owners excluded this alternative from further consideration. Each revised alternative was reviewed and discussed, including the results of the cost effectiveness and incremental cost analysis. At the end of the meeting, participants were asked to consider the information presented and submit their preferred alternative(s) prior to Meeting 4.

2.3.4 Meeting 4

The fourth alternatives analysis meeting was held on July 12, 2023. The meeting began with a discussion on potential velocity barriers in response to a question from ADFG about the possibility that higher flows (80 to 350 cfs) could be a barrier to upstream fish migration.

In response to the request for each participant to submit their preferred alternative(s), the Project Owners received 12 alternatives from seven entities; some entities provided more than one preferred alternative (see Section 2.4). Each of the preferred alternatives were reviewed. The total present value of annualized costs (capital, O&M, and replacement energy) for each alternative ranged from $44 million to $385 million for the 35-year period of analysis. Impacts to Chugach and MEA ratepayers and MOA taxpayers were also reviewed, along with results of the cost effectiveness and incremental cost analysis.

The final meeting topic was a review and discussion of potential effects, both positive and negative, of the preferred alternatives on other resources including wetlands and wildlife, public water supply, and recreational use and facilities.

2.3.5 Meeting 5

The final alternatives analysis meeting was held on August 9, 2023. The meeting began with a discussion on the potential effects, both positive and negative, of the preferred alternatives on cultural resources. That was followed by a discussion of a hybrid flow release alternative that was requested by The Conservation Fund. The final topic for discussion was monitoring and adaptive management. Use of water budgets was raised for discussion by the Project Owners

for both year-round and channel maintenance flows; a water budget establishes a total amount of water available for release into the Eklutna River each year based on the selected flow regimes. Adjustments to the flow regimes may be made as long as the total volume of water to be released does not exceed the water budget. An open discussion was then held on potential monitoring needs and methods. At the end of the meeting, the Project Owners invited stakeholders to revise and resubmit their preferred alternatives if needed.

2.4 Comprehensive Alternatives

Throughout the alternatives analysis process, over 36 comprehensive alternatives were proposed by stakeholders for evaluation. Over the course of the five alternative analysis meetings described in Section 2.3, the proposed flow regimes, required infrastructure and operations of each alternative were evaluated to determine annualized costs and their associated environmental benefits. The final list of preferred alternatives proposed by each stakeholder encompasses variations on infrastructural improvements, flow release regimes, and habitat improvement measures suggested to mitigate impacts from the Project per the 1991 Agreement. The following subsections detail the components of each stakeholder's preferred alternatives.

2.4.1 Infrastructure Modifications

To assess varying degrees of habitat improvements, various infrastructure modification measures were proposed. These measures encompassed physical modifications to existing infrastructure and/or construction of new infrastructure. The various modifications proposed[14] and analyzed throughout this process are as follows:

Instream Flow Measures

- Existing Dam Modifications
- Replacement Dam
- Siphon Bypass
- AWWU Portal Release Facility
- AWWU Pipeline Release Facility

[14] During the Aquatics TWG meeting on November 9, 2022, three additional potential measures were discussed, including volitional downstream fish passage through the existing intake, trap and haul downstream fish passage utilizing a rotary screw trap and guide net, and a trapping facility with hatchery spawning, rearing, and release. However, none of these measures were selected by the Aquatics TWG for further evaluation.

- Bypass Tunnel
- Channel Excavation
- Lach Q'Atnu Creek Re-route

Channel Maintenance Flow Measures

- Existing Gate Release
- Tainter Gate Installation
- Fixed Wheel Gate Installation

Fish Passage

- Gravity Flow Fish Ladder
- Variable Exit Fish Ladder
- Pumped Supply and Slide Fish Ladder
- Hybrid Fish Ladder with Nature-like Entrance
- Trap and Haul Facility
- Floating Surface Collector
- Fish Exclusion Barrier

Habitat Improvements

- Physical Habitat Manipulation in Valley and Lower River

Other Improvements

- Lakeside Trail Improvements
- Mitigate Impacts of Flow Releases to AWWU Access Road

Each measure was evaluated, and comprehensive alternatives were developed by each stakeholder as part of the alternatives analysis process (Section 2.3). A list of the final 12 preferred alternatives by stakeholders is presented in Table 2-1. Where multiple alternatives exist for a single entity, the preferred alternatives are in descending order.

Table 2-1. Stakeholders' Preferred Infrastructure Modifications.

Entity	Instream Flow Measure	Peak Flow Measure	Fish Passage	Habitat Improvements	Other Improvements
NVE	Replacement Dam	Fixed Wheel Gate	Upstream: Hybrid Fish Ladder Downstream: Gate Releases (Spill)	Physical Habitat Manipulation	AWWU Bridge Crossings Lakeside Trail Repair
USFWS Alt A	Replacement Dam	Fixed Wheel Gate	Upstream: Hybrid Fish Ladder Downstream: Recirculating Bypass	Physical Habitat Manipulation	AWWU Bridge Crossings Lakeside Trail Repair
USFWS Alt B	Existing Dam w/ Fixed Wheel Gate	Fixed Wheel Gate	Upstream: Variable Exit Fish Ladder Downstream: Recirculating Bypass	Physical Habitat Manipulation	AWWU Bridge Crossings Lakeside Trail Repair
USFWS Alt C[15]	Existing Dam w/ Fixed Wheel Gate	Fixed Wheel Gate	Upstream: None Downstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings Lakeside Trail Repair
USFWS Alt D[13]	AWWU Portal Release Facility	Fixed Wheel Gate	Upstream: None Downstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings Lakeside Trail Repair
TCF	Replacement Dam	Fixed Wheel Gate	Upstream: Hybrid Fish Ladder Downstream: Gate Releases (Spill)	None	None

[15] USFWS alternatives C and D are in descending order of preference and are preferred if public and financial support for alternatives A and B are not obtained.

Entity	Instream Flow Measure	Peak Flow Measure	Fish Passage	Habitat Improvements	Other Improvements
NMFS[16]	AWWU Portal Release Facility	Fixed Wheel Gate	Upstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: None		Lakeside Trail Repair
	Replacement Dam	Fixed Wheel Gate	Upstream: Hybrid Fish Ladder	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: Floating Surface Collector		Lakeside Trail Repair
TU	Existing Dam w/ Fixed Wheel Gate	Fixed Wheel Gate	Upstream: Variable Exit Fish Ladder	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: Gate Releases (Spill)		Lakeside Trail Repair
ADFG	AWWU Portal Release Facility	Fixed Wheel Gate	Upstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: None		Lakeside Trail Repair
ADNR State Parks	AWWU Portal Release Facility	Existing Gate Release	Upstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: None		Lakeside Trail Repair
Project Owners	AWWU Portal Release Facility	Existing Gate Release	Upstream: None	Physical Habitat Manipulation	AWWU Bridge Crossings
			Downstream: None		Lakeside Trail Repair

[16] NMFS's comprehensive alternative involves implementing the AWWU Portal Valve and fixed wheel gate as an immediate action (within 5 years as required by the Agreement), followed by replacement of the existing dam with a new dam allowing for fish passage as a long-term action outside the implementation period of the Agreement.

2.4.2 Year-Round Instream Flow Regimes

For each of the comprehensive alternatives, stakeholders proposed various year-round flow regimes with seasonal variability to provide habitat within the Eklutna River. The monthly flows proposed by each entity are presented in Table 2-2 in ascending order.

Table 2-2. Stakeholders' Preferred Instream Flow Regimes.

Month	Flow Rate (cfs)								
	Project Owners	ADNR	ADFG Alt B	ADFG Alt A	NMFS	USFWS	TCF[1]	TU[1]	NVE[1]
Jan	27	27	31	35	75	75	60	61	65
Feb	27	27	31	35	75	75	60	61	65
Mar	27	27	31	35	75	75	60	61	65
Apr	27	27	31	35	75	75	60	61	65
May	34	34	41	50	75	75	100	134	160
Jun	40	40	50	65	160	160	180	206	255
Jul	40	40	60	80	160	160	180	206	350
Aug	40	40	60	80	160	160	180	206	350
Sep	40	40	48	57	160	160	180	134	150
Oct	40	40	48	57	160	160	100	61	150
Nov	34	34	39	46	75	75	60	61	108
Dec	27	27	31	35	75	75	60	61	65

[1] The NVE, TU, and TCF preferred alternatives include additional releases from the dam for downstream out- juvenile fish passage in April – June, which is not reflected in the instream flow regime presented. migrating

2.4.3 Channel Maintenance Flow Regimes

The channel maintenance flow is intended to preserve habitat and maintain channel morphology over the long term. Each stakeholder proposed variations of the channel maintenance flow magnitude, duration, and recurrence interval as presented in Table 2-3 in ascending order.

Table 2-3. Stakeholders' Preferred Channel Maintenance Flows.

Entity	Flow (cfs)	Duration (Hrs)	Recurrence (Yrs)
Project Owners	220	72	3 of 10
ADNR	220	72	3 of 10
ADFG Alt B	325	72	3 of 10
ADFG Alt A	400	72	3 of 10
TU	400	72	3 of 10
TCF	600	72	3 of 10
NMFS	700	72	3 of 10
USFWS	700	72	3 of 9
NVE	700	72	Annually

2.4.4 Cost Benefit Summary

Each of the comprehensive alternatives were analyzed as part of the cost effectiveness and incremental cost analysis model. A summary of the estimated costs is presented in Table 2-4 and presented graphically in Figure 2-1.

Table 2-4. Cost Summary for Stakeholders' Preferred Alternatives.

Stakeholder	Capital Cost ($M)[1]	O&M Cost ($M)	Replacement Energy Cost ($M)	35-Year Annualized Cost ($M)	35-Year Present Worth ($M)
Project Owners	8.9	0.2	1.3	2.7	44
ADNR	8.9	0.2	1.3	2.7	44
ADFG Alt B	16.9	0.2	1.7	3.8	63
ADFG Alt A	16.9	0.2	2.0	4.3	70
USFWS Alt D	16.9	0.2	2.0	4.3	70
USFWS Alt C	18.0	0.5	5.2	8.7	142
TU	28.9	0.6	7.2	13.5	221
USFWS Alt B	88.6	2.1	5.2	17.7	289
TCF	118.1	0.3	6.9	18.9	310
NVE	122.9	0.3	8.4	21.1	346
USFWS Alt A	158.7	1.7	4.9	22.4	366
NMFS	170.8	1.7	4.9	23.5	385

[1] Capital costs are based on Class 5 OPCC's and carry an expected accuracy range of -50% to +100%.

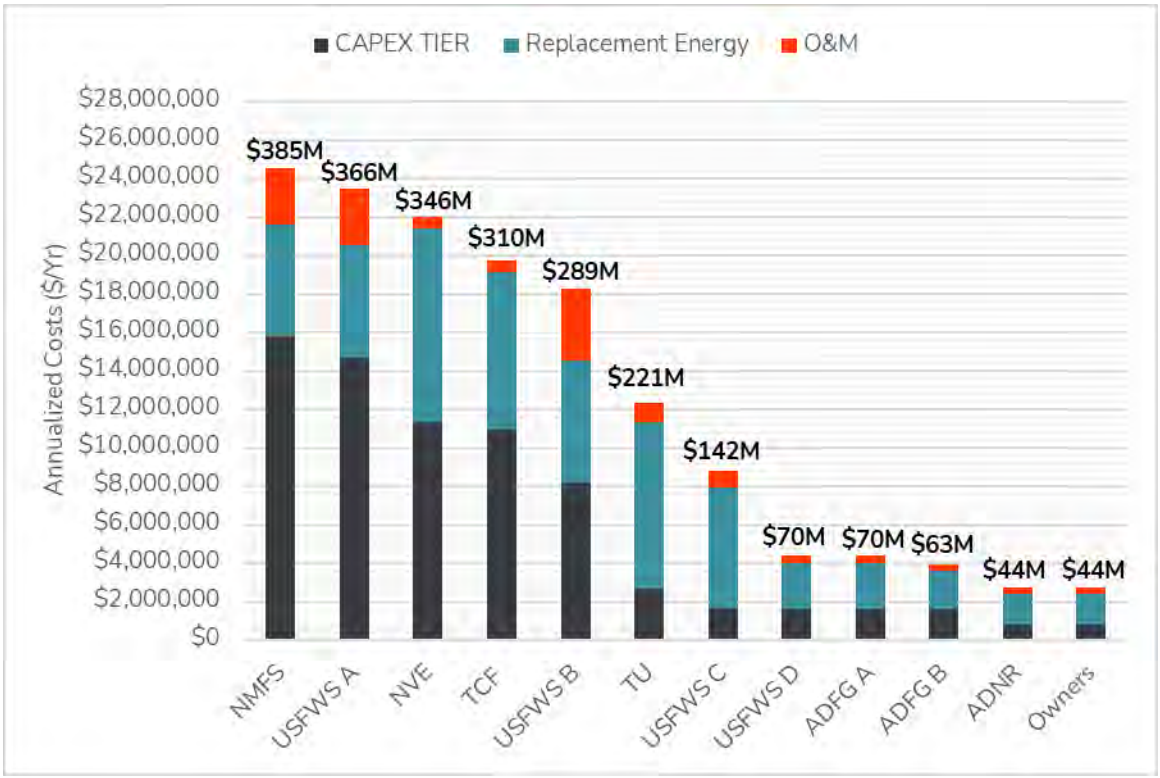

Figure 2-1. Comparison of Annualized Costs and Present Worth for Stakeholders' Preferred Alternatives.

The associated ratepayer impacts by utility are presented in Table 2-5 in ascending order. The supporting data for the cost effectiveness modeling is provided in Appendix D.

Table 2-5. Ratepayer/Taxpayer Impacts for Stakeholders' Preferred Alternatives.

Stakeholder	Ratepayer Impacts		Property Tax Increase	
	Chugach Electric Association	Matanuska Electric Association	Municipality of Anchorage	
	(%)	(%)	(mils)	($/100k)
Project Owners	+ 0.53%	+ 0.84%	0.005	$0.51
ADNR	+ 0.53%	+ 0.84%	0.005	$0.51
ADFG Alt B	+ 0.76%	+ 1.13%	0.008	$0.81
ADFG Alt A	+ 0.84%	+ 1.31%	0.008	$0.81
USFWS Alt D	+ 0.84%	+ 1.31%	0.008	$0.81
USFWS Alt C	+ 1.70%	+ 2.96%	0.011	$1.13

TU	+ 2.38%	+ 4.11%	0.016	$1.60
USFWS Alt B	+ 3.53%	+ 4.66%	0.052	$5.23
TCF Alt A	+ 3.80%	+ 5.29%	0.045	$4.46
NVE	+ 4.24%	+ 6.10%	0.046	$4.62
USFWS Alt A	+ 4.53%	+ 5.45%	0.072	$7.21
NMFS	+ 4.73%	+ 5.81%	0.076	$7.63

As part of the instream flow and habitat modeling performed throughout the study program, each proposed flow regime results in habitat gains throughout the river and lake by month while varying by species and life stage. A summary of the habitat gains modeled for each comprehensive alternative by species and life stage is presented in Table 2-6.

Table 2-6. Summary of Habitat Gains for Stakeholders' Preferred Alternatives.

Stakeholder	Habitat Gains (Acres)				
	Chinook Spawning	Coho Spawning	Sockeye Spawning	Chinook Rearing	Coho Rearing
Project Owners	1.5	1.6	1.2	6.3	9.9
ADNR	1.5	1.6	1.2	6.3	9.9
ADFG Alt B	1.5	1.6	1.2	7.7	11.6
ADFG Alt A	1.6	1.6	1.2	8.7	12.7
USFWS Alt D	1.5	1.2	0.5	12.6	18.5
USFWS Alt C	2.0	2.1	1.1	19.1	28.2
TU	4.7	5.0	4.2	18.2	27.1
USFWS Alt B	4.9	5.0	4.0	19.1	28.2
TCF	3.8	3.9	2.7	19.0	28.1
NVE	3.1	3.6	2.5	21.0	31.0
USFWS Alt A	3.9	4.0	3.0	15.5	22.8
NMFS	3.9	4.0	3.0	15.5	22.8

To further assess each comprehensive alternative, the incremental costs were analyzed to determine the annual spending per acre of habitat gained in the river and lake. This exercise helps to inform the consequences of increasing unit costs to achieve additional habitat gains. A summary of the alternative incremental costs is presented in Table 2-7.

Table 2-7. Incremental Costs Per Acre of Habitat for Stakeholders' Preferred Alternatives.

Stakeholder	Incremental Cost ($/Yr/Acre)				
	Chinook Spawning	Coho Spawning	Sockeye Spawning	Chinook Rearing	Coho Rearing
Project Owners	$1,800,000	$1,700,000	$2,300,000	$400,000	$300,000
ADNR	$1,800,000	$1,700,000	$2,300,000	$400,000	$300,000
ADFG Alt B	$1,800,000	$1,700,000	$2,300,000	$400,000	$300,000
ADFG Alt A	$2,500,000	$2,400,000	$3,200,000	$500,000	$300,000
USFWS Alt D	$2,700,000	$2,700,000	$3,600,000	$500,000	$300,000
USFWS Alt C	$4,400,000	$4,100,000	$7,900,000	$500,000	$300,000
TCF Alt B	$3,600,000	$3,500,000	$4,400,000	$900,000	$600,000
TU	$2,900,000	$2,700,000	$3,200,000	$700,000	$500,000
USFWS Alt B	$5,200,000	$5,100,000	$7,300,000	$1,000,000	$700,000
TCF Alt A	$7,100,000	$6,100,000	$8,800,000	$1,000,000	$700,000
NVE	$5,700,000	$5,600,000	$7,500,000	$1,400,000	$1,000,000
USFWS Alt A	$6,000,000	$5,900,000	$7,800,000	$1,500,000	$1,000,000
NMFS	$1,800,000	$1,700,000	$2,300,000	$400,000	$300,000

3.0 Draft Fish and Wildlife Program

This section presents the Project Owners' proposed Draft Fish and Wildlife Program and supporting rationale. The Project Owners are proposing what the results of the study program, consultation, and alternatives analysis support as the most cost-effective alternative for improving fish habitat affected by the Project. The Project Owners' Draft Program includes release of year-round flows from Eklutna Lake into the Eklutna River as a PME measure to significantly improve fish habitat in the Eklutna River below Eklutna Dam, which will indirectly benefit wildlife in the area, while retaining the important operational and energy benefits of the Project. The Draft Program also includes measures to offset impacts of releasing water into the Eklutna River to the existing AWWU road and infrastructure and a monitoring and adaptive management plan.

The Project Owners developed this Draft Program based on results of the two-year study program, in-depth alternatives analysis, and extensive consultation. As required by the 1991 Agreement, the Draft Program gives equal consideration to the purposes of:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The protection of other aspects of environmental quality
7. Other beneficial public uses
8. Other requirements of State law

The Draft Summary of Study Results of the two-year study program has been released concurrently with this Draft Program. The complete study reports and presentations from the alternatives analysis meetings are available on the Project website (www.eklutnahydro.com). A summary of the consultation record is included in Appendix A.

3.1 Impacts to Fish and Wildlife

This section provides an overview of development on the Eklutna River dating back to 1914. Although the 1991 Agreement is focused on the impacts of the Project on fish and wildlife, there have been many other developments on the Eklutna River that have impacted fish and wildlife and created conditions today that are relevant in assessing PME measures included in the Draft Program.

In 1914, the U.S. Congress authorized construction of the Alaska Railroad, which was completed in 1923. This included the construction of a bridge over the Eklutna River. The current railroad bridge at the Eklutna River creates a significant channel constriction in the natural alluvial fan in the lower river.

In 1929, a privately owned company constructed the first hydroelectric project on the Eklutna River. This project included a 60-foot-tall concrete arch diversion dam (also referred to as the lower dam) located at river mile (RM) 4. The construction of this earlier project effectively eliminated any upstream passage of salmon or resident fish populations to the upper 8 miles of river and into Eklutna Lake.

In 1955, USBR constructed the existing hydroelectric project and diverted all outflows from Eklutna Lake through the tunnel/penstock system to the powerhouse on the Knik Arm (Figure 1-1). This impacted salmon populations in the Eklutna River below the lower dam. The reduced flows to the Eklutna River led to loss of winter rearing habitat, poor sediment transport, excessive siltation of stream channels, gravel starved stream channels, reduced water quality, and insufficient water depth for Chinook salmon spawning (USACE 2011). In addition to impacting fish habitat, the Project also impacted wetlands downstream of Eklutna Dam, both riparian wetlands that existed in the upper river and estuarine wetlands below the railroad bridge. Impacts to salmon and wetlands likely had an indirect impact on the wildlife that depend on the salmon and utilize those wetlands. However, the original impact of the Project on fish and wildlife resources is difficult to quantify since no fish or wildlife studies were conducted pre-construction.

In 1969, the Alaska Railroad diverted the Eklutna River north to a new stream channel and started gravel mining in the Eklutna River below the railroad bridge. This significantly impacted both fish and wildlife habitat in the area.

In 1975, the New Glenn Highway was constructed. The northbound and southbound bridges create another channel constriction in the natural alluvial fan of the lower river, although not as significant as the railroad bridge.

In 1988, construction of the Eklutna Water Project (now owned and operated by AWWU) was completed. Construction of the buried water supply pipeline and access road for the Eklutna Water Project impacted both fish and wildlife habitat and constricted channel migration in the river above the canyon reach.

In 1989, Chugach Electric, Matanuska Electric, and the Municipality of Anchorage agreed to buy the Project. However, they did not officially buy the Project from the federal government until 1997.

In 2018, Eklutna, Inc. removed the lower dam. However, the majority of the sediment that had accumulated behind the lower dam for decades was left in the river. Even without the lower dam serving as a barrier to fish passage, the lack of flow releases from Eklutna Lake into the Eklutna River still limits adult salmon from accessing potential habitat above the Thunderbird Creek confluence and is an ongoing impact of the Project.

3.2 PME Measures for Fish and Wildlife

The Project Owners recognize that as the holder of significant water rights in the basin and the operator of the current hydroelectric facilities that control such water, only the Project Owners can provide water in the Eklutna River for the protection, mitigation, and enhancement of fish and wildlife habitat. Because of this, and based on the study results, TEK, and input from Parties and stakeholders, the Project Owners have committed to providing instream flows to the Eklutna River while balancing costs and other impacts in accordance with the 1991 Agreement.

The Project Owners will provide year-round release of water and periodic channel maintenance flows from Eklutna Lake into the Eklutna River as PME measures for fish and wildlife habitat affected by the Project. Water for the annual base flow regime will be released from a new facility constructed adjacent to the AWWU portal valve, located approximately one mile downstream from Eklutna Dam. Release of water from the portal valve will provide year-round flow to 11 of the 12 river miles (Figure 1-1). Flow levels will vary throughout the year to meet specific seasonal habitat needs of fish while maximizing cost efficiency. Periodic channel maintenance flows to complement the base flow regime will be provided through a combination of water released from the base flow release facility and water released through the recently replaced maintenance gate in the existing Eklutna Dam.

This is the most cost-effective alternative of the 12 final alternatives analyzed with significant gains in spawning and rearing habitat within the river and simultaneously has the least impact to Chugach and MEA ratepayers and MOA property taxpayers. This will also allow continued year-round operation of the Project, and protect its associated benefits of cost-effective,

carbon-free, flexible hydroelectric power for the electric customers in Anchorage and the surrounding area, although less water (213,500 acre-feet) will be available for energy production on average.

3.2.1 Year-Round Instream Flows

The Instream Flow Study successfully developed a set of models and analytical tools that were used in the alternatives analysis in formulating and comparing different flow release alternatives and the amounts of increased salmon habitat relative to baseline conditions. Building on this understanding, as well as consideration of results from other resource studies, a flow release prescription has been developed that is focused on restoring habitat for Pacific salmon in the Eklutna River to productive levels, but at the same time, and in accordance with the 1991 Agreement, is balanced with the needs of other water resource users in the basin (e.g., wildlife, electric rate payers, municipal water utilities, recreation, and others).

Flow releases into the Eklutna River will be implemented year-round (Section 3.2.1.2) to provide rearing habitat to juvenile Pacific salmon and resident fishes throughout 11 miles of the Eklutna River below the AWWU portal valve (Section 3.2.1.1). During periods when adult salmon are migrating, flow levels will be augmented to facilitate access into the Eklutna River above the confined canyon reach, and sufficient flows to promote successful spawning of adult Chinook, coho, pink, and chum salmon. As discussed previously, the flow regime proposed in this Draft Program was selected to achieve a significant amount of the potentially available habitat in the Eklutna River within prudent capital, O&M, and replacement energy costs, and within the capacity of existing AWWU infrastructure to release the water.

3.2.1.1 Eklutna River Release Facility

The proposed infrastructural modification for providing continuous, year-round flow from Eklutna Lake to the Eklutna River involves the addition of a new valve and release structure located adjacent to AWWU's portal value one mile below the Eklutna Dam. The proposed infrastructure, referred to as the Eklutna River Release Facility, would consist of a tee off the existing 54-inch pipeline that diverts water from Eklutna Lake as part of AWWU's Eklutna Water Project (Section 1.1.1.8) and new control valves to bypass water into the Eklutna River. A plan view of the site with proposed infrastructure changes is presented in Figure 3-1. The 15% design drawings for the Eklutna River Release Facility are provided in Appendix E.

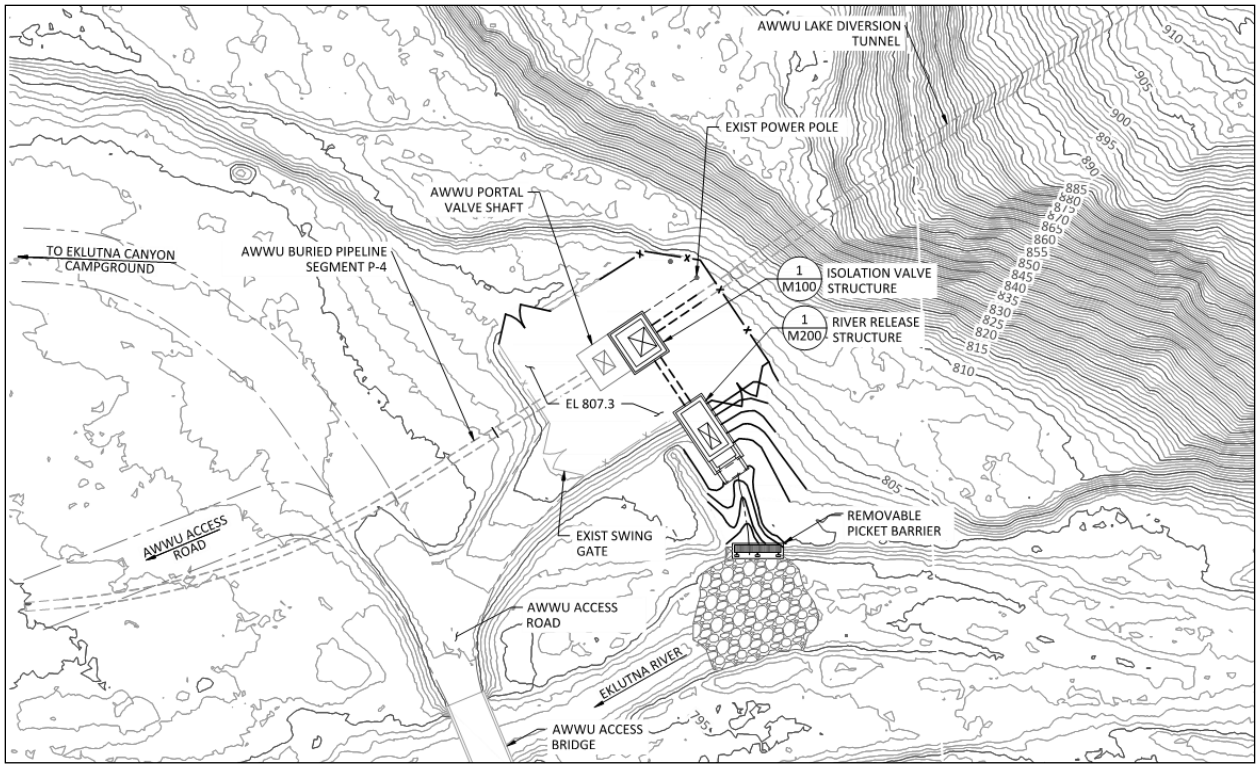

Figure 3-1. Eklutna River Release Facility Site Layout.

The infrastructure included as part of the 15% level of design for the Eklutna River Release Facility is as follows:

- Construction of a new isolation gate structure immediately upstream of the AWWU portal valve shaft;
- Replacement of approximately 25-ft of existing pipeline with a newly fabricated steel 54-inch x 42-inch tee;
- Installation of a 54-inch gate valve on the main segment of pipe intended to provide dual means of isolation for AWWU's pipeline segment P-4;
- Installation of a 42-inch gate valve on the branch segment intended to provide isolation to the river release structure;
- Installation of a draining and filling system around each isolation valve;
- Installation of a pressure monitoring system and flow meter to provide dual redundancy to AWWU's portal release valve facility;

- Construction of a new river release structure approximately 30-ft downstream of the isolation gate structure;
- Installation of a 30-inch sleeve valve or alternative energy dissipation valve to control flow into the Eklutna River;
- Installation of a flow monitoring system to monitor flow releases into the Eklutna River;
- Construction of a bypass channel from the river release structure to the Eklutna River; and
- Upgrades to communication infrastructure to provide direct communication between the Eklutna River Release Facility, AWWU portal valve shaft, AWWU intake valve shaft, Eklutna Water Treatment Facility, and the Eklutna Power Plant.

Releasing water from the proposed Eklutna River Release Facility would water approximately 11 out of 12 miles of the Eklutna River and provide continuous flow year-round for fish and wildlife. With the water supply being supplied from the existing Eklutna Lake intake structure, no significant change to the annual operating regime of the reservoir is anticipated and the Eklutna Power Plant will be able to operate year-round. Further details of the Eklutna River Release facility and associated infrastructure are provided in Appendix E.

Flow releases through the facility will be limited to a maximum of 80 cfs to protect the AWWU valves and pipeline. The closure rate of the proposed river release valve will be set to keep transient pressures within the rating of the lake diversion tunnel and AWWU pipeline. Additional instrumentation including new flow meters and pressure transducers will be installed to monitor the new facility and protect AWWU infrastructure in the event of an emergency. The addition of this release facility on the existing Eklutna Water Project will not reduce or impact flow available for water supply purposes, as required by state law.

3.2.1.2 Flow Regime

The flow releases into the Eklutna River are anticipated to vary seasonally with a winter flow of 27 cfs and a summer flow of 40 cfs with appropriate ramping rates keeping downramping within the river at a rate of less than 1 to 2 inches per hour between flow levels. The total volume of water to be released annually from Eklutna Lake into the Eklutna River for year-round base flows is 24,280 acre-ft/yr, equivalent to approximately 10% of the average annual inflow to the lake. The seasonal flows released into the river are presented in Figure 3-2 and tabulated in Table 3-1.

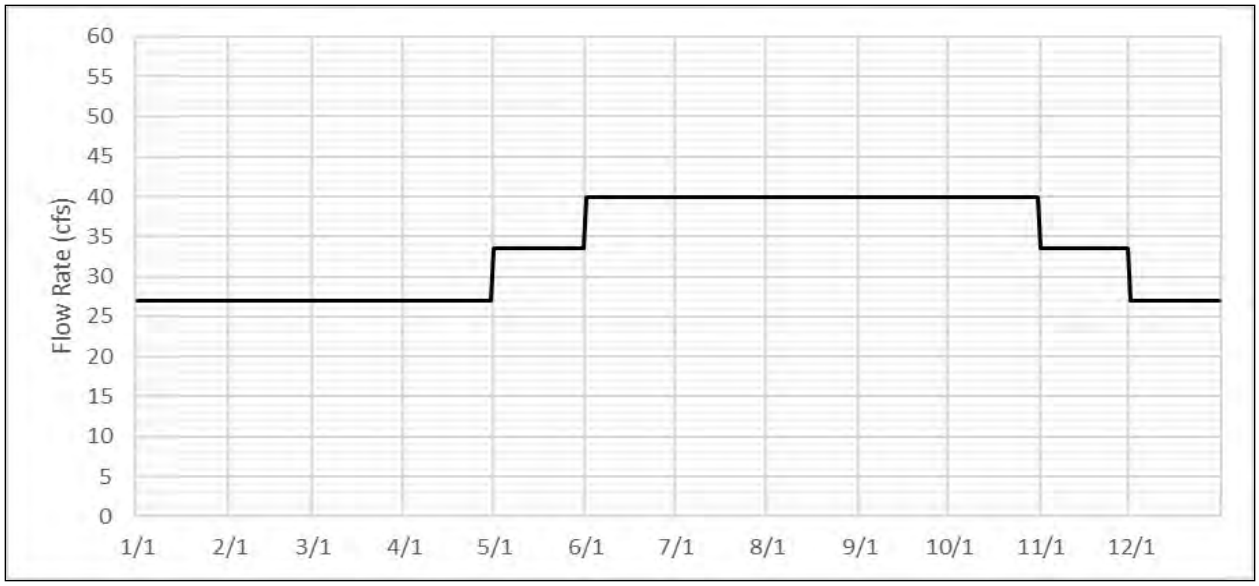

Figure 3-2. Eklutna River Flow Regime.

Table 3-1. Eklutna River Flow Regime by Month.

Month	Flow Rate (cfs)
Jan	27
Feb	27
Mar	27
Apr	27
May	34
Jun	40
Jul	40
Aug	40
Sep	40
Oct	40
Nov	34
Dec	27

The flow regime selected promotes new spawning and rearing habitat for salmon in the Eklutna River while maintaining carbon-free energy production through the Eklutna Power Plant. The expected spawning and rearing habitat gain for Chinook and coho salmon are presented in Table 3-2.

Table 3-2. Chinook and Spawning and Rearing Habitat Gains.

	Chinook Habitat		Coho Habitat	
Criteria	**Spawning**	**Rearing***	**Spawning**	**Rearing***
Baseline Habiat (Acres)	0.7	11.8	2.5	14.7
Total Habitat with Proposed Base Flows (Acres)	2.2	18.1	4.1	24.6
Percent Gain	209%	53%	65%	67%
% of Maximum Available Habitat Below the AWWU Portal Valve	96.5%	n/a	99.6%	n/a
% of Maximum Available Habitat in the Eklutna River	81.7%	n/a	83.7%	n/a

*The % of maximum available habitat is not shown for Chinook or coho rearing habitat because the flow needed to achieve maximum rearing habitat for both species appears to be higher than the range of flows that was modeled.

The spawning habitat curves for Chinook and coho salmon habitat downstream of the AWWU Portal Valve are presented in Figure 3-3. Spawning and rearing habitat gains are presented graphically in Figure 3-4 and Figure 3-5, respectively. Additional habitat gains for pink and chum salmon are expected to be similar to the prior two species but were not quantified as part of the study program. While these flow releases may create potential spawning habitat for sockeye in the river, they are unlikely to create rearing habitat for sockeye since sockeye typically rear in lakes. Therefore, the potential spawning habitat for sockeye in the river is not shown.

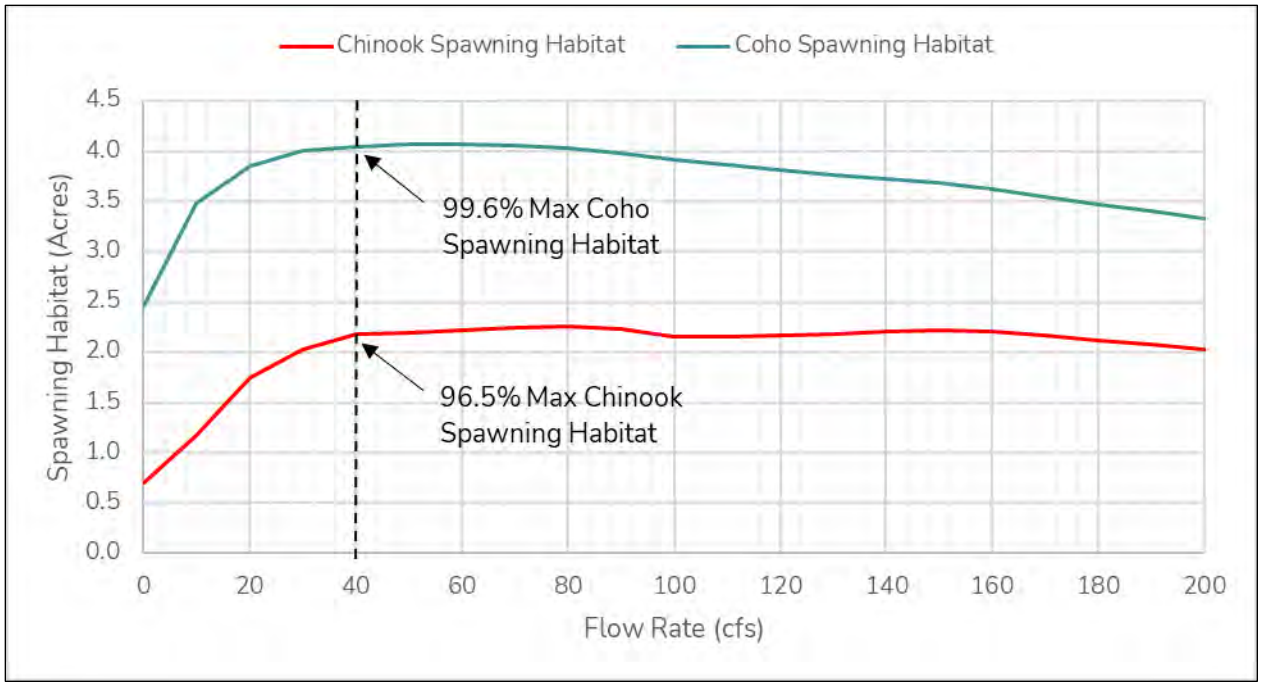

Figure 3-3. Spawning Habitat Curves for the Eklutna River below the AWWU Portal Valve.

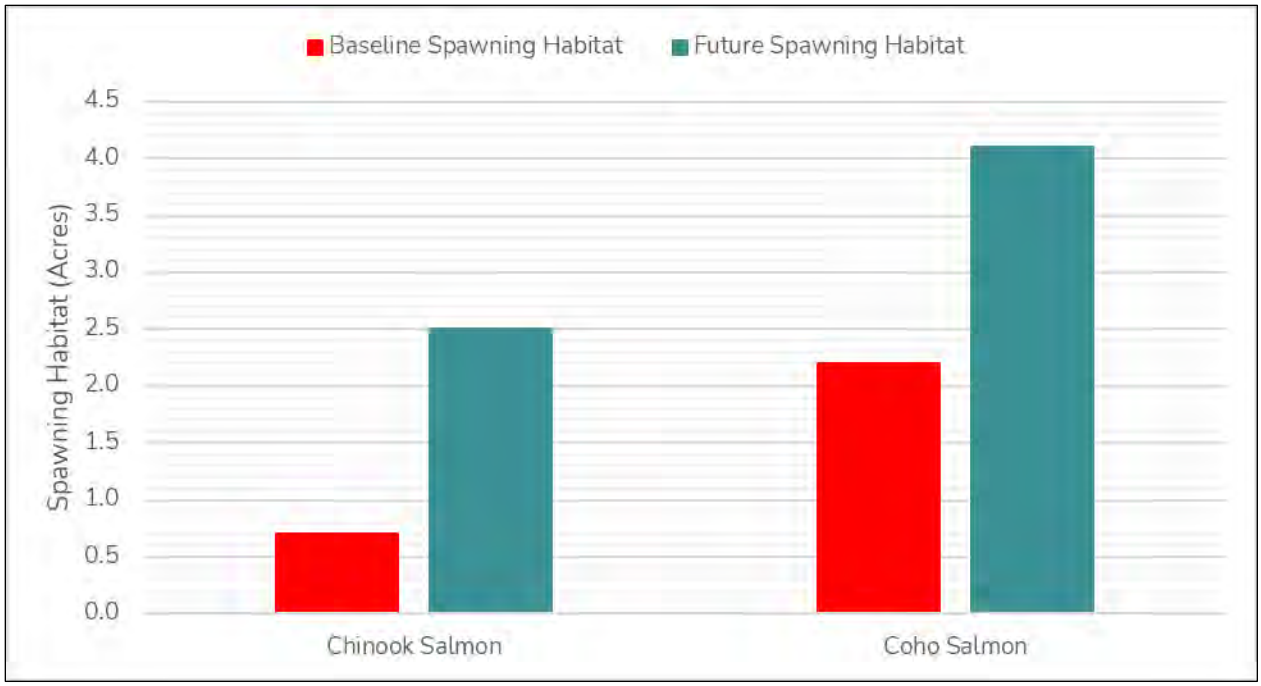

Figure 3-4. Spawning Habitat Comparison, Baseline vs. Future Flow Conditions.

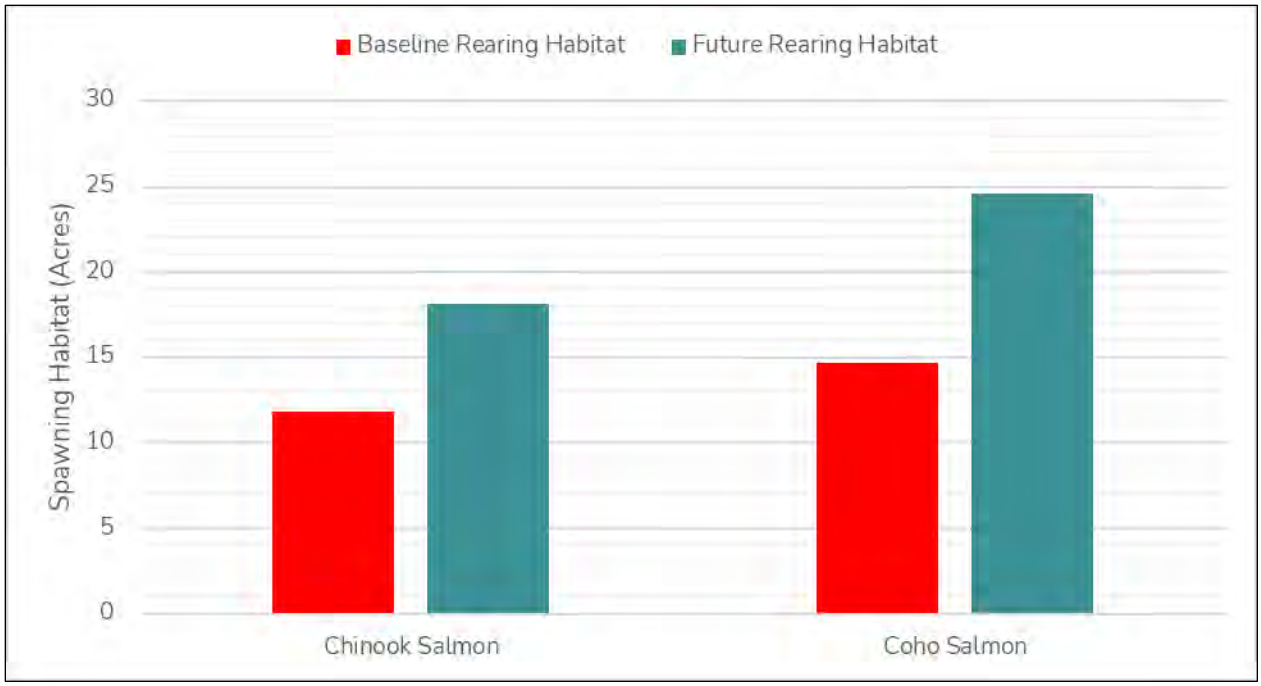

Figure 3-5. Rearing Habitat Comparison, Baseline vs. Future Flow Conditions.

Increased flow and salmon abundance will also directly or indirectly benefit several ecologically and/or culturally important wildlife species, including:

- Bears, especially brown bears (direct foraging)
- Moose (increased plant nutrients and forage; however, moose could also be negatively impacted as a result of increased bear densities)
- Wolves (direct foraging and potentially higher prey base)
- River otters and mink (direct foraging)
- Beavers (beaver dams would also create salmon rearing habitat)
- Piscivorous birds
- Marine mammals

3.2.2 Channel Maintenance Flows

A channel maintenance flow regime was developed to help create and maintain channel dimensions and substrate characteristics to support physical fish habitat over the long term. The channel maintenance flow regime was developed based on field studies, modeling, and

peak flow statistics in similar unmanaged Alaskan rivers and is designed to complement the base flow regime discussed in Section 3.2.1.2.

3.2.2.1 Infrastructure

The proposed infrastructural modification to provide periodic channel maintenance flows in the Eklutna River includes automating the existing outlet gate within the base of the spillway at Eklutna Dam. The existing outlet gate, replaced in 2021 as part of the study program, has a maximum capacity of approximately 190 cfs at the normal maximum water surface elevation of El 871.0 ft. The Eklutna River Release Facility is designed to provide a maximum potential flow release of 80 cfs without impacting operations of the AWWU water supply project. A channel maintenance flow with a peak of 220 cfs is anticipated to be released through a combination of flow released through the dam outlet gate and flow releases at the Eklutna River Release Facility (Section 3.2.1.1). The infrastructure to provide channel maintenance flows to the river is as follows:

- Replacement of existing manual actuator for the dam outlet gate with electric motor actuator with position sensing;
- Construction of new access platform and stilling well with level transducer to measure water surface elevation in Eklutna Lake; and
- Installation of 0.5 miles of new buried power line from Eklutna Lake Road to Eklutna Dam.

3.2.2.2 Channel Maintenance Flow Regime

The proposed channel maintenance flow regime is a 220 cfs flow in three out of every 10 years in order to take advantage of wet water years. The channel maintenance flow regime may be provided by spill events. In the absence of any natural high flow events or spill events, flow releases to meet the channel maintenance flow regime will be made. It shall be noted that for this channel maintenance flow to occur, operations of the reservoir may change to raise the water surface higher to achieve the desired flow rate.

Based on geomorphic and fisheries studies and modeling, the proposed default channel maintenance flow is a shaped hydrograph (as shown in Table 3-3 and Figure 3-6) which is designed to closely resemble a natural peak flow hydrograph. Figure 3-6 also shows a flow of 220 cfs for 72 hours for comparison with the proposed shaped hydrograph.

Table 3-3. Proposed Channel Maintenance Flows.

Duration (hours)	Flow (cfs)
Start	40
3	150
3	200
36	220
12	200
6	160
6	140
6	110
6	90
6	80
6	70
4	60
End	40

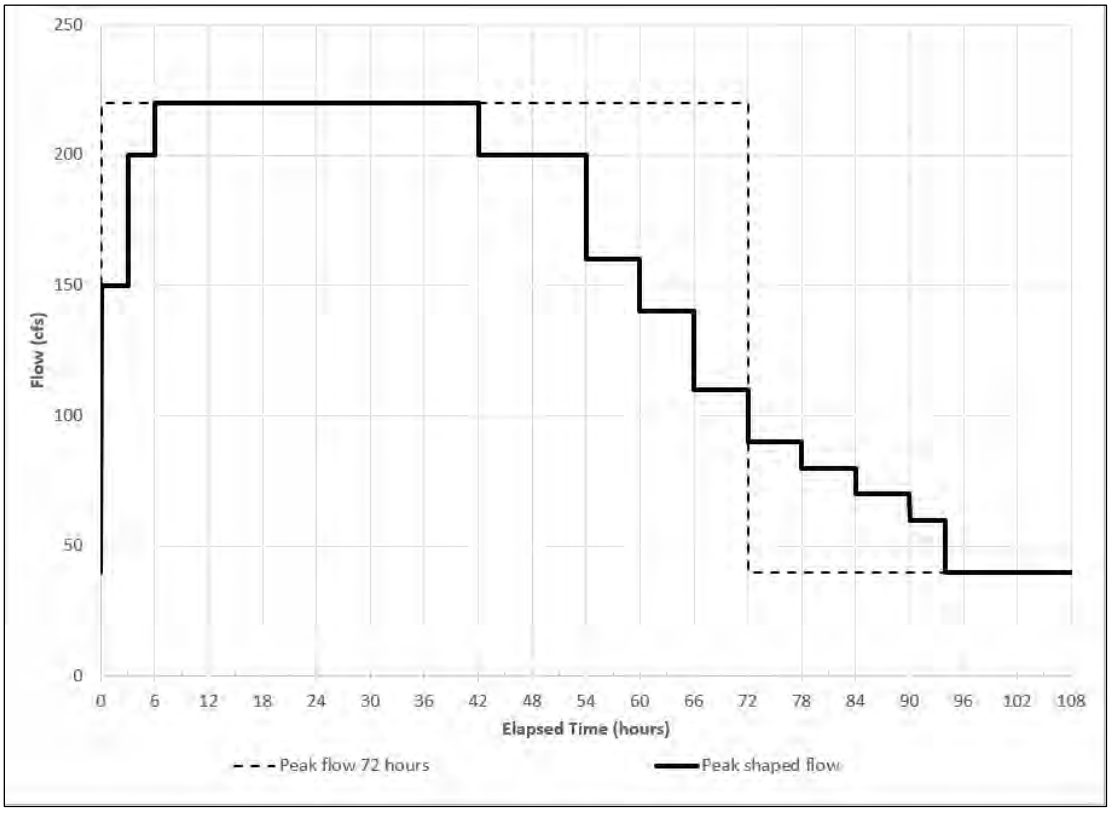

Figure 3-6. Proposed Channel Maintenance Flows.

The timing of channel maintenance flows will be during the fall when Eklutna Lake levels are highest and take into consideration limitations of inflow volumes and allow for year-round hydropower operations.

3.2.3 Water Balance

The proposed instream flows and channel maintenance peak flows to be provided as part of the Fish and Wildlife Program modify the water balance of Eklutna Lake. The baseline and future water balance detailing the percent of flows provided to hydropower, public water supply and instream flows is provided in Table 3-4.

Table 3-4. Eklutna Lake Water Balance, Baseline vs. Future Condition.

Condition	Eklutna Water Volume (Acre-Ft)					Percent of Total Volume (%)		
	Inflows	Hydro	Public Water Supply	Base Flows	Peak Flows (Avg)	Hydro	Public Water Supply	Instream Flows
Baseline	262,456	238,444	24,670	0	0	**91%**	**9%**	**0%**
Future	262,456	212,804	24,670	24,280	323	**81%**	**9%**	**10%**

3.3 Other Mitigation Measures

The 1991 Agreement requires the Project Owners to consider the impact of fish and wildlife PME measures on electric rate payers, municipal water utilities, recreational users, and adjacent land use, as well as available means to mitigate these impacts. The impacts of providing year-round and periodic channel maintenance flows as a PME measure for fish and wildlife on other resources is described below.

3.3.1 Public Water Supply

A portion of the water supplied to Eklutna Lake is diverted for public water supply purposes through AWWU's diversion tunnel and pipeline as part of the Eklutna Water Project (Section 1.1.1.8). Under the 1984 Agreement for Public Water Supply and Energy Generation from Eklutna Lake, Alaska, the Project Owners may not take any action that will reduce the water quality of Eklutna Lake or "take or authorize any other actions with regard to Eklutna Lake which may have the effect of reducing it present suitability for use as a public water supply."

Future operations of Eklutna Lake and the proposed Eklutna River Release Facility will not reduce the water supply, adversely impact water quality, or restrict the ability of AWWU to

withdraw water from the lake. Hydraulic restrictions will be in place limiting the maximum flow able to be released from the Eklutna River Release Facility while still maintaining the maximum flow able to be withdrawn for treatment at the Eklutna Water Treatment Facility. Additional safeguards to be implemented to protect public water supply include upgrades to the existing communications system from the AWWU portal and intake valve shafts to the water treatment facility to provide increased resiliency, as well as the inclusion of redundant flow meters and pressure transmitters for monitoring and control of the system.

Flow releases in the river will impact the ability for AWWU to access their pipeline for maintenance purposes, as the existing maintenance road consists of eight river ford style road crossings. It is anticipated that flow within the river will make these impassable for most of the year. To allow year-round access to the pipeline for maintenance, new bridges will be constructed at each of the eight crossings.

3.3.2 Recreational Use and Facilities

Continuation of existing reservoir operations as proposed could cause some continuing erosion of the non-motorized portions of the lakeside trail at higher lake levels. Chugach State Park has secured funding to address trail erosion. Therefore, the Project Owners are not proposing mitigation for this impact.

The Project Owners note that the public cannot access most of the Eklutna River; the land under and surrounding the Eklutna River is largely owned by Eklutna, Inc. The Project Owners cannot ensure public access to the Eklutna River.

Increased salmon populations in the Eklutna River will likely attract increased numbers of both black and brown bears. This may provide increased opportunities for wildlife viewing, but it could also increase the likelihood of bear-human interactions near the campground. However, releasing flows from the AWWU portal valve approximately one mile downstream from the dam will reduce this potential impact on the users of nearby developed recreational facilities in Chugach State Park.

Stocked Chinook and coho returning to the Eklutna tailrace first pass by the mouth of the Eklutna River. As documented by ADFG, all of the Chinook salmon carcasses recovered by the Project Owners and NVE during spawning surveys in 2021 and 2022 originated from the Eklutna Tailrace Fishery and are therefore considered strays. A significant increase in the straying of adult Chinook and coho from the Eklutna Tailrace into the Eklutna River after implementation of the new flow regime may represent a loss of recreational fishing opportunities at the tailrace fishery, and there is currently no public access to the Eklutna

River[17] that would allow new recreational fishing opportunities for fish returning to the river. Because fish straying from the tailrace to the Eklutna River is anticipated and could affect recreational fishing opportunities, the Project Owners will conduct a study to determine hatchery fish straying from the Eklutna Tailrace to the Eklutna River as part of their Monitoring and Adaptive Management Plan. This study is described in Section 3.4.3.2.

3.3.3 Carbon Emissions

Flow releases to the Eklutna River will result in a reduction in generation at the Eklutna Power Plant. It is assumed that this generation will be replaced by natural gas to meet demand. Therefore, The Project Owners' Draft Program would result in increased carbon emissions of 6,900 metric tons of CO_2 equivalent annually. It should be noted that the social cost of carbon is not included in the overall Program costs presented in Section 3.5.

3.4 Monitoring and Adaptive Management Program

The PME measures described in the previous sections are based on the results of the 2-year study program, modeling, and extensive consultation. However, the Project Owners recognize there is some inherent uncertainty in modeling and data analysis. Therefore, following the implementation of the PME measures for fish and wildlife (Section 3.2), the following monitoring and adaptive management plan will be implemented to document both the implementation of PME measures and response of the Eklutna watershed to the introduction of instream flows. This approach allows for some flexibility and adjustments to PME measures, if needed.

3.4.1 Adaptive Management Committee

A committee will be established to execute the monitoring and adaptive management component of the Program. Th Committee will review the results of the monitoring program, maintain a monitoring database/archive, and decide on any appropriate actions under the adaptive management portion of the program as further described below. The Committee will consist of representatives from Parties to the 1991 Agreement (excluding the Project Owners) and the Native Village of Eklutna (NVE) and will be chaired by the Governor's designee.

3.4.2 Water Budgets

Use of a water budget is proposed for both year-round and channel maintenance flows; a water budget establishes a total volume of water available for release into the Eklutna River each water year (June 1 to May 31) based on the selected flow regimes. Adjustments to the

[17] The majority of the land around the Eklutna River is owned by Eklutna, Inc.

flow regimes may be made so long as the total volume of water to be released does not exceed the annual water budget.

3.4.2.1 Year-Round Instream Flows

The water budget for the year-round instream flow has a total volume of water available for release throughout the year of 24,280 acre-feet. The monthly volumes are shown in Table 3-5.

Table 3-5. Default Flow Regime and Water Budget for Year-Round Instream Flows.

Month	Flow (cfs)	Volume (acre-feet)
January	27	1,660
February	27	1,500
March	27	1,660
April	27	1,607
May	34	2,060
June	40	2,380
July	40	2,460
August	40	2,460
September	40	2,380
October	40	2,460
November	34	1,993
December	27	1,660
Total	**-**	**24,280**

If the entire water budget is not released into the Eklutna River in a given water year, then that "banked water" can be released in the subsequent water year. Up to 20% of the water budget from the previous water year can be banked for the subsequent water year. Water can only be banked for 1 year. If the water released into the Eklutna River in a given year exceeds the water budget, then that deficit will be carried over into the next water year.

3.4.2.2 Channel Maintenance Flows

The proposed channel maintenance flow regime is equivalent to a water budget of 971 acre-feet per channel maintenance flow event, or 2,913 acre-feet of water for each 10-year period. The water budget for each 10-year period must be used within that period and cannot be carried over to the following 10-year period. The first 10-year period starts the first full water year following the completion of the Eklutna River Release Facility.

3.4.3 Monitoring

The monitoring plan for the Eklutna River is described below.

3.4.3.1 Flow Monitoring

Accurate monitoring of the flow releases into the Eklutna River is essential to maintain compliance with the Program. A flow meter will be installed on the river release pipeline within the Eklutna River Release Facility. The accuracy of this meter is anticipated to utilize the ultrasonic transit time method and have an accuracy of ±1%.

To provide accurate monitoring of flow released through the dam outlet gate during a channel maintenance flow event, a rating curve tied to the design of the outlet gate shall be utilized, determining flow is a function of gate position and water surface elevation in the reservoir. The gate position will be monitored remotely via a new position feedback sensor within the electric motor operator of the gate. To monitor the water surface elevation of the reservoir, a new stilling well and pressure transducer will be located upstream of the gate within the entrance to the Eklutna Dam spillway channel. The addition of this transducer will avoid any potential inaccuracies with the existing USGS gauge measuring water surface elevation near the intake. The flow measurement at the gate is anticipated to have an accuracy of ±2%.

3.4.3.2 Other Monitoring Efforts

The Project Owners will provide a total of up to $270,000 to the Governor's designee to fund additional monitoring efforts in the Eklutna River over the length of the Program. This funding commitment is based on the estimated costs to conduct the monitoring efforts described below. These monitoring efforts are recommended by the Project Owners, but the Committee may revise the monitoring plan or seek supplemental funding to conduct additional monitoring efforts if desired.

Timing and Distribution of Returning Adult Salmon

Following the implementation of the Program, which includes release of year-round flows into the Eklutna River, it is recommend that the presence and distribution of spawning adult salmon be monitored. The methodology for these surveys should be identical to those completed during the Year 1 and Year 2 Eklutna River Fish Species Composition and Distribution Study, with the noted exception that surveys should continue beyond the confined canyon reach to assess not only whether salmon can pass through the canyon reach successfully to reach upstream habitats but also whether there are any changes in the timing of spawning migrations and spawning behavior over the monitoring period

It's recommended that surveys be conducted for a total of 5 years (need not be consecutive) at weekly intervals between June and October within the boundaries of safe river access for survey teams. The presence and disposition (i.e., live fish, carcass, completed redd) of anadromous salmon spawning should be documented.

Winter Egg Incubation and Juvenile Rearing Habitat

In stream systems like the Eklutna River, the complex interaction between winter water temperature, low stream flow, ice formation, habitat accessibility and suitability for stream-dwelling fish species all play a role in successful egg incubation and juvenile rearing. Therefore, the Project Owners recommend implementing a 3-year temperature monitoring study to evaluate whether winter rearing habitat for salmon is adequate to maintain survival, and whether winter conditions are adequate to maintain survival of incubating eggs in completed redds (spawning nests) observed during the adult spawning surveys.

It is recommended that temperature monitoring be implemented using continuous temperature loggers (thermistors) deployed at three to five locations that represent potential overwintering habitats for juvenile rearing and egg incubation. These sites should include established redds in glide habitat, deep pools such as the beaver pond complex in the lower river, and intermediate rearing habitats between Thunderbird Creek and the AWWU portal valve. Thermistors should be deployed in the fall in rearing habitats, and 1-2 weeks following redd construction for egg-incubation sites. They should be removed in the spring when access is possible. Temperature patterns indicative of freezing conditions would suggest unsuitable winter conditions at that site. The presence of accessible ice-free refuge for overwintering fish and ice-free or groundwater-fed incubation temperatures for eggs represents a suitable winter condition.

Sediment Grain Size in Spawning Reaches

The substrate goals of the channel maintenance flow regime are to maintain: (1) substrate in salmon spawning areas in the preferred grain size range for spawning (16-128 mm); (2) sub-surface substrate characteristics in spawning areas with a low percent of fine sediments (less than 12 percent of sub-surface material finer that 0.83 mm); and (3) substrate in spawning and rearing areas with low embeddedness (spawning and rearing visual embeddedness less than 25%).

The Project Owners recommend monitoring of substrate characteristics at selected monitoring transects to assess the effectiveness of the channel maintenance flow regime at meeting the substrate goals. Monitoring transects should include spawning and rearing areas within geomorphic reaches 2, 3, 4, 7, 8, and 9 (two transects per reach; geomorphic reaches are

shown in Dubé 2023). Specific transect locations should be selected in coordination with the Adaptive Management Committee and should include transects already established in these reaches as part of the Eklutna Geomorphology and Sediment Transport Study if feasible.

The monitoring should take place during low flows and include:

- Surficial grain size (pebble counts): measured prior to initial flow release and then after flows are established, total of 5 years (need not be consecutive). The pebble counts should be performed by selecting a clast every foot across the bankfull width of each transect. A minimum of 100 clasts (pebbles) should be measured; if less than 100 clasts are measured across the transect, another pass across the river should be made 1 foot downstream from the transect. Passes across the stream should continue until at least 100 clasts are measured and each pass should continue across the entire bankfull width of the river. Pebble size should be measured by passing through a gravelometer.

- Sub-surface sampling in spawning-sized gravel to assess percent fines: sample sub-surface substrate annually for a total of 5 years (need not be consecutive). One sub-surface bulk sample should be collected at each spawning transect and sieved to determine grain size distribution using the methods of Church et. al, (1987), with the hybrid method of Rice and Haschenburger (2004) applied to characterize the coarse tail of the bulk grainsize distribution as needed to minimize sub-surface sample size. The coarse fraction should be field-sieved and a sub-sample of the fine fraction taken for lab sieving.

- Visual assessment of substrate embeddedness in spawning and rearing habitat areas: measured prior to initial flow release and then after flows are established, total of 5 years (need not be consecutive). A visual assessment of embeddedness to the nearest quartile should be made at each transect prior to any pebble counts or sub-surface sampling.

Hatchery Fish Straying from the Eklutna Tailrace to the Eklutna River

All Chinook and coho carcasses (heads) observed in the Eklutna River during the adult salmon surveys should be collected and delivered to ADFG for stock origin analysis. The Project Owners will also coordinate annually with the ADFG Sportfish Division on whether there have been substantial changes to Tailrace Fishery escapement (as measured via angler days, catch per unit effort, etc.) that might result from Chinook and coho straying into the Eklutna River. If significant straying is observed, the Project Owners will work with ADFG to evaluate and determine the appropriate mitigation. Costs related to any mitigation for impacts to the tailrace fishery are not included in the anticipated costs described below in Section 3.5.

3.4.3.3 Reporting

The Project Owners will prepare an annual report that summarizes the water available for release in the subsequent water year and provide it to the Adaptive Management Committee by February 28 each year. An annual report that summarizes the monitoring results should be prepared by the Governor's designee and provided to the Project Owners and the Adaptive Management Committee by the same date.

3.4.4 Adaptive Management

The Adaptive Management Committee will meet annually in April of each year to review the results of the monitoring efforts conducted in the previous calendar year and determine what monitoring efforts should be conducted in the upcoming calendar year. The Committee must notify the Project Owners of the planned monitoring efforts for the upcoming year by July 1 of the previous year so that the Project Owners can budget accordingly.

Based on the results of the monitoring program, the Committee may request modifications to the default flow regime each year, as long as 1) the requested flows do not exceed the operational limitations of the Project infrastructure, 2) the total volume of water to be released in a given year still does not exceed 24,280 acre-feet (plus any banked water that might be available), and 3) the ramping rates conform to fisheries ramping rate requirements.

The Committee may also request modifications to the magnitude, duration, frequency, or shape of scheduled peak flow releases, as long as 1) the requested flows do not exceed the operational limitations of the Project infrastructure, 2) the total volume of water to be released in a ten-year period does not exceed 2,913 acre-feet, and 3) the ramping rates conform to fisheries ramping rate requirements.

The Committee must submit any requests for modifications to the flow regime or scheduled peak flows to the Project Owners by May 1 of each year. If the requested flows exceed the operational limitations of the Project infrastructure, the established water budgets, or the approved ramping rates, then the Project Owners may reject the requested flow modifications with supporting rationale. If the Project Owners reject the requested flow modifications, then they must notify the Committee so that the Committee may request alternative flows if desired.

The Project Owners are not responsible for responding to natural processes that result in undesirable conditions in the river such as debris flow associated with precipitation or earthquakes, beaver activity, large wood build-up, etc.

3.5 Anticipated Costs

A Class 4 OPCC with an accuracy range of -30% to +50% was developed for the capital improvements proposed in this Draft Program (see Appendix E). Both the capital costs and the O&M costs for the prosed improvements increased from the Class 5 OPCC in part due to modifications to the design that were requested by AWWU. The total anticipated costs for the Project Owners to implement the proposed Draft Program are presented below in Table 3-6.

Table 3-6. Cost Summary for the Proposed Fish and Wildlife Program.

Cost Description	Value
Capital Cost ($)[1]	$15,433,800
O&M Cost ($/Yr)	$315,900
Replacement Energy Cost ($/Yr)	$1,365,600
Monitoring Program Cost ($)	$270,000
Annualized Cost ($/Yr)	$3,485,000
Present Value of Annualized Costs ($)	$57,100,000
CEA Rate Impact (%)	+ 0.67%
MEA Rate Impact (%)	+ 0.87%
MOA Tax Impact ($/100k)	$0.54

[1] Capital costs at this level of design have an expected accuracy range of -30% to +50%.

4.0 Measures Not Selected for Fish and Wildlife Program

Section 4 presents alternative means of mitigating Project impacts that were identified by others and evaluated during the alternatives analysis process described in Section 2.0.

4.1 Higher Flow Releases from the AWWU Portal Release Facility

Of the 12 preferred alternatives, four proposals included construction of the AWWU portal release facility to deliver flow into the Eklutna River. Three of these comprehensive alternatives proposed flow regimes higher than that of the Project Owners' Draft Program proposal. The increased flows are technically feasible to be released at the AWWU portal and provide increased habitat; however, the incremental gains in habitat are minor and result in significantly larger incremental unit costs, as presented in Figure 4-1.

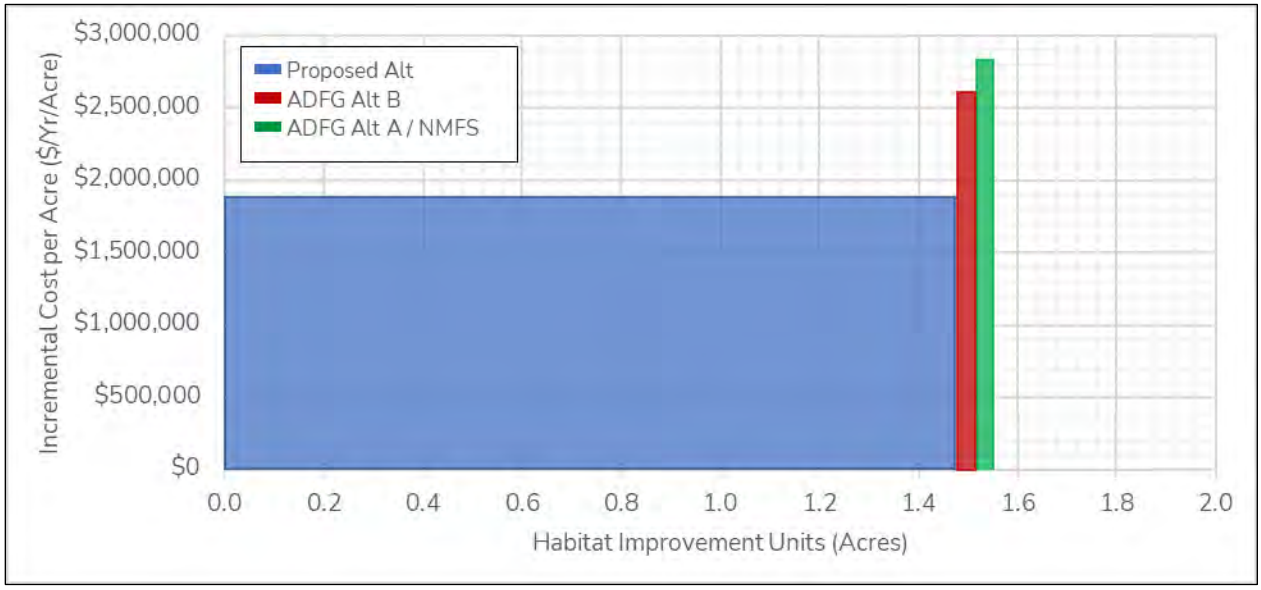

Figure 4-1. Incremental Cost Comparison – AWWU Portal Release Facility.

An additional means of analyzing the incremental gains of higher flow releases from the AWWU portal release facility is to quantify habitat improvements as a function of the maximum spawning habitat in the river. The Draft Program year-round flow release enhances 82% of maximum spawning habitat for Chinook and 84% of the maximum spawning habitat for coho. In comparison, the higher flow release alternatives from the AWWU portal release facility have minor gains of approximately 1% - 3% of Chinook spawning habitat and 0.2% - 0.3% of coho spawning habitat. A comparison of the habitat change as a percentage of maximum available riverine habitat is presented in Table 4-1.

Table 4-1. Habitat Gains Comparison – AWWU Portal Release Facility.

Comprehensive Alternative	Chinook		Coho	
	Flow Rate in July/Aug (cfs)	Habitat Gain (% of Max River Habitat)	Flow Rate in Sep/Oct (cfs)	Habitat Gain (% of Max River Habiat)
Selected Alternative	40	82%	40	84%
ADFG Alt B	60	83%	48	84%
ADFG Alt A	80	85%	57	84%

4.2 Flow Releases from the Existing AWWU Pipeline (RM 5.5)

The AWWU pipeline segment P-4 runs along the Eklutna River from RM 5.5 to RM 11.0. Similar to the design of the AWWU portal release facility, an alternative was originally proposed to build a river release structure on the existing pipeline at or near RM 5.5, to take advantage of additional pipeline pressure resulting in a more compact facility. This location would have also eliminated the need to improve upstream AWWU road fords. This alternative was ultimately not selected as a preferred alternative due to the significant reduction in habitat that would benefit from releases. A summary of the gains in habitat if the preferred flow regime is released at the AWWU portal location rather than RM 5.5 is presented in Table 4-2.

Table 4-2. Habitat Gains Comparison – AWWU Pipeline Release Facility.

Description	Chinook Spawning	Coho Spawning	Chinook Rearing	Coho Rearing
Habitat Gains (Acres) with AWWU Portal Releases	1.5	1.6	6.3	9.9
Habitat Gains (Acres) with AWWU Pipeline Releases	0.3	0.8	3.3	4.7
Incremental Cost ($/Yr/Acre) for AWWU Portal Releases	$1,833,000	$1,696,000	$428,000	$273,000
Incremental Cost ($/Yr/Acre) for AWWU Pipeline Releases	$8,486,000	$3,594,000	$860,000	$601,000

4.3 Flow Releases from a New Bypass Tunnel (RM 11.5)

As an alternative to the AWWU portal release facility, which utilizes the existing lake AWWU diversion tunnel, an alternative was brought forth to construct a new tunnel in parallel to the existing AWWU tunnel complete with a river release facility at RM 11.5. This alternative was ultimately not selected due to the substantial capital costs to provide the same environmental benefits as the AWWU portal release facility. A comparison of the new bypass tunnel release approach with the AWWU portal release facility is presented in Table 4-3.

Table 4-3. Habitat Gains Comparison – New Bypass Tunnel Release Facility.

Description	Chinook Spawning	Coho Spawning	Chinook Rearing	Coho Rearing
Habitat Gains (Acres) with Portal Releases	1.5	1.6	6.3	9.9
Habitat Gains (Acres) with New Bypass Tunnel	1.5	1.6	6.3	9.9
Incremental Cost ($/Yr/Acre) for Portal Releases	$1,833,000	$1,696,000	$428,000	$273,000
Incremental Cost ($/Yr/Acre) for New Bypass Tunnel	$5,373,000	$5,037,000	$1,279,000	$814,000

4.4 Flow Releases from the Existing Dam (RM 12)

A measure that was included in three of the 12 comprehensive alternatives proposed by stakeholder groups was to modify the existing dam to release water into the river continuously. In doing so, operations of the reservoir would need to change substantially from current operations. In an average year the water surface elevation fluctuates from El. 830.0 ft (local datum) to El. 867.0 ft with the ability to draw down to El. 814 ft if necessary. Releases year-round at the existing dam would require the reservoir to remain above El. 861 ft to maintain connectivity with the dam outlet gate. A representation of the proposed reservoir operation if flow releases were made at the existing dam compared to current operations is presented in Figure 4-2.

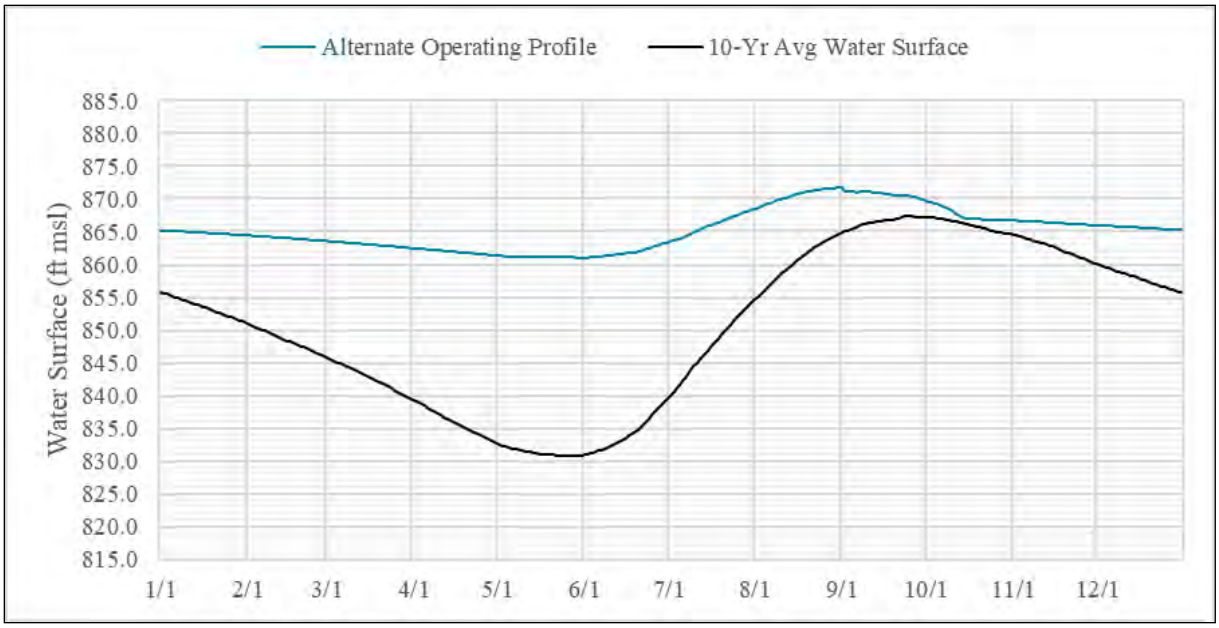

Figure 4-2. Water Surface Elevation Comparison – Existing Dam Releases.

This alternative was ultimately not selected due to the elimination of over 80% of the reservoir storage from being utilized for power generation purposes. Due to the reduction of inflows throughout the winter and the need for maintaining the reservoir above El. 861 for river release purposes, the powerhouse is unable to operate for up to eight months of the year. This results in a substantial loss of power generation when grid demand is highest, violates power capacity reserve requirements throughout the winter for MEA, and presents an unacceptable risk to the Project Owners.

4.5 Fish Passage

The Traditional Ecological Knowledge (TEK) from the Native Village of Eklutna (NVE) indicates that there was a sockeye salmon run in Eklutna Lake before the lower dam was constructed in 1929. However, in a 2011 report, the USACE stated “It is doubtful that significant numbers of sockeye salmon ever spawned in the Eklutna River drainage because suitable spawning area upstream of the lake is limited and water quality in the lake would likely have limited opportunities for spawning in the littoral zone of the lake. Fully 80 percent of the water entering Eklutna Lake comes from two glacial streams that would not be conducive to the consistent survival of sockeye salmon from egg to fry, and the remaining spawning area would not be sufficient to support large numbers of spawning anadromous salmon. In addition, the physical limnology studies of Eklutna Lake suggest that the turbidity in Eklutna Lake during much of the year is not conducive to significant primary production.”

A separate study was conducted by Loso et al. to try to determine "whether there was an anadromous salmon run into Eklutna Lake prior to 1929" by using marine derived nutrients (MDN) as a biochemical marker in lake sediment. The study found that there was no significant difference in the composition of sediment layers from before and after 1929. However, a sensitivity test was conducted to assess the possibility that a small salmon run may have gone undetected by the isotopic analysis. It was determined that "a salmon run of up to 1,000 per year, and potentially as many as 15,000 per year, would be possible without noticeably altering the measured isotopic composition of the sediments in Eklutna Lake." Therefore, the results "provide no evidence that such runs occurred, but do not preclude the possible existence of a relatively small sockeye fishery in Eklutna Lake before 1929."

To investigate further, the Project Owners conducted several surveys to quantify the potential spawning habitat around and above Eklutna Lake and evaluate the available nutrients, turbidity, and primary production in Eklutna Lake. The Project Owners also developed high level (5%) conceptual designs and cost estimates of four upstream fish passage measures and two downstream fish passage measures. In addition, the Project Owners evaluated the impact of these measures on reservoir operations. It should be noted that although several entities expressed interest in fish passage to Eklutna Lake during the study planning process, no requests were made for studies specific to the efficacy of introducing anadromous fish above the dam. It should also be noted that AWWU has raised concerns that the introduction of a large salmon run to Eklutna Lake could potentially impact the water quality of the public water supply and may necessitate additional water treatment. However, no studies were requested by AWWU to evaluate this potential impact.

The lake study results and justification for the exclusion of each measure from the Project Owners' Draft Program are presented in the following subsections.

4.5.1 Lake Studies

Much of the Eklutna Lake shoreline is steep, bouldery, or characterized by fine silt and grasses. The remaining shorelines that could be accessed during the study program (above the waterline) contained ~1.5 acres of potential habitat for lakeshore-spawning ocean-run salmon such as sockeye.

Most tributaries to Eklutna Lake are too steep to provide significant spawning or rearing habitat for ocean-run salmon. The only lake tributaries with accessible low-gradient habitat suitable for the migration and spawning of ocean-run salmon are the East and West Forks of Eklutna Creek where an estimated 0.77 – 3.61 acres of potential spawning habitat was documented based on water depth and substrate size. A small tributary to the West Fork of Eklutna Creek adds between 0.02 – 0.24 acres of potential spawning habitat.

Low water transparency (caused by high turbidity) and low nutrients levels in Eklutna Lake correlate with low levels of chlorophyll *a* (an indirect indicator of primary production). The low algal biomass within Eklutna Lake likely corresponds to low zooplankton densities (secondary production) and appears to be a limiting factor (i.e., food resource) for fish production in the lake, especially for the resident Kokanee population.

Spawning Kokanee collected from Eklutna Lake were smaller (4.5-6.5 inches) than those reported in many other lake systems (10–12 inches). The Kokanee in Eklutna Lake also differ from other Kokanee in their low fecundity (only 20-30 eggs), lack of sexual dimorphism, and lack of spawning color that is typical of the species (Figure 4-3). As previously stated, these are likely an indication of low nutrient concentrations and limited food sources in the environment, and may indicate that Eklutna Lake, in its existing condition, may not provide productive potential rearing habitat for large populations of ocean-run salmon.

Figure 4-3. Typical spawning Kokanee in Eklutna Lake (left) vs. other lake systems (right).

It has been theorized, but not studied, that if fish passage was provided into Eklutna Lake, the spawning salmon would bring enough marine derived nutrients with them. However, high turbidity in Eklutna Lake would still limit light penetration. The high turbidity in the lake is caused by runoff from the retreating Eklutna Glacier. Like the Eklutna Glacier, the nearby Skilak Glacier is also retreating. Elevated runoff from the retreating Skilak Glacier produces more silt (i.e. turbidity), blocking sunlight, reducing the euphotic zone, and diminishing zooplankton densities. The result is fewer zooplankton (e.g. copepods) available as a food resource for juvenile sockeye. Research by ADFG in 2004 showed that the average weight of juvenile sockeye in Skilak Lake was almost half of what was typical. If a critical summer weight size isn't achieved, overwinter survival of juvenile sockeye will be poor and at some point, will have a substantial impact on sockeye returns. As the Eklutna Glacier retreats further, we can expect a similar trend of increasing turbidity in Eklutna Lake as well.

It also important to note that no adult sockeye were observed spawning in the lower river during the 2-year study program. Therefore, any attempt to establish a sockeye salmon run in

the Eklutna watershed would either rely on sockeye straying from other river systems or intentional stocking efforts.

4.5.2 Upstream Passage Measures

4.5.2.1 Gravity Flow Fish Ladder

The gravity flow fish ladder measure includes the construction of a new technical fishway at the existing Eklutna Dam. The fish ladder would be of the weir and orifice or vertical slot style with an entrance below the dam and exit at fixed elevation on the upstream side of the dam. For proper function, the water surface elevation of the lake must maintain relatively constant during spawning season, resulting in the inability to utilize any of the reservoir storage for power generation purposes. For this reason, this alternative was not included in any of the preferred comprehensive alternatives.

4.5.2.2 Variable Exit Fish Ladder

The variable exit fish ladder measure is included in three of the 12 comprehensive alternatives proposed by stakeholders. The design and construction are similar to the gravity flow fish ladder measure; however, the exit includes a series of gates corresponding to varying water surface elevations which allow for approximately 15-feet of reservoir fluctuation. While allowing for some operational flexibility and continued hydropower generation, this alternative being combined with the existing dam structure for flow releases still requires the hydroelectric powerhouse to be offline throughout the winter, when power demand is the highest. For this reason, the variable exit fish ladder and release through the existing dam is not included as part of the Project Owners' Draft Program.

4.5.2.3 Fish Ladder with Pumped Water Supply and Slide

The fish ladder with pumped supply and slide measure includes the construction of a new technical fishway at the existing Eklutna Dam with a chute or slide to return fish to a lower water surface elevation within the lake. The fish ladder would be of the weir and orifice or vertical slot style with an entrance below the dam and exit at a false weir located at the dam. Water from the lake would be pumped continuously over the weir during spawning season providing attraction flow for salmon. From the false weir, migrating adults would fall into a chute or slide and enter Eklutna Lake at a reduced water surface elevation. While this alternative allows for operations of the reservoir for power supply purposes, the reliance on pumps for providing flow to the ladder presents a significant risk. Additionally, this method of fish passage has little to no precedence at existing dams. For these reasons this measure was not included in any of the stakeholder comprehensive alternatives.

4.5.2.4 Trap and Haul

A trap and haul facility was proposed to be combined with either the AWWU Portal Release or AWWU Pipeline Release measures. The proposal included the addition of a false weir, holding pond with crowder, and lift to transport migrating adults to a truck for transport to Eklutna Lake. While this measure would allow the Project Owners to maintain current reservoir operations and operate the powerhouse year-round, it was ultimately not selected as part of the Project Owners' Draft Program due to the lake studies concluding that Eklutna Lake has little to no productivity potential and would likely not support a healthy fishery as evidenced by the condition of kokanee residing in the lake. In addition, this upstream fish passage option received no support from any of the stakeholders.

4.5.3 Downstream Passage

4.5.3.1 Spill

One measure proposed for allowing downstream passage of out-migrating juvenile salmonids is to release a significant flow from the dam via a new spillway gate, or by uncontrolled release over the existing spillway from April through June. While this approach is viable, due to the size, depth, and layout of Eklutna Lake, a spill event on the order of 300-500 cfs would provide very low attraction velocities within the lake itself, resulting in substantially reduced efficacy of downstream passage. Additionally, the volume of water released in a spill event of this magnitude for a duration of up to 3 months results in a significant portion of the reservoir annual inflow volume being utilized for downstream passage rather than for power generation purposes. For these reasons spill is not being proposed for downstream passage as part of the Project Owners' Draft Program.

4.5.3.2 Floating Surface Collector

To preserve water for power supply purposes, an alternate method for downstream passage was proposed, consisting of a floating surface collector located at or near the intake or the lake outlet. This floating barge structure would consist of guidance screens and attraction flow pumps moving approximately 500 cfs through the screens to attract and capture migrating juveniles. A primary concern with the usage of floating surface collector for downstream passage is that the barge must operate in ice-free conditions. At Eklutna Lake, ice breakups typically occur in May to June, which results in the floating surface collector being inoperable for 50%-70% of the outmigration window. Additionally, as presented in the cost estimate summary, these structures have substantial capital and operating expenses. For these reasons, the floating surface collector has not been included as part of the Project Owners' Draft Program.

4.5.4 Other Downstream Passage Measures

During the Aquatics TWG meeting on November 9, 2022, two other downstream fish passage measures were discussed: 1) volitional downstream fish passage through the existing intake, and 2) trap and haul downstream fish passage utilizing a rotary screw trap and guide net. However, after preliminary evaluation, it was determined that neither of these measures would have a high success rate; therefore, neither measure was selected by the Aquatics TWG for further evaluation.

4.6 Replacement Dam

The base of the existing Eklutna Dam is located on a depositional shelf approximately 200-ft higher in elevation than the deepest portion of Eklutna Lake and approximately 60-ft higher in elevation than the intake elevation for the power tunnel. As described in Section 4.4, providing continuous releases to the Eklutna River from the existing dam significantly curtails power generation and reduces the active storage volume of the reservoir by over 80%. An alternative proposed to reduce restrictions on reservoir operations while providing year-round hydroelectric generation involves the excavation of the depositional shelf at the existing dam and construction of a replacement dam in its place. The excavation would require construction of a channel approximately 20-ft deep, 50- to 350-ft in width, and 1-mile in length resulting in removal of approximately 550,000 cubic yards of material. The replacement dam would have an overall height of approximately 56-feet and incorporate a spillway and fish passage structures.

This alternative would restrict the minimum reservoir operating elevation to El. 840, removing approximately 40% of the storage capacity of the reservoir. While this allows operation of the Eklutna Power plant year-round in an average water year, it requires some operational restrictions and reduces flexibility in hydropower generation seasonally.

The replacement dam is included in four of 12 comprehensive alternatives proposed by stakeholder groups. While the replacement dam concept continues to allow hydroelectric generation year-round, the cost of this measure and loss of reservoir capacity are the primary reasons it is not included within the Project Owners' proposed Draft Program. Dependent on the measure chosen for downstream fish passage, the replacement dam alternatives range from a capital cost of approximately $120M to $180M[18] which results in a significant additional burden on ratepayers and taxpayers. A summary of the costs of the replacement

[18] The cost estimate for the replacement dam measure was developed in close coordination with Eklutna Inc. and has a median construction cost of $113M with a class 5 estimate range of $57M to $220M. Following development of the original estimate, Eklutna Inc. had recommended a few revisions to the costs including providing a new location for material disposal which resulted in a potential cost savings of approximately $25M. The revision falls within the price range of the original estimate and will be considered if the design of this measure is advanced.

dam comprehensive alternatives compared to the Project Owners' proposed fish and wildlife alternative is presented in Table 4-4.

Table 4-4. Cost Comparison Summary – Replacement Dam.

Comprehensive Alternative	Alternative Measure	Capital Cost ($)	Annualized Cost ($/Yr)	CEA Rate Impact (%)	MEA Rate Impact (%)	MOA Tax Impact ($/100k)
Selected Alternative	Portal Release Facility	$8,862,000	$2,743,000	0.53%	0.84%	$0.51
TCF Alt A	Replacement Dam	$118,129,000	$19,776,000	3.81%	5.31%	$4.46
NVE	Replacement Dam	$122,853,000	$22,006,000	4.24%	6.10%	$4.62
USFWS Alt A	Replacement Dam	$158,719,000	$23,483,000	4.61%	5.50%	$7.48
NMFS	Replacement Dam	$177,833,000	$25,465,000	4.91%	5.89%	$8.32

4.7 Lach Q'atnu Creek Reroute

A proposal to provide year-round natural flows into the Eklutna River included the re-route of Lach Q'atnu Creek from its current path into Eklutna Lake to a location approximately 1,000 feet downstream of Eklutna Dam. Stream gauging records of the creek as part of the study program revealed negligible inflows in the winter (<1 cfs) with daily mean flow rates >10 cfs for about 30 days in the summer. Engineering challenges with the proposed reroute of the creek involve the risk of channel migration through the alluvial fan over time and the encroachment onto private property in the vicinity of the proposed alignment. For these reasons the cost associated with the re-routing combined with the risk of impacting private property deemed this alternative unsuitable for further analysis and was excluded from all preferred alternatives.

4.8 Physical Habitat Manipulation

As part of adapting the river to a new flow regime, physical habitat manipulations were proposed including measures such as re-routing, widening, or deepening main and side channels, construction of beaver dam analogs, engineered log jams, or post assisted log

structures, and placement of boulders or other improvements to encourage scour or deposition to improve fish habitat in the river. Federal funding is currently being pursued separately by NVE, USFWS, and other entities, thus any additional work regarding physical habitat manipulation in the river is excluded from the Project Owners' Draft Program.

4.9 Lakeside Trail Repairs

A recreational related measure evaluated as part of the study program involved repairing portions of the Eklutna Lakeside Trail that have historically been damaged by erosion, some of which was related to high lake water elevations. Repairs of the lakeside trail are currently underway by organizations funded by the State of Alaska, thus any additional work on the trail system is excluded from the Project Owners' Draft Program.

4.10 Trapping Facility with Hatchery Spawning, Rearing, and Release

During the Aquatics TWG meeting on November 9, 2022, the concept of a trapping adult salmon at the flow release point, spawning the adult salmon and rearing the juvenile salmon at a hatchery, and then releasing the juvenile salmon back into the Eklutna River. This method would likely result in a higher survival rate which would accelerate the salmon population growth in the river. However, the Aquatics TWG strongly opposed the idea of a hatchery; therefore, this measure was not selected by the Aquatics TWG for further evaluation.

5.0 Summary of Draft Fish and Wildlife Program and Rationale

The Project Owner's Draft Program includes the following elements:

- The Project Owners will release year-round instream flow from Eklutna Lake into Eklutna River from the new Eklutna River Release Facility located adjacent to the AWWU portal valve approximately one mile downstream from the dam. This will water 11 of 12 miles of the Eklutna River.

- The year-round flow will vary seasonally between 27 cfs in the winter and 40 cfs in the summer as shown in Figure 3-2.

- The Project Owners will conduct channel maintenance flows 3 out of every 10 years by releasing water concurrently from the existing dam outlet gate and the Eklutna River Release Facility. The Project Owners will automate the dam outlet gate, including providing power for the automation, to facilitate flow release.

- Channel maintenance flows will be ramped up to 220 cfs over the first 6 hours, be held at 220 cfs for 24 hours, and then be ramped back down over 52 hours as shown in Table 3-3.

- The Eklutna River Release Facility will not reduce the water supply or restrict the ability of AWWU to withdraw water from Eklutna Lake. Hydraulic restrictions will be in place limiting the maximum flow able to be diverted to the Eklutna River Release Facility while still maintaining the maximum flow able to be withdrawn for treatment at the Eklutna Water Treatment Facility. The River Release Valve actuator stroke timing will be set to minimize transient pressure surges within the AWWU diversion tunnel and pipelines during operation. Redundant flow meters and pressure transducers will be implemented to minimize the risk of a fault causing emergency closure of the existing AWWU intake valve. The facilities will be designed to provide flows into the river in the event of a power failure or loss of communication to the facility.

- The Project Owners will construct eight bridges over the Eklutna River on the AWWU access road to replace the existing ford crossings, so AWWU has reliable access to maintain their pipeline.

- A Monitoring and Adaptive Management Program will be implemented as described in Section 3.4, which includes the following:

- Use of water budgets for year-round and channel maintenance flows.
- Monitoring flow release at the Eklutna River Release Facility through use of a flow meter installed on the river release pipeline within the facility.
- Monitoring flow release at the Eklutna Dam outlet gate utilizing a gate rating curve, position feedback on the actuator, and a new level monitoring transducer within the lake.
- Monitoring the distribution and timing of adult salmon by conducting surveys for 5 years at weekly intervals between June and October.
- Monitoring winter incubation and rearing habitat by implementing a 3-year temperature monitoring study using continuous temperature loggers (thermistors) deployed at 3-5 locations that represent potential overwintering habitats for juvenile rearing and egg incubation.
- Monitoring sediment grain size in spawning reaches at selected monitoring transects annually for 5 years.
- Monitoring hatchery fish straying from Eklutna Tailrace into Eklutna River by collecting Chinook and coho carcasses (heads) observed in the Eklutna River during the annual salmon distribution and periodicity monitoring and delivering them to ADFG for stock origin analysis.

The Project Owners selected the Draft Program elements for the following reasons:

- The year-round and channel maintenance flows are the most cost-effective options in terms of fish habitat gains, creation and maintenance of channel dimensions, and substrate characteristics that support physical fish habitat in the Eklutna River over the long term.
- The Draft Program has the least impact on Chugach and MEA's ratepayers and MOA's property taxpayers of all the evaluated comprehensive alternatives while meeting the Project Owners' obligation to mitigate Project impacts to fish and wildlife.
- The Draft Program allows continued year-round operation of the Project and the benefits it provides including generation of cost-effective, carbon-free, flexible hydroelectric power for the electric customers in Anchorage and the surrounding area and contribution to Alaska's renewable energy goals.

- The monitoring and adaptive management plan helps to manage the inherent uncertainty associated with modeling of complex natural systems by allowing for continued knowledge to be gained and adjustments to the proposed measures to be considered.

6.0 Next Steps

The schedule for the remainder of the consultation process is outlined in Table 6-1 below.

Table 6-1. Next Steps.

Responsible Party	Milestone	Timeframe
Project Owners	Distribute the Draft Fish and Wildlife Program to the Parties and NVE.	October 27, 2023
Parties and NVE	Review and provide comments to the Project Owners.	November 2023
Project Owners	Meet with the Parties and NVE to attempt to resolve any differences.	December 2023
Project Owners	Conduct public meetings in Anchorage and the Mat-Su Valley.	Week of January 15, 2024
Project Owners	Submit the Proposed Final Fish and Wildlife Program to the Governor.	April 2024
Parties and NVE	Review and provide comments to the Governor.	May/June 2024
Project Owners	Provide responses to the Governor.	July 2024
Governor	Issues the Final Fish and Wildlife Program.	October 2024
Project Owners	Design and Permitting.	2024-2027
Project Owners	Contracting, Requisitioning, and Construction.	2027-2032
Project Owners and Committee	Monitoring and Adaptive Management	2033-2059

6.1 Review and Comment Period

Per the 1991 Agreement, the Project Owners have distributed this Draft Program and Draft Summary of Study Results to the Parties; it has also been provided to NVE for an initial opportunity to review. The Parties and NVE will have 30 days to review and provide comments to the Project Owners.

6.2 Attempt to Resolve Differences

Per the 1991 Agreement, if any of the Parties' or NVE's comments or recommendations differ from the Project Owners, the Project Owners will attempt to resolve such differences giving due weight to the recommendations, expertise, and statutory responsibilities of the Parties. The Project Owners will hold individual meetings to discuss differences and attempt to come to a resolution.

6.3 Public Meetings

Per the 1991 Agreement, once comments and recommendations have been received from the Parties and NVE, the Project Owners will hold four public meetings, two in Anchorage and two in the Matanuska Valley. For each location, one meeting will be held in the afternoon and one in the evening. All four meetings will be held the week of January 15, 2024 in an open house style with a brief presentation followed by an opportunity for participants to meet with the Project Owners and their technical team, ask questions, and submit comments. Members of the public will also have an opportunity to submit comments via email to info@eklutnahydro.com.

6.4 Proposed Final Fish and Wildlife Program

The Project Owners are planning to submit their Proposed Final Program with all supporting information to the Governor in April 2024. An agreement with AWWU regarding interconnection and transportation services will be needed before then. After the Final Proposed Program is submitted to the Governor, the Parties will have a 60-day period in which they can provide comments directly to the Governor on the Project Owners' Proposed Final Program. The Project Owners will then have a 30-day comment period in which they can provide any final information to the Governor for consideration.

6.5 Governor's Issuance of a Final Fish and Wildlife Program

The Governor is required by the 1991 Agreement to review the Proposed Final Program as well as any comments or recommendations for alternative PME measures while giving equal consideration to:

1. Efficient and economical power production
2. Energy conservation
3. The protection, mitigation of damages to, and enhancement of fish and wildlife (including related spawning grounds and habitat)
4. The protection of recreational opportunities
5. Municipal water supplies
6. The preservation of other aspects of environmental quality
7. Other beneficial public uses
8. Other requirements of State law

The Project Owners anticipate the Governor's issuance of a final approved Fish and Wildlife Program no later than October 2, 2024.

6.6 Additional Requirements to Implementing the Fish and Wildlife Program

Upon the Governor's approval of the Fish and Wildlife Program, the Project Owners then have three years to achieve the following additional requirements that are preconditions to the Project Owners' ability to implement the Fish and Wildlife Program. Should any of these requirements fail to be achieved, the Project Owners will not be able to execute on the Fish and Wildlife Program.

- **Permits:** Various state and local permits may be required in relation to construction activities, environmental matters, and more.
- **Land Rights and Easements:** Various land rights (rights of way, easements, etc.) will be required for both temporary and permanent infrastructure related to constructing the Eklutna River Release Facility.
- **Amendment of ADL 44944:** The Project Owners' current Certificate of Appropriation must be amended by ADNR in order to allow the Project Owners to convey water to the Eklutna River for the purposes of complying with the Fish and Wildlife Program and to protect such in-stream flows in order to maintain appropriate fish and wildlife habitat thereto.

Appendix A. Consultation Record

Eklutna Hydroelectric Project
Consultation Record

Initial Consultation Meetings

Item No.	Stakeholders	Date	Meeting Type	Description
1	AWWU	3/18/2019	In-person Meeting	Initial Consultation
2	Eklutna Inc.	3/19/2019	In-person Meeting	Initial Consultation
3	ADFG	3/19/2019	In-person Meeting	Initial Consultation
4	ADNR – Water	3/20/2019	In-person Meeting	Initial Consultation
5	TCF	3/20/2019	In-person Meeting	Initial Consultation
6	NVE	3/26/2019	In-person Meeting	Initial Consultation
7	NMFS	3/26/2019	In-person Meeting	Initial Consultation
8	ADEC	3/26/2019	In-person Meeting	Initial Consultation
9	USFWS	3/27/2019	In-person Meeting	Initial Consultation
10	ADOT&PF	4/8/2019	In-person Meeting	Initial Consultation
11	USACE	4/10/2029	In-person Meeting	Initial Consultation
12	ADNR – State Parks	4/10/2019	In-person Meeting	Initial Consultation
13	ADNR – OHA	4/11/2019	In-person Meeting	Initial Consultation
14	ARRC	4/11/2019	In-person Meeting	Initial Consultation

Group Stakeholder Meetings

Item No.	Stakeholders	Date	Meeting Type	Description
1	All Interested Stakeholders	7/16/2019	In-person Meeting	Follow-up Technical Discussion
2	All Interested Stakeholders	11/15/2019	Video Conference	Quarterly Project Update
3	All Interested Stakeholders	2/13/2020	Video Conference	Quarterly Project Update
4	All Interested Stakeholders	4/16/2020	Video Conference	Review Comments on the Draft IIP, Review the Information Matrix, and Establish the Aquatics TWG
5	All Interested Stakeholders	6/2/2020	Video Conference	Quarterly Project Update
6	All Interested Stakeholders	9/10/2020	Video Conference	Quarterly Project Update
7	All Interested Stakeholders	1/28/2021	Video Conference	Quarterly Project Update
8	All Interested Stakeholders	5/4/2021	Video Conference	Quarterly Project Update
9	All Interested Stakeholders	1/28/2021	Video Conference	Quarterly Project Update
10	All Interested Stakeholders	8/23/2021	Video Conference	Quarterly Project Update
11	All Interested Stakeholders	10/20/2021	Video Conference	Quarterly Project Update
12	All Interested Stakeholders	2/9/2022	Video Conference	Quarterly Project Update
13	All Interested Stakeholders	6/2/2022	Video Conference	Quarterly Project Update
14	All Interested Stakeholders	11/16/2022	Video Conference	Quarterly Project Update
15	All Interested Stakeholders	6/9/2023	Video Conference	Quarterly Project Update

Anchorage Assembly Meetings

Item No.	Stakeholders	Date	Meeting Type	Description
1	Anchorage Assembly	2/12/2020	Worksession	Project Overview, 1991 Agreement, Schedule, Consultation to Date, and Next Steps
2	Enterprise and Utility Oversight Committee	10/15/2020	Video Conference	Quarterly Project Update
3	Watershed and Natural Resources Advisory Commission	1/27/2021	Video Conference	Project Overview and Efforts to Date
4	Enterprise and Utility Oversight Committee	3/18/2021	Video Conference	Quarterly Project Update
5	Enterprise and Utility Oversight Committee	6/17/2021	Video Conference	Quarterly Project Update
6	Enterprise and Utility Oversight Committee	10/21/2021	Video Conference	Quarterly Project Update
7	Enterprise and Utility Oversight Committee	2/17/2022	Video Conference	Quarterly Project Update
8	Enterprise and Utility Oversight Committee	7/21/2022	In-person w/ Video Conference Option	Quarterly Project Update
9	Enterprise and Utility Oversight Committee	11/17/2022	In-person w/ Video Conference Option	Quarterly Project Update
10	Enterprise and Utility Oversight Committee	3/16/2023	In-person w/ Video Conference Option	Quarterly Project Update
11	Anchorage Assembly	7/14/2023	Worksession	Study Results, Alternatives Analysis, and Next Steps

Additional Meetings with Native Village of Eklutna (NVE) Tribal Council and Administration

Item No.	Stakeholders	Date	Meeting Type	Description
1	NVE, CEA, MEA, MOA	9/30/2020	In-person Meeting	Share the History of the Eklutna People and Surrounding Area
2	NVE, CEA, MEA, MOA	6/3/2023	Video Conference	Project Update
3	NVE, CEA, MEA, AWWU	9/14/2023	Site Visit	Study Flow Releases
4	NVE, CEA, MEA, MOA	10/19/2022	In-person Meeting	Share the History of the Eklutna People and Surrounding Area, Project Update, and Opportunities to Collaborate
5	NVE, CEA	6/29/2023	In-person Meeting	Meeting with Board of Directors
6	NVE, MEA	8/7/2023	In-person Meeting	Meeting and Site Visit with Board of Directors

Technical Working Group (TWG) Meetings

Item No.	Stakeholders	Date	Meeting Type	Description
1	Aquatics TWG	7/15/2020	Video Conference	Site Recon Prep, and Additional Data Collection Updates
2	Aquatics TWG	7/23/2020	Video Conference	Site Recon Debrief, Additional Data Collection Updates, and Kick-off Study Planning
3	Aquatics TWG	9/3/2020	Video Conference	Proposed Study Program Framework, Study Plan Outline, and Study Planning Schedule

4	Aquatics TWG	11/30/2020	Video Conference	Review and Discuss Draft Year 1 Study Plans
5	Aquatics TWG	12/21/2020	Video Conference	Review and Address Comments on Draft Instream Flow and Geomorphology Study Plans
6	Aquatics TWG	1/26/2021	Video Conference	Present Hydro Operations Model, and Review Revised Study Plans
7	Aquatics TWG	4/21/2021	Video Conference	Update on Proposed Final Study Plans, Permits / Authorizations, Consents / Waivers, Engineering for Study Flow Releases, and Other Stakeholder Engagement
8	Aquatics TWG	6/9/2021 – 6/10/2021	Site Visit	Establish Transect Locations for the Instream Flow and Geomorphology Studies
9	Aquatics TWG	8/23/2021	Video Conference	Update on Concurrence Letters, Permits and Authorizations, MOAs and Consents, Gate Replacement, and Other Field Work
10	Recreation TWG	11/8/2021	Video Conference	Review Results from Lakeside Trail Erosion Study, Recreation Study Goals, Methods, and Planning Schedule
11	Cultural TWG	11/8/2021	Video Conference	Discuss Confidentiality, Area of Potential Effect, Cultural Study Goals, Methods, and Planning Schedule

12	Terrestrial TWG	11/9/2023	Video Conference	Discuss Terrestrial Study Goals, Methods, and Planning Schedule
13	Aquatics TWG	11/9/2023	Video Conference	Discuss Results from Year 1 Aquatics Studies, and Proposed Year 2 Aquatics Studies
14	Terrestrial TWG	3/21/2022	Video Conference	Discuss Comments on Draft Terrestrial Study Plans, Review Field Work Schedule, and Permitting Needs
15	Recreation TWG	3/21/2022	Video Conference	Discuss Comments on Draft Recreation Study Plan, Review Field Work Schedule, and Permitting Needs
16	Cultural TWG	3/22/2022	Video Conference	Discuss Comments on Draft Cultural Study Plan, TEK Assessment Update, Review Permitting Needs
17	Aquatics TWG	3/24/2022	Video Conference	Discuss Comments on Draft Year 2 Study Plans (Water Resources and Engineering Studies), Review Field Work Schedule, and Permitting Needs
18	Aquatics TWG	3/25/2022	Video Conference	Discuss Comments on Draft Year 2 Study Plans (Geomorphology, Fish, and Instream Flow Studies), Review Field Work Schedule, and Permitting Needs
19	Cultural TWG	4/8/2022	Video Conference	Discuss Area of Potential Effect, Confidentiality Protocol, and TEK Assessment Update

20	Aquatics TWG	4/18/2022	Video Conference	Established Habitat Suitability Curves for the Instream Flow Study
21	Aquatics TWG	9/28/2022	In-person w/ Video Conference Option	Discuss Preliminary Instream Flow Modeling Results and Potential Engineering Solutions for Providing Year-Round Flows
22	Aquatics TWG	10/17/2022	In-person w/ Video Conference Option	Discuss Preliminary Geomorphology Modeling Results and Potential Engineering Solutions for Providing Peak Flows
23	Aquatics TWG	11/9/2022	In-person w/ Video Conference Option	Discuss Preliminary Lake Study Results and Potential Engineering Solutions for Providing Fish Passage
24	Aquatics TWG	2/13/2023	Video Conference	Review 2D Modeling
25	Aquatics TWG	3/28/2023	In-person w/ Video Conference Option	Review Draft Year 2 Study Reports, Present Winter Flow Analysis, Review Conceptual Designs and Cost Estimates
26	Terrestrial TWG	3/29/2023	In-person w/ Video Conference Option	Review Draft Terrestrial Study Reports
27	Recreation TWG	3/29/2023	In-person w/ Video Conference Option	Review Draft Recreation Study Report
28	Cultural TWG	3/30/2023	In-person w/ Video Conference Option	Review Draft Cultural Study Report

Meetings to Discuss Potential Funding Opportunities

Item No.	Stakeholders	Date	Meeting Type	Description
1	Hosted by USFWS, NVE, ADFG, CEA, MOA	3/1/2023	In-person w/ Video Conference Option	Discuss Perceived Gaps in the Current Analysis and Upcoming Funding Opportunities
2	Hosted by USFWS, NVE, ADFG, CEA, MOA, MEA, NMFS, TU	3/24/2023	Video Conference	Discuss Upcoming Funding Opportunities, Who May Qualify, Restrictions, Due Dates, Objectives, and Next Steps

Meetings to Discuss Additional Infrastructure Options

Item No.	Stakeholders	Date	Meeting Type	Description
1	USFWS, NVE	3/17/2023	Video Conference	Discuss Details for Additional Infrastructure Options: 1) Nature-like Fishway, and 2) Replacement Dam
2	Eklutna, Inc.	4/17/2023	Video Conference	Discuss Details for Replacement Dam, Including Excavation Cost Assumptions
3	Eklutna, Inc.	8/11/2023	Video Conference	Discuss Replacement Dam Concept
4	Eklutna, Inc.	9/6/2023	Video Conference	Discuss Replacement Dam Construction and Excavation Projections

Alternatives Analysis Meetings

Item No.	Stakeholders	Date	Meeting Type	Description
1	CEA, MOA, MEA, AEA, ADFG, ADNR, State Parks, OHA, NMFS, USFWS, NVE, TU	4/6/2023	In-person w/ Video Conference Option	Present Potential Instream Flow Regimes, Introduce CE/ICA Model, Review Comprehensive Alternatives Request Form
2	CEA, MOA, MEA, AEA, ADFG, State Parks, USFWS, NVE, Eklutna Inc., TU, TCF	5/17/2023	In-person w/ Video Conference Option	Review Conceptual Design and Cost Estimate for the Replacement Dam, Review Comprehensive Alternatives and Modeling Results
3	CEA, MOA, MEA, AEA, ADFG, ADNR, State Parks, NMFS, NVE, Eklutna Inc., AWWU, TU, TCF	6/14/2023	In-person w/ Video Conference Option	Discuss Feasibility of Downstream Fish Passage, Lake/Tributary Habitat, Review the Revised Comprehensive Alternatives and Modeling Results
4	CEA, MOA, MEA, AEA, ADFG, ADNR, State Parks, OHA, NMFS, USFWS, NVE, Eklutna Inc., AWWU, TCF	7/12/2023	In-person w/ Video Conference Option	Review Preferred Alternatives and Modeling Results, Discuss Impacts to Wetlands, Wildlife, and Recreation
5	CEA, MOA, MEA, AEA, ADFG, ADNR, OHA, NMFS, USFWS, NVE, Eklutna Inc., AWWU, TU, TCF	8/9/2023	In-person w/ Video Conference Option	Discuss Cultural Resources, Feasibility of the Hybrid Flow Release Alternative, Potential Monitoring Studies and Adaptive Management

Appendix B. Comparison to Baseline Conditions

Eklutna Hydroelectric Project
Comparison to Existing Conditions

Evaluation Parameter	Existing Conditions	Draft Fish and Wildlife Program
Instream Flows		
Year-Round Base Flows	There are currently no year-round flow releases from Eklutna Lake into the Eklutna River. There is some accretion (~4-6 cfs) between the Project Dam and the Thunderbird Creek (TBC) confluence. TBC mean daily flows peaked in June (81 cfs in 2021; 182 cfs in 2022) and ranged from 7 cfs to 27 cfs in the winter.	Provides year-round base flows from Eklutna Lake to the Eklutna River by utilizing the existing AWWU tunnel. This provides flow to 11 out of 12 miles of the river, varying from 40 cfs in the summer to 27 cfs in the winter.
Periodic Peak Flows	There have been 10 spill events since the current dam was constructed in 1965 (every 6 years on average). Spill events occurred between August and October, ranged in magnitude from 18 cfs to 1,022 cfs, and ranged in duration from 8 days to 74 days.	Provides peak flows in 3 out of 10 years utilizing a combination of flows from the AWWU portal valve and the drainage outlet gate at the base of the dam. Peak flows will occur in the fall, ramp up from 40 cfs to 220 cfs over 6 hours, hold at 220 cfs for 36 hours, then ramp back down to 40 cfs over 52 hours.
Water Quality		
Temperature	Winter water temperatures in the Eklutna River above the TBC confluence ranged from 0.9°C to 3.3°C on average. Peak water temperatures in the Eklutna River above the TBC confluence ranged from 6.2°C to 9.3°C in 2021 and from 7.6°C to 9.7°C in 2022. This meets ADEC water quality criteria (≤15°C).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. The water temperature in Eklutna Lake at the intake depth ranges from ~3°C in the winter to ~10-12°C in the summer, which meets ADEC water quality criteria (≤15°C).
Dissolved Oxygen (DO)	DO in the Eklutna River above the TBC confluence is >10mg/L throughout the year. This meets ADEC water quality criteria (≥7mg/L).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. DO in Eklutna Lake at the intake depth is >10mg/L

		throughout the year, which meets ADEC water quality criteria (≥7mg/L).
pH	pH in the Eklutna River above the TBC confluence ranged from 7.8 to a maximum of 8.6 in the summer, just above the ADEC criteria (8.5).	Flow releases to the Eklutna River would come from the existing intake at Eklutna Lake. pH in Eklutna Lake at the intake depth ranged from 7.9 to 8.1, which meets ADEC water quality criteria (8.5).
Geomorphology		
Substrate	Salmon prefer a substrate size of 16-128 mm for spawning gravel. - Coho prefer 16-64 mm - Chinook prefer 64-128 mm The average substrate size where salmon are currently spawning (below the TBC confluence) is ~25-30 mm. The average substrate size above the canyon from: - RM 5 to 6.5 ranges from ~75-16 mm (good for spawning) - RM 6.5 to 10 is <16 mm (bad for spawning) - RM 10 to 11 is ~16-64 mm (good for spawning)	The sediment transport modeling results indicate that the proposed peak flows will maintain the preferred substrate size of 16-128 mm throughout the majority of the potential spawning reaches in the Eklutna River, with significant improvements from RM 6.5 to 10.
Fish Passage		
Canyon Reach	The minimum flow required for adult salmon to migrate up through the canyon is ~40 cfs. Flows in the canyon currently range from ~4-6 cfs. Therefore, adult salmon are currently unable to migrate through the canyon.	Modeling indicates that the proposed 40 cfs flow release from the AWWU portal valve in the summer, plus the ~4-6 cfs of accretion above TBC, should allow adult salmon to migrate through the canyon.
Beaver Dams	There are several beaver dams in the Eklutna River below the railroad bridge. However, adult salmon have been observed above those dams, which indicates that they are not a barrier to upstream fish passage. There are 6 additional beaver dams above the canyon, the largest of which is 6 feet tall. It is unknown if	It is likely that increased flows in the Eklutna River will encourage beavers to build their dams on side channels instead of in the main channel, which should allow unimpeded upstream fish passage.

	these are a barrier to fish passage since adult salmon currently cannot reach this section of the river.	
Project Dam	The dam does not currently have any volitional fish passage facilities; however, adult salmon are not currently able to reach the dam due to insufficient flows. Trap and haul of fish from the river into the lake is not currently being done.	The Draft Program does not propose any volitional or trap and haul fish passage into or out of Eklutna Lake.
Spawning Habitat		
Chinook	0.7 acres	2.2 acres (this is a 209% increase and represents 96.5% of the max available habitat below the AWWU portal valve and 81.7% of the max available habitat in the Eklutna River)
Coho	2.5 acres	4.1 acres (this is a 65% increase and represents 99.6% of the max available habitat below the AWWU portal valve and 83.7% of the max available habitat in the Eklutna River)
Pinks	Pink salmon are known to utilize the lower Eklutna River for spawning; however, spawning habitat for pink salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit pink salmon.
Chum	Chum salmon are known to utilize the lower Eklutna River for spawning; however, spawning habitat for chum salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit chum salmon.
Sockeye	No adult sockeye salmon were observed spawning in the Eklutna River by the Project Owners or NVE.	While the year-round flow releases may technically create spawning habitat for sockeye in the Eklutna River, sockeye generally rear in lakes and the Draft Program does not propose fish passage into Eklutna Lake. Therefore, any sockeye habitat that may technically be created in the Eklutna River is not shown here.
Rearing Habitat		
Chinook	11.8 acres	18.1 acres (this is a 53% increase)

		It should also be noted that beaver dams in the river above the canyon may create additional rearing habitat; however, this was not quantified.
Coho	14.7 acres	24.6 acres (67% increase) It should also be noted that beaver dams in the river above the canyon may create additional rearing habitat; however, this was not quantified.
Pinks	Pink salmon are known to utilize the lower Eklutna River for rearing; however, rearing habitat for pink salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit pink salmon.
Chum	Chum salmon are known to utilize the lower Eklutna River for rearing; however, rearing habitat for chum salmon was not quantified.	The Aquatics TWG agreed that flows benefiting Chinook and coho should also benefit chum salmon.
Sockeye	Sockeye generally rear in lakes. Ocean-run sockeye cannot currently access Eklutna Lake; however, the current water quality conditions in Eklutna Lake (high turbidity, low nutrients, low productivity) indicate that it would not support a large sockeye run. This is supported by the current condition of the kokanee (land-locked sockeye) population in Eklutna Lake, which is poor (undersized and low fecundity with no sexual dimorphism or coloration).	The Draft Program does not propose any volitional or trap and haul fish passage into Eklutna Lake; therefore, no change in sockeye rearing habitat is anticipated.
Winter Habitat	The current overwintering strategy for salmon in the Eklutna River is unknown. However, modeling indicates that low winter flows may be causing unfavorable ice conditions (frazil ice and anchor ice) in the river.	Modeling indicates that the proposed 27 cfs flow release from the AWWU portal valve in the winter, plus the ~4 cfs of accretion above the TBC and ~7-27 cfs from TBC itself, should promote good ice conditions (surface ice) in the river.
Wetlands		
Estuary	There are 487.0 acres of habitat in the Eklutna River estuary below the railroad bridge. The brackish habitat	Since the Eklutna River estuary already receives flows from TBC (mean daily flows peaked in June at

	types in this area have a high ranking for wetland function.	81 cfs in 2021 and 182 cfs in 2022) the proposed base flow releases from the AWWU portal valve (40 cfs in the summer months) are not likely to significantly impact the quantity or quality of estuary habitat.
Riparian Zone	There are 42.5 acres of habitat in the flooded forest (area between the railroad bridges and the highway bridges) with a low to moderate ranking for wetland function. There are 46.9 acres of seasonally flooded Alder-Willow shrub scrub located above the canyon in portions of the dewatered Eklutna River channel with a high ranking for wetland function.	Channel maintenance flows are expected to remove the small, linear strip of riparian shrub along the narrowed stream channel in the upper and middle river. Overbank flooding and sediment deposits could, over time, promote greater cover of streamside cottonwoods in mixed forests.
Littoral Zone	There are 114 acres of freshwater littoral habitat near the outlet of Eklutna Lake with a low to moderate ranking for wetland function.	Since there are no proposed changes to reservoir operations, the quantity and quality of littoral habitat near the outlet of Eklutna Lake is not likely to change significantly.
Wildlife		
Bears	Camera traps were deployed throughout the Eklutna River in 2022. A total of 32 black bear groups and 14 brown bear groups were recorded, some with 1-3 cubs. Both black and brown bears were seen throughout most of the river corridor. However, there were more brown bears seen below the canyon and more black bears seen above the canyon.	Increased salmon abundance will likely benefit and may attract more bears to the area. This could potentially increase competition between black and brown bears for prime fishing habitats.
Moose	Moose were the most abundant wildlife species observed along the Eklutna River. A total of 352 moose groups were recorded in 2022. A moose browse survey was also conducted in 2022. The results showed a 22% browse removal rate, which is indicative of a population that should be in good nutritional	Increased salmon abundance should indirectly benefit moose (increased plant nutrients for forage); however, increased salmon abundance may also attract more bears, which could lead to a heightened predation risk for moose.

	status with healthy twinning rates. However, few moose twins were observed, which may be due to moose calf predation.	
Beavers	There is one long-standing active beaver colony (with 4 active dams) in the Eklutna River below the railroad bridge. Since the lower dam was removed in 2018, evidence of beavers started to be seen above the lower dam site. In 2022, there were 2 active beaver colonies above the canyon, each with a colony size of ≥3 beavers. The middle river colony has 6 active dams. The largest dam is over 6 ft tall and some of the dams have caused flooding along the AWWU access road. The upper river colony was removed by ADFG in late 2022 because the impoundment behind the beaver dam was flooding the AWWU access road.	The study flow releases in 2021 breached 2 beaver dams and completely removed a third. It is likely that increased flows in the Eklutna River will encourage beavers to build their dams on side channels instead of in the main channel.
Raptors	A raptor nest survey was conducted in 2022. Suitable nesting sites for bald eagles are limited to coastal areas. A total of 4 bald eagle nests were recorded near the coast, but only 1 nest was determined to be occupied. The eroding cliff substrate in the river above the canyon is very low quality for other nesting raptors. However, 2 raven (or possible goshawk) nests were recorded in the Eklutna River valley.	Increased salmon abundance will likely benefit and may attract more raptors to the area.
Marine Mammals	Beluga, harbor seals, and sea otters have been observed around the mouth of the Eklutna River.	Increased salmon abundance will likely benefit and may attract more marine mammals to the area.
Cultural Resources		
Natural Resources	Eklutna Village (Idlughet) is located near the mouth of the Eklutna River (Idluytnu). The Eklutna River drainage	Increased salmon abundance will indirectly benefit other wildlife species, all of which are important

	is an important subsistence area for the Eklutna Dena'ina. - Fishing – salmon - Hunting – moose, bear, sheep and ground squirrel - Gathering – berries, plants, trees, and stones	subsistence resources for the Eklutna Dena'ina.
Archaeological Resources	There were no archaeological resources identified within the Area of Potential Effect (APE).	No impacts to archaeological resources are anticipated.
Historic Resources	The Eklutna Dam and Spillway and the Eklutna River Railroad Bridge are within the APE and are eligible for the National Register of Historic Places.	No substantial modifications to the dam or spillway are proposed. ARRC had previously raised concerns about the potential for increased flows to impact the railroad bridge. However, the study flow releases in 2021 had no impact on the railroad bridge, and the proposed flows are well within the hydraulic capacity of the bridge. Therefore, no impacts to the railroad bridge are anticipated.
Municipal Water Supply		
Water Availability	AWWU's water right allows them to divert up to 41 million gallons per day (MGD); however, on average AWWU only diverts ~31 MGD.	The Draft Program proposes to utilize the excess capacity in the AWWU tunnel for providing flows to the Eklutna River. This will not impact AWWU's ability to divert up to 41 MGD. In addition, several engineering measures are proposed to prevent any potential disruption to the public water supply.
Water Treatment	Four step process: coagulation / flocculation, sedimentation, filtration, and disinfection.	Because the Draft Program does not propose fish passage into Eklutna Lake, no impact to the water quality in Eklutna Lake is anticipated. Therefore, no change in water treatment is required.
Water Supply Infrastructure	AWWU's buried pipeline follows the Eklutna River for 6 miles, crossing it 8 times before exiting the valley to the water treatment facility. The pipeline	Year-round base flows will prevent AWWU from crossing the river at the 8 fords. Therefore, the Draft Program proposes to construct 8 new bridges

	is buried ~5 feet deep, and the crossings are armored; therefore, no impacts to the buried pipeline are anticipated. AWWU's access road follows the buried pipeline and crosses the river 10 times. Of the 10 crossings, 2 of them are bridges and 8 of them are fords. The AWWU bridges have a hydraulic capacity of ~1,000-1,200 cfs.	at these crossing to allow continued access by AWWU once the instream flow regime is implemented.
Other Downstream Infrastructure		
Old Glenn Highway Bridge	The current bridge was constructed in 2015 and has a hydraulic capacity of >1,800 cfs. Since 2015, the largest flow release from the dam was the study flow releases in 2021 which had a max flow release of 150 cfs and resulted in a peak mean daily flow of 215 cfs in the lower river. In 2022, the peak mean daily flow was 270 cfs. Neither of these flows in 2021 or 2022 impacted the bridge.	Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak flows is well within the hydraulic capacity of the Old Glenn Highway bridge.
New Glenn Highway Bridges	These bridges were constructed in 1975 and have a hydraulic capacity of >4,700 cfs. Since 1975, the largest flow release from the dam was the spill event in 1995 which had a max flow of 1,022 cfs. This did not impact the highway bridges, but it did occur before the lower dam was removed in 2018. ADOT&PF previously raised concerns about how all the accumulated sediment that was left in the river after the lower dam removal would be transported downstream and may impact the highway bridges. In 2021, the Project Owners conducted a series of study flow releases with a max flow release of 150 cfs. These flows did not impact the highway bridges.	Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak flows is well within the hydraulic capacity of the New Glenn Highway bridges.

Railroad Bridge	The current bridge pre-dates the existing hydro project and has a hydraulic capacity of >8,000 cfs. Since 1965 when the existing dam was constructed, the largest flow release from the dam was a spill event in 1995 with a max flow of 1,022 cfs. This did not impact the railroad bridge, but it did occur before the lower dam was removed in 2018. ARRC previously raised concerns about how all the accumulated sediment that was left in the river after the lower dam removal would be transported downstream and may impact the railroad bridge. In 2021, the Project Owners conducted a series of study flow releases with a max flow release of 150 cfs. These flows did not impact the railroad bridge.	Increasing flows in the Eklutna River by 27 cfs in the winter, 40 cfs in the summer, and 220 cfs during peak flows is well within the hydraulic capacity of the railroad bridge.
Recreational Use and Facilities		
Lakeside Trail	A recreation survey was conducted in 2022. The Eklutna Lakeside Trail was the most frequently reported destination in the area, with >400 pedestrians per day in the summer months. The trail is open to motorized use Sunday-Wednesday and non-motorized use Thursday-Saturday. There are areas where the trail splits, with the non-motorized trail closer to the lake shoreline. Current reservoir operations cause some erosion of the non-motorized trail at high lake levels.	Chugach State Park has received funding to repair the sections of the trial that are currently impacted by erosion at high lake levels. Since the Draft Program does not propose any changes to reservoir operation, no additional impacts are anticipated.
Campground and Cabins	The nearby Eklutna Lake Campground has 50 campsites and is a popular camping area. There are also 2 popular cabins near the dam.	No impacts to the campground or the cabins are anticipated.
Kayaking	Kayaking is a popular activity on Eklutna Lake.	No impacts to kayaking are anticipated.

Tailrace Fishery	ADFG stocks Chinook and coho smolts at the Project tailrace to support a recreational fishery. In 2022, a minimum of 31,447 recreators partook in activities (mostly fishing) at the tailrace between June 8 and August 23.	With the proposed Draft Program, water from Eklutna Lake will now be released into both the Project tailrace and the Eklutna River. Salmon returning to the tailrace will first pass by the mouth of the Eklutna River and may stray into the river. This could decrease the number of adult salmon returning to the tailrace each year, which could impact the tailrace fishery. Therefore, a straying study has been proposed as part of the monitoring plan in the Draft Program. If significant straying is observed, the appropriate mitigation measures will be determined in coordination with ADFG.
Eklutna River Fishery	Most of the land around the river is owned by Eklutna, Inc. There is currently no public access to the Eklutna River.	The potential for allowing public access to the Eklutna River has been discussed with Eklutna, Inc. However, there are currently no plans to allow public access to the Eklutna River.
Hunting	ADFG regulates hunting and trapping activities in the Eklutna Lake Management Area, which is closed to all hunting except by bow and arrow. The taking of moose, brown bear, and sheep requires a permit, and the taking of black and brown bears requires completion of a hunter safety course.	Bears and potentially moose are likely to benefit from increased salmon abundance, which could improve hunting opportunities for these species in the area.
Wildlife Viewing	Some people reported wildlife viewing as one of their intended recreational activities in the Eklutna area.	Increased salmon abundance and the indirect benefits to other wildlife species will likely improving wildlife viewing opportunities in the area.
Safety		
Wildlife-Human Interactions	Negative wildlife-human interactions, while not common within Chugach State Park, are a public safety concern as visitors seek to view wildlife and use park resources for recreational pursuits. At least half of	Increased salmon abundance may attract more bears to the area, which could increase negative bear-human interactions near the campground. However, the year-round base flows will be releases at the AWWU portal

	the 12 people injured or killed by bears in Chugach State Park since its establishment were within 100 yards of salmon spawning streams.	valve approximately 1 mile downstream of the dam and campground. Therefore, any increase in negative bear-human interactions should be low.
Flood Protection	The entire volume of the Probable Maximum Flood can be contained in the flood storage capacity of the reservoir with 3 feet of freeboard remaining even if the spillway was blocked.	Because there are no proposed changes to reservoir operations, there will be no change in the flood storage capacity.
Power Production		
Generation	Average annual generation at the Eklutna Power Plant is approximately 169,000 MWh per year.	The water released into the river will not go through the powerhouse and will result in a net reduction of 16,100 MWh per year. This is a 10% reduction on average.
Grid Reliability	The Project provides grid reliability through diversification of fuel for generation.	While the Project would continue to provide grid reliability through diversification of fuel for generation, its benefit would be slightly reduced.
Renewable Integration	The Project can be used to firm other intermittent renewables (wind and solar).	While the Project could still be used to firm other intermittent renewables, its benefit would be slightly reduced.
Other Aspects of Environmental Quality		
Carbon Offsets	The Project offsets approximately 72,500 metric tons of CO_2 equivalent per year.	Carbon offsets would decrease by 6,900 metric tons of CO_2 equivalent per year. This is a 10% reduction on average.
Costs		
Capital Improvements	-	$15,433,800
Operations and Maintenance	-	$315,900 (per year)
Replacement Energy	-	$1,365,600 (per year)
Monitoring Program	-	$270,000
Total Annualized Cost	-	$3,485,000 (per year)

Ratepayer and Taxpayer Impacts		
Chugach Electric	-	+0.67%
Matanuska Electric	-	+0.87%
Municipality of Anchorage	-	+$0.54 (per $100k of property value)

Appendix C. Alternatives Request Form

Eklutna Hydroelectric Project

Alternatives Analysis – Request Form

Entity:

Flow Regime (check one):

☐ **Flow Level 1** (Jul/Aug = 40 cfs, Sep/Oct = 40 cfs, Winter = 27 cfs)

Channel Maintenance Flow: ☐ 200 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 2** (Jul/Aug = 60 cfs, Sep/Oct = 48 cfs, Winter = 31 cfs)

Channel Maintenance Flow: ☐ 325 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 3** (Jul/Aug = 80 cfs, Sep/Oct = 57 cfs, Winter = 35 cfs)

Channel Maintenance Flow: ☐ 400 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 4** (Jul/Aug = 100 cfs, Sep/Oct = 65 cfs, Winter = 39 cfs)

Channel Maintenance Flow: ☐ 450 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 5** (Jul/Aug = 120 cfs, Sep/Oct = 73 cfs, Winter = 42 cfs)

Channel Maintenance Flow: ☐ 500 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 6** (Jul/Aug = 140 cfs, Sep/Oct = 82 cfs, Winter = 46 cfs)

Channel Maintenance Flow: ☐ 550 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Flow Level 7** (Jul/Aug = 160 cfs, Sep/Oct = 90 cfs, Winter = 50 cfs)

Channel Maintenance Flow: ☐ 600 cfs for 72 hours ☐ Other:

Every: ☐ Year ☐ 2 Years ☐ 3 Years ☐ 4 Years ☐ 5 Years ☐ Other:

Time of year:

☐ **Other:**

Infrastructure for Year-Round Instream Flows (check one):

☐ Existing Dam with Existing Gate at El. 852 feet (RM 12)[1]

☐ Existing Dam with Fixed Wheel Gate at El. 852 feet (RM 12) [1]

☐ Existing Dam with Siphon Bypass at El. 840 (RM 12)[2]

☐ Replacement Dam with Automated Gate at El. 835 feet (RM 12)[3]

☐ Releases through new Bypass Tunnel, existing intake at El. 793 (RM 11.5)[3]

☐ Releases at AWWU Portal Valve, existing intake at El. 793 (RM 11)[3]

☐ Releases from lower in the AWWU Pipeline, existing intake at El. 793 (RM 5.5)[3]

Infrastructure for Channel Maintenance Flows (check one):

☐ Uncontrolled Spill [4]

☐ Radial Gate [5]

☐ Fixed Wheel Gate[6]

☐ AWWU Portal Valve plus Existing Gate in the Dam (only for Flow Level 1)[6]

Upstream Fish Passage (check one):

☐ Existing Dam with Gravity Fish Ladder

☐ Existing Dam with Fish Ladder with Variable Exit Gates

☐ Existing Dam with Fish Ladder with Slide

☐ Replacement Dam with Fish Ladder

☐ Trap and Haul

☐ None

Downstream Fish Passage (check one):

☐ Spill during: ☐ April ☐May ☐ June ☐ Other:

☐ Floating Surface Collector

☐ None

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[1] Eklutna Lake average WSEL will fluctuate from WSEL 863 to WSEL 876 (approx.)
[2] Eklutna Lake average WSEL will fluctuate from WSEL 854 to WSEL 870 (approx.)
[3] Eklutna Lake average WSEL will fluctuate from WSEL 830 to WSEL 865 (approx.)
[4] Requires WSEL 873 (@ 200 cfs spill) to El 876 (@ 600 cfs spill)
[5] Requires WSEL 875 (@ 200 cfs spill) to El 878 (@ 600 cfs spill)
[6] Requires WSEL 861

Miscellaneous:

☐ Divert Lach Q'atnu Creek into the Eklutna River

☐ Construct Bridges at AWWU Road Crossings *(recommended for any alternative that includes year-round instream flows from either the dam or the AWWU portal valve)*

☐ Lakeside Trail Repairs (check one):

- ☐ Full (*recommended for any alternative that requires the lake level to be held higher)*
- ☐ Partial *(recommended for any alternative that maintains current reservoir operations)*
- ☐ Other:

☐ Physical Habitat Improvements (check one): ☐ Current Concept ☐ Other:

Monitoring Program / Adaptive Management (open answer):

Appendix D. Cost Effectiveness Modeling

Technical Memorandum			
To:	Mike Brodie, P.E. Chugach Electric Association	Project:	Eklutna Fish & Wildlife Project
From:	Sean P. Ellenson, P.E. McMillen, Inc.	cc:	
Date:	August 30, 2023		
Subject:	Supporting Data for Cost Effectiveness Model		

Revision Log

Revision No.	Date	Revision Description
0	08/30/2023	Draft

1.0 Introduction

A cost effectiveness model was utilized to compare various alternative protection, mitigation, and enhancement measures proposed by stakeholders as part of the Eklutna Fish & Wildlife Program. To capture the financial considerations of each proposed alternative, the capital costs, operations and maintenance (O&M) costs, and replacement energy costs must be annualized over the 35-year period of the agreement. This memorandum defines the methodology and components of the financial analysis that went into determining the annualized costs and ultimately the estimated ratepayer and taxpayer impacts for each proposed alternative.

2.0 Annualized Costs

To determine the annualized cost of each comprehensive alternative proposed as part of the alternatives analysis process, the components of capital costs, O&M costs, and replacement energy costs were evaluated. The details of this evaluation are presented in the following subsections.

2.1 Capital Expenditures

The estimated capital expenditures for each proposed alternative were based on the class 5 opinion of probable construction costs (OPCC) developed for each measure as part of the Phase 1 engineering design (McMillen, Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs 2023). The estimated costs for each measure are defined in Table 2-1.

Table 2-1. Class 5 OPCC - Cost Summary.

PME Measure		Total Median Cost	Expected Estimate Cost Range Class 5 (-50% to +100%)		
A	Dam Release Modifications	$6,680,000	$3,340,000	to	$13,360,000
B	Siphon Bypass Pipeline	$22,371,500	$11,186,000	to	$44,743,000
C	AWWU Portal Release Facility	$5,546,500	$2,773,000	to	$11,093,000
D	AWWU Pipeline Release Facility	$2,248,300	$1,124,000	to	$4,497,000
E	Bypass Tunnel Release	$76,747,200	$38,374,000	to	$153,494,000
F	Channel Excavation	$569,000	$285,000	to	$1,138,000
G	Lach Q'atnu Creek Re-Route	$1,523,000	$762,000	to	$3,046,000
H	Spillway Modifications - Tainter Gate	$5,574,300	$2,787,000	to	$11,149,000
I	Spillway Modifications - Fixed Wheel Gate	$6,573,500	$3,287,000	to	$13,147,000
J	Gravity Flow Fish Ladder	$16,670,300	$8,335,000	to	$33,341,000
K	Variable Exit Fish Ladder	$17,569,600	$8,785,000	to	$35,139,000
L	Pumped Supply and Slide Fish Ladder	$15,240,200	$7,620,000	to	$30,480,000
M	Trap and Haul Facility	$8,336,200	$4,168,000	to	$16,672,000
N	Floating Surface Collector	$57,557,000	$28,779,000	to	$115,114,000
O	Fish Exclusion Barrier	$3,125,600	$1,563,000	to	$6,251,000
P	Replacement Dam	$113,344,500	$56,672,000	to	$226,689,000
Q	Lakeside Trail Improvements	$373,600	$187,000	to	$747,000
R	AWWU Maintenance Road Crossings	$2,941,500	$1,471,000	to	$5,883,000
S	Physical Habitat Manipulation	$1,469,200	$735,000	to	$2,938,000

A comprehensive alternative proposed by a stakeholder, owner, or interested party combines the individual costs of each measure for a combined estimated capital cost. It shall be noted that at the level of design presented in phase 1 engineering these costs carry an accuracy range of -50% to +100%, which will be further refined as part of further phases of engineering design. A summation of capital costs for an example comprehensive alternative proposed as part of the Fish & Wildlife Program is presented in Table 2-2.

Table 2-2. Example Comprehensive Alternative Cost Summary.

PME Measure	Capital Cost
AWWU Portal Release Facility:	$5,547,000
AWWU Maintenance Road Crossings:	$2,942,000
Lakeside Trail Improvements:	$374,000
Comprehensive Capital Cost:	$8,863,000

To annualize the cost of the capital expenditures over 35 years, a discount rate is applied to take into account the time value of capital costs spread over the 35-year program. The discount rate utilized by the Hydro Project owners for assessing future cash flows is equal to 5%. In addition to the discount rate applied for assessing future cash flow, the Regulatory Commission of Alaska (RCA) sets a Times Interest Earned Ratio (TIER) which must be applied on assessing future interest payments as part of the equation for setting utility rates. The TIER is only applied to assess capital cost cashflow for Chugach Electric Association (CEA) and Matanuska Electric Association (MEA) and is currently set at 1.75x and 1.60x, respectively.

To assess the responsibility of these costs per Project Owner, the annualized capital costs must vary based on the TIER and ownership of the project by entity. The breakdown of project ownership for capital costs associated with the Project is presented in Table 2-3 based on the comprehensive alternative discussed within this section. The 35-year annualized cost variation based on the required TIER is presented in Table 2-4. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-5.

Table 2-3. Project Ownership - Capital Expenditures.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	16.67%
Municipality of Anchorage	19.04%

Table 2-4. 35-Year Annualized Capital Costs with Varied TIER.

Description	35-Year Annualized Cost
Capital Cost	$8,863,000
35-Yr Annualized Cost; 1.75x TIER	$819,000
35-Yr Annualized Cost; 1.60x TIER	$760,000
35-Yr Annualized Cost; No TIER	$541,000

Table 2-5. 35-Year Annualized Capital Costs by Owner.

Entity	35-Year Annualized Cost
Chugach Electric Association	$527,000
Matanuska Electric Association	$127,000
Municipality of Anchorage	$103,000

2.2 Operations and Maintenance Annualized Costs

The estimated O&M costs for each proposed alternative were based on estimates developed for each measure as part of the Phase 1 engineering design (McMillen, Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs 2023). The estimated O&M costs for each measure are defined in Table 2-6.

Table 2-6. O&M Cost Summary.

PME Measure		O&M Cost
A	Dam Release Modifications	$565,500
B	Siphon Bypass Pipeline	$664,300
C	AWWU Portal Release Facility	$196,300
D	AWWU Pipeline Release Facility	$196,300
E	Bypass Tunnel Release	$210,600
F	Channel Excavation	$0
G	Lach Q'atnu Creek Re-Route	$19,500
H	Spillway Modifications - Tainter Gate	$32,500
I	Spillway Modifications - Fixed Wheel Gate	$32,500

PME Measure		O&M Cost
J	Gravity Flow Fish Ladder	$604,500
K	Variable Exit Fish Ladder	$657,800
L	Pumped Supply and Slide Fish Ladder	$813,800
M	Trap and Haul Facility	$200,200
N	Floating Surface Collector	$1,773,200
O	Fish Exclusion Barrier	$37,700
P	Replacement Dam	$299,000
Q	Lakeside Trail Improvements	$0
R	AWWU Maintenance Road Crossings	$0
S	Physical Habitat Manipulation	$0

A comprehensive alternative proposed by a stakeholder, owner, or interested party combines the individual costs of each measure for a combined estimated O&M cost. A summation of O&M costs for an example comprehensive alternative proposed as part of the Fish & Wildlife Program is presented in Table 2-7.

Table 2-7. Example Comprehensive Alternative Cost Summary.

PME Measure	Capital Cost ($)
AWWU Portal Release Facility:	$196,300
AWWU Maintenance Road Crossings:	$0
Lakeside Trail Improvements:	$0
Comprehensive O&M Cost:	$163,800

To annualize the cost of the O&M expenditures over 35 years, an annual increase is applied to consider the increasing price of labor and materials over time. The escalation is based on historical trends for the utilities and is equal to an annual increase of 3% per year.

To assess the responsibility of these costs per Project Owner, the annualized O&M costs vary based on the ownership of the project by entity and is equal to the ownership breakdown of the capital costs of the project, as presented in Table 2-8. The 35-year annualized cost including annual escalation is equal to $345,000/yr based on the comprehensive alternative proposed as part of the Fish & Wildlife Program. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-9.

Table 2-8. Project Ownership – O&M Expenditures.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	16.67%
Municipality of Anchorage	19.04%

Table 2-9. 35-Year Annualized O&M Costs by Owner.

Entity	35-Year Annualized Cost
Chugach Electric Association	$221,800
Matanuska Electric Association	$57,500
Municipality of Anchorage	$65,688

2.3 Replacement Energy Annualized Costs

The estimated replacement energy costs for each comprehensive alternative are based on the hydropower operations model developed as part of the Year 1 study results (McMillen 2023). For the comprehensive alternative proposed as part of the Fish & Wildlife Program the replacement energy is based on reduced flow to the Eklutna Power Plant as a result of flow releases into the Eklutna River. The proposed release regime is presented in Table 2-10.

Table 2-10. Eklutna River Flow Release by Month.

Month	Flow Rate (cfs)
Jan	27
Feb	27
Mar	27
Apr	27
May	34
Jun	40
Jul	40
Aug	40
Sep	40
Oct	40
Nov	35
Dec	27

Modifying reservoir and powerhouse operations to release the proposed flow regime into Eklutna River results in an average annual decrease of generation of 15,725 MWh/yr. To determine the value of energy losses from the Eklutna Power Plant the value of the replacement energy within MEA and CEA's system was studied. In the case of both utilities, any energy lost from the facility would be replaced by one of the multiple natural gas generation facilities located in the local system.

The value of energy produced from a natural gas generation facility is directly tied to the price of natural gas. In June 2023 the local provider of natural gas, Enstar Natural Gas Company LLC, presented to the RCA a range of gas prices expected in 2026. The price of gas ranged from a low of $12.20 per thousand cubic feet (MCF) to $13.90/MCF with a median expected value of $13.05/MCF. Using the median expected gas price, the Project Owners performed a production cost model run of energy generation on the Railbelt system utilizing GenTrader®, an energy portfolio modeling software, to determine a forecasted price of energy from natural gas generation sources of $84.65/MWh. Based on the median price of replacement energy, an initial cost of replacement energy during Year 1 was determined to be $1,330,000.

To annualize the cost of the replacement energy over 35 years, an annual increase is applied to consider the increasing price of gas over time. The escalation is based on historical trends for the utilities and is equal to an annual increase of 1% per year. Considering the annual increase in energy costs, the 35-year average annualized cost of replacement energy is equal to $1,593,000/Yr.

To assess the responsibility of these costs per Project Owner, the annualized replacement energy costs vary based on the ownership of the project by entity as presented in Table 2-11. The annualized cost for the purposes of ratepayer impacts based on project ownership by utility is presented in Table 2-12.

Table 2-11. Project Ownership – Replacement Energy Costs.

Entity	Ownership
Chugach Electric Association	64.29%
Matanuska Electric Association	35.71%
Municipality of Anchorage	0%

Table 2-12. 35-Year Annualized Replacement Energy Costs by Owner

Entity	35-Year Annualized Cost
Chugach Electric Association	$1,024,000
Matanuska Electric Association	$569,000
Municipality of Anchorage	$0

2.4 Comprehensive Cost Summary

After determining the individual annualized costs of each sub-component by utility ownership structure, the overall annualized cost per comprehensive alternative is combined to assess impacts to each Project Owner. The combined annual costs by utility are presented in Table 2-13.

Table 2-13. 35-Year Annualized Cost Summary.

Entity	35-Year Annualized Cost
Chugach Electric Association	$1,772,800
Matanuska Electric Association	$753,500
Municipality of Anchorage	$168,700

3.0 Ratepayer & Taxpayer Impacts

Each of the utilities is a member-owned not-for-profit cooperative of which rate schedules are set by the RCA based on annual expenses for O&M, capital expenditures, labor, and debt service if applicable. The Municipality of Anchorage must fund expenses through the collection of property taxes on an annual basis. The annualized costs associated with ownership of this project will have direct impacts to member utility rates and property taxes for households residing in the Anchorage area. The energy rate increases based on annual expenditures are 0.3% and 1.12% per $1,000,000 spent for CEA and MEA, respectively. On a property tax basis, the Municipality of Anchorage must increase property taxes by 0.03 mils per $1,000,000 spent, with 0.03 mils being defined as a $3 increase in property tax per year per $100,000 in property value. A summary of the ratepayer and taxpayer impacts based on the example comprehensive alternative is presented in Table 3-1.

Table 3-1. Summary of Ratepayer and Taxpayer Impacts.

Entity	Ratepayer / Taxpayer Impacts
Chugach Electric Association	+0.53%
Matanuska Electric Association	+0.84%
Municipality of Anchorage	0.0051 mils $0.51/$100k

4.0 References

McMillen. 2023. *Eklutna Fish & Wildlife Project. Engineering Feasibility Study - Class 5 Opinion of Probable Construction Costs.* https://eklutnahydro.com/documents/.

—. 2023. *Hydropower Operations Modeling Study Report.* https://eklutnahydro.com/documents/.

Appendix E. 15% Design Drawings

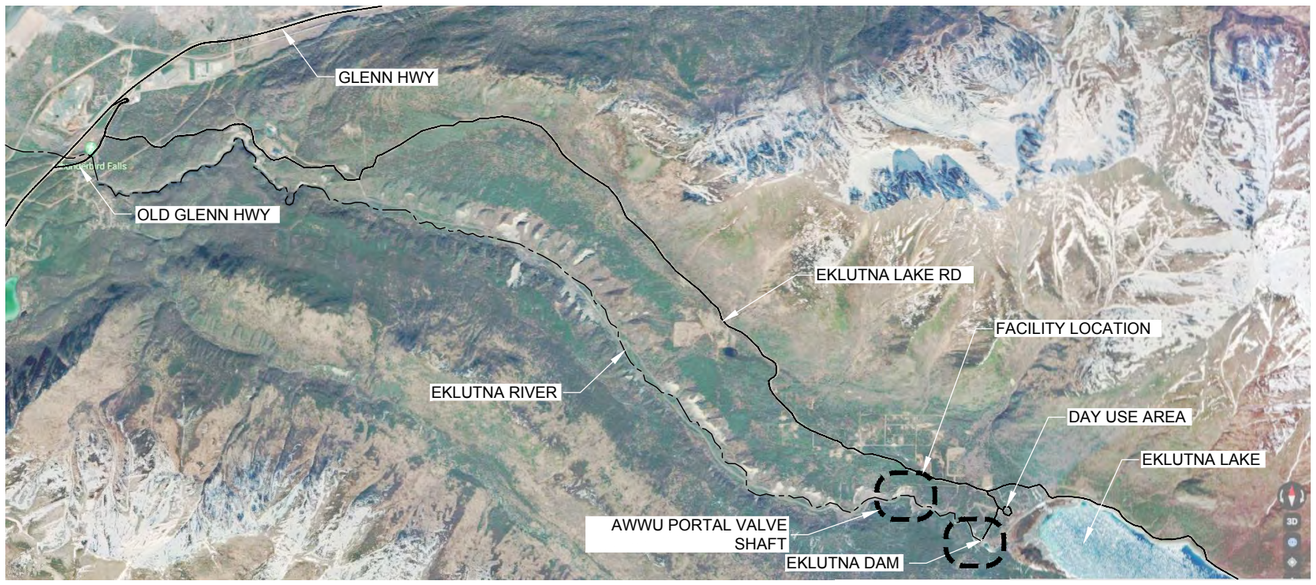
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
ANCHORAGE, ALASKA

15% DESIGN
OCTOBER 2023

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY
15% DESIGN

LOCATION MAP
NTS



VICINITY MAP
NTS

FACILITY MAP
NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

LOCATION MAP, VICINITY MAP, AND FACILITY MAP

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\G001.dwg Plot date: Sep 28, 2023 10:08am, CAD User: HaberFlavia

DRAWING INDEX

15% SUB*	SHEET NO.	DWG NO.	DESCRIPTION
			GENERAL
			COVER SHEET
X	1	G001	LOCATION MAP, VICINITY MAP, AND FACILITY MAP
X	2	G002	DRAWING INDEX
X	3	G003	STANDARD ABBREVIATIONS
X	4	G004	STANDARD SYMBOLS
X	5	G005	PIPING SCHEDULE
X	6	G006	INSTRUMENTATION AND EQUIPMENT LEGEND
			DEMOLITION
X	7	D001	DEMOLITION KEY PLAN
X	8	D100	PORTAL VALVE SHAFT YARD DEMOLITION PLAN
			CIVIL
X	9	GC001	CIVIL GENERAL NOTES AND STANDARD DETAILS
X	10	C001	PORTAL VALVE SHAFT YARD EXISTING SITE PLAN
X	11	C100	PORTAL VALVE SHAFT YARD GRADING PLAN
			STRUCTURAL
X	12	GS001	STRUCTURAL GENERAL NOTES
X	13	GS002	STRUCTURAL STANDARD DETAILS 1
X	14	GS003	STRUCTURAL STANDARD DETAILS 2
X	15	S001	STRUCTURAL KEY PLAN
X	16	S100	ISOLATION VALVE STRUCTURAL PLAN, SECTIONS, AND DETAILS
X	17	S101	ISOLATION VALVE STRUCTURAL SECTIONS
X	18	S200	RIVER RELEASE STRUCTURE PLAN,SECTIONS AND DETAILS
X	19	S201	RIVER RELEASE STRUCTURE SECTIONS
			MECHANICAL
X	20	GM001	MECHANICAL EQUIPMENT SCHEDULE
X	21	GM002	MECHANICAL STANDARD DETAILS
X	22	M001	MECHANICAL KEY PLAN
X	23	M100	ISOLATION VALVE STRUCTURE MECHANICAL PLAN
X	24	M101	ISOLATION VALVE STRUCTURE MECHANICAL SECTIONS
X	25	M200	RIVER RELEASE STRUCTURE MECHANICAL PLAN, SECTIONS
			ELECTRICAL
X	26	GE001	ELECTRICAL ABBREVIATIONS AND DEVICE INDEXES
X	27	GE002	ELECTRICAL STANDARD SYMBOLS 1
X	28	GE003	ELECTRICAL STANDARD SYMBOLS 2
X	29	E001	ELECTRICAL SITE AND KEY PLAN
	30	E002	COMMUNICATIONS BLOCK DIAGRAM
X	31	E003	TRANSMISSION AND COMMUNICATION UPGRADES PLAN
X	32	E100	ISOLATION VALVE STRUCTURE ELECTRICAL PLAN
X	33	E200	RIVER RELEASE STRUCTURE ELECTRICAL PLAN AND SECTION

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
DRAWING INDEX

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\G002.dwg Plot date: Sep 26, 2023 05:01pm, CAD User: HaberFlavia

A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
A	ARCHITECTURAL (DWG DISCIPLINE), AMP
AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABAN	ABANDON
AC	ALTERNATING CURRENT
ACST	ACOUSTIC
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AIC	AMPS INTERRUPTING CAPACITY
ALIG	ALIGNMENT
ALUM	ALUMINUM
ALT	ALTERNATE, ALTITUDE
AMB	AMBIENT
ANC	ANCHOR
AP	ACCESS PANEL
APRX	APPROXIMATE
APVD	APPROVED ARCH ARCHITECTURAL
ASSY	ASSEMBLY
AT	AMP TRIP
ATM	ATMOSPHERE
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
AWWU	ANCHORAGE WATER AND WASTEWATER UTILITY
B/B	BACK TO BACK
BAL	BALANCE
BBD	BULLETIN BOARD
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER, BOLT CIRCLE
BD	BOARD
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE, BOARD FEET
BFV	BUTTERFLY VALVE
BITUM	BITUMINOUS
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BTWLD	BUTT WELD
BV	BALL VALVE
BW	BOTH WAYS
BYP	BYPASS
C TO C	CENTER TO CENTER
C&G	CURB & GUTTER
C	CHANNEL SHAPE, CENTIGRADE, CONDUIT, CIVIL (DRAWING DISCIPLINE)
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCW	COUNTER CLOCKWISE
CF	CUBIC FEET (FOOT)
CHFR	CHAMFER
CHD	CHORD
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIPB	CONCRETE INTERLOCKING PAVER BALLAST
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT, CONTROL JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE
CONC	CONCENTRIC, CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUED
COORD	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSK	COUNTERSINK
CTR	CENTER
CTRL	CONTROL
CU	COPPER, CUBIC
CW	CLOCKWISE
CY	CUBIC YARD
d	PENNY (NAIL MEASURE)
D	DEEP, DIFFUSER
DB	DUCT BANK, DECIBEL, DRY BULB
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DN	DOWN
DP	DEPTH
DS	DOWN SPOUT
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DWG	DRAWING
DWL	DOWEL
E	EAST, ELECTRICAL (DWG DISCIPLINE)
EA	EACH, EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EG	EXISTING GRADE
EGL	ENERGY GRADE LINE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMER	EMERGENCY
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, EMERGENCY SHOWER
ESEW	EMERGENCY SHOWER AND EYE WASH
EST	ESTIMATE
EW	EACH WAY, EMERGENCY EYE/FACE WASH
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION, EXPOSED
EXT	EXTERIOR, EXTERNAL, EXTENSION
F TO F	FACE TO FACE
FAB	FABRICATE
FBO	FURNISHED BY OWNER
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FCV	FIXED CONE VALVE
FD	FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDR	FEEDER
FE	FLANGED END
FEC	FIRE EXTINGUISHER CABINET
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FIG	FIGURE
FH	FIRE HYDRANT
FIN	FINISH
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FND	FOUNDATION
FNC	FENCE
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB, FIBER OPTIC CABLE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FLOOR SINK, FAR SIDE
FT	FEET, FOOT
FTG	FOOTING, FITTING FUR FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE
G	GRILLE, GROUND, GENERAL (DWG DISCIPLINE)
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GP	GUY POLE
GR	GRADE
GRND	GROUND
GRTG	GRATING
GT	GREASE TRAP
GWB	GYPSUM WALLBOARD
GYP	GYPSUM HARDBOARD
H	HIGH
HB	HOSE BIB
HBD	HARDBOARD
HC	HANDICAPPED, HOLLOW CORE, HORIZONTAL CURVE
HC	HORIZONTAL CENTERLINE
HDR	HEADER
HDW	HARDWARE
HEX	HEXAGONAL
HH	HANDHOLE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER
HPC	HORIZONTAL POINT OF CURVATURE
HPS	HIGH PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOUR
HS	HEADED STUD, HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC HZ HERTZ, CYCLES PER SECOND
I	INSTRUMENTATION (DWG DISCIPLINE)
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE, INCANDESCENT
INF	INFLUENT
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IRR	IRRIGATION
ISO	ISOMETRIC
JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JT	JOINT
K	KIP
KB	KNEE BRACE
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KIUC	KAUAI ISLAND UTILITY COOPERATIVE
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
L	ANGLE, LENGTH, LAVATORY
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LDR	LEADER
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LMLU	LIQUID MARKER LECTURE UNIT
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT
LPS	LOW PRESSURE SODIUM
LR	LONG RADIUS
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
M	MECHANICAL (DWG DISCIPLINE)
MA	MIXED AIR
MAINT	MAINTENANCE
MAN	MANUAL
MAOP	MAXIMUM ALLOWABLE OPERATING PRESSURE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MCJ	MASONRY CONTROL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFR	MANUFACTURER
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODULAR, MODIFY
MON	MONUMENT
MPT	MALE PIPE THREAD
MSL	MEAN SEA LEVEL
MT	MOUNT
MU	MASONRY UNIT
MULL	MULLION
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NEG	NEGATIVE
NF	NEAR FACE, NON-FUSED
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
O TO O	OUT-TO-OUT
OA	OUTSIDE AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT, PROCESS (DWG DISCIPLINE)
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX
PBD	PARTICLE BOARD
PC	POINT OF CURVE, PIECE, PRECAST
PCC	POINT OF COMPOUND CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCT	PERCENT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PI	POINT OF INTERSECTION
PKG	PACKAGE
PL	PLATE, PROPERTY LINE
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
POL	POLISH
POS	POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PROP	PROPERTY
PROT	PROTECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PT	POINT, POINT OF TANGENCY
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWD	PLYWOOD
PZ	PIEZOMETER
Q	RATE OF FLOW
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
R	RADIUS, REGISTER, RISER
RA	RETURN AIR
RB	RESILIENT BASE, ROCK BERM
RCPT	RECEPTACLE
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RFL	REFLECTED, REFLECTOR
RGS	RIGID GALVANIZED STEEL
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RL	REQUIRED LAP
RND	ROUND
RNG	RENEWABLE NATURAL GAS
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
S	SOUTH, SINK, STRUCTURAL (DWG DISCIPLINE)
SA	SUPPLY AIR
SAN	SANITARY
SC	SOLID CORE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCRN	SCREEN
SE	STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS
SECT	SECTION
SEP	SEPARATE
SF	SQUARE FOOT
SH	SHOWER
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SOG	SLAB ON GRADE
SP	SOUNDPROOF, STANDPIPE
SPC	SPACING
SPEC	SPECIFICATION
SPLY	SUPPLY
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T	TILE, TREAD
TA	TEMPERED AIR
TAN	TANGENT
TBM	TEMPORARY BENCHMARK
TEMP	TEMPORARY, TEMPERATURE
THK	THICK
THRD	THREAD
THRU	THROUGH
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TP	TELEPHONE POLE, TOE PLATE, TRAP PRIMER
TPG	TOPPING
TRANS	TRANSITION
TRD	TRENCH DRAIN
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY, VOLT
VA	VOLT AMPERE
VAC	VACUUM
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCT	VINYL COMPOSITION TILE, VERTICAL CENTERLINE
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VS	VERSES, VAPOR SEAL
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W/	WITH
W/O	WITHOUT
W	WATT, WEST, WIDE, WINDOW, WIRE, WIDE FLANGE BEAM
WC	WATER CLOSET, WATER COLUMN
WD	WIDTH
WF	WIDE FLANGE, WASH FOUNTAIN
WG	WIRE GLASS, WATER GAGE
WH	WALL HYDRANT, WEEP HOLE
WL	WATER LEVEL
WLD	WELDED
WM	WIRE MESH
WP	WATERPROOF, WORKING POINT
WTHP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG
XSECT	CROSS SECTION
YH	YARD HYDRANT
YS	YIELD STRENGTH

GENERAL NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF THE WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION; "INC" MAY MEAN INCLUDED OR INCLUDING; "REINF" MAY MEAN EITHER REINFORCE OR REINFORCING.
4. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

STANDARD ABBREVIATIONS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

G003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\G003.dwg Plot date: Sep 26, 2023 03:53pm, CAD User: HaberFlavia

SHEET SYMBOLS

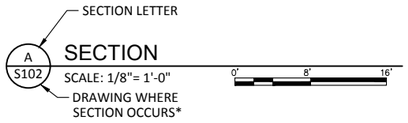
PLAN
SCALE: 1/2"= 1'-0"
0' 2' 4'

N

SECTION IDENTIFICATION

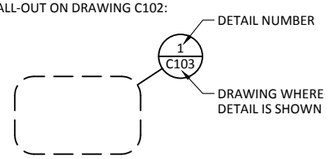
(1) SECTION CUT ON DRAWING C102:

(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

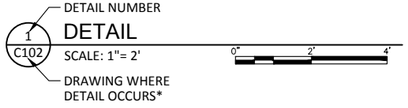


DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON DRAWING C102:



(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

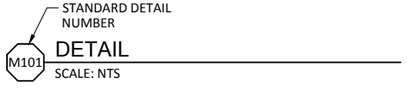


*NOTE: IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON SAME DRAWING. DRAWING NUMBER IS REPLACED BY A LINE.

STANDARD DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON PLAN OR SECTION:

(2) ON DETAIL DRAWINGS, IDENTIFIED AS:



ELEVATION/IMAGE IDENTIFICATION

SITE PLAN LINE TYPES

- FENCE LINE (X — X)
- OVERHEAD POWER (P — P)
- MAJOR CONTOUR (455)
- MINOR CONTOUR (456)
- EXIST MAJOR CONTOUR (455)
- EXIST MINOR CONTOUR (456)
- EDGE OF WATERLINE
- TOE OF SLOPE (TOE)
- TOP OF BANK (TOB)
- SANITARY SEWER (SS — SS)
- STORM DRAIN (SD — SD)
- EDGE OF PAVEMENT (EP — EP)
- EDGE OF GRAVEL (EG — EG)
- WATTLE (W)
- SILT FENCE (SF — SF)
- CONSTRUCTION FENCE (CF — CF)
- GAS LINE (GAS)
- TURBIDITY CURTAIN (TC)
- IRRIGATION LINE (IRR — IRR)
- WATER LINE (WTR)
- TELEPHONE LINE (TEL)
- COMMUNICATION LINE (COM)
- OVERHEAD ELECTRICAL/POWER (OHP)
- UNDERGROUND ELECTRICAL (EUG)
- PROPERTY LINE (P/L)
- EXISTING OVERHEAD POWER LINE (OHP)
- EXISTING OVERHEAD POWER & TELEPHONE LINE (OHP&T)
- EXISTING OVERHEAD TELEPHONE LINE (T)
- EXISTING BURIED TELEPHONE LINE EVIDENCED BY PEDESTALS & WARNING PADDLES (BT)
- EXISTING FENCE LINE
- PROJECT BOUNDARY
- TREE PROTECTION FENCE
- LIMITS OF DISTURBANCE
- SHORING

SITE PLAN SYMBOLS

- ARROW INDICATES DIRECTION OF PLAN NORTH
- CONIFER TREE: FIR, SPRUCE, LARCH OR PINE, 8" DIAMETER OR LARGER.
- DECIDUOUS TREE: COTTONWOOD, HAWTHORN, ASPEN, 8" DIAMETER OR LARGER.
- MH — MANHOLE
- EB — ELECTRIC BOX
- STORM DRAIN MANHOLE
- FH — FIRE HYDRANT
- YH-X — YARD HYDRANT
- SURVEY CONTROL POINT, AS NOTED.
- POLE ANCHOR
- POWER POLE
- LIGHT POLE
- SIGN
- SURVEY HUB
- SECTION CORNER
- BENCH MARK
- EXISTING HEADWALL
- EXISTING MONITORING STATION
- X — X — EXISTING FENCE
- STATE PLANE COORDINATE MARKER
- EXISTING TREE LINE
- EXISTING BUILDING, STRUCTURES
- EXISTING SECTION CORNER MONUMENT FOUND AS DESCRIBED
- EXISTING 5/8" REBAR CONTROL POINT MONUMENT, BORING LOCATION
- W — EXISTING HOSE BIB
- EXISTING PORTABLE IRRIGATION WATER PUMP
- WELL — EXISTING 6" WATER WELL
- EXISTING ELECTRICAL OUTLET
- P — EXISTING POWER POLE
- T — EXISTING TELEPHONE PEDESTAL
- CONTROL POINT
- PUMP
- PUMP
- TP — TEST PIT LOCATION

MISCELLANEOUS SYMBOLS

- CHANGE OF PIPE MTL
- OR — END OF PIPE
- ℄ — CENTERLINE
- Ø — DIAMETER
- ∠ — ANGLE
- PL — PLATE
- ± — PLUS/MINUS

GENERAL NOTES:

1. ALL SYMBOLS ARE NOT NECESSARILY USED. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLS ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.

HATCH SYMBOLS

- ROCK, TYPE AS NOTED (PLAN/SECTION)
- BED ROCK
- EXISTING GRADE (SECTION)
- NEW SOIL (SECTION)
- CONCRETE EXISTING (SECTION/PLAN)
- CONCRETE 1ST STAGE (SECTION/PLAN)
- CONCRETE 2ND STAGE (SECTION/PLAN)
- SAND, GROUT (PLAN/SECTION)
- STEEL (SECTION)
- GRATING (PLAN)
- MASONRY (PLAN)
- WOOD, SIZE/TYPE AS NOTED (PLAN)
- WOOD, SIZE/TYPE AS NOTED (SECTION)
- RIP RAP (PLAN/SECTION)
- RIGID INSULATION (SECTION)
- ASPHALT CONCRETE PAVEMENT SURFACE (PLAN/SECTION)
- GRASS/VEGETATION (PLAN)
- BATT INSULATION (SECTION)
- NEW CONSTRUCTION
- EXISTING
- EXISTING TO BE REMOVED OR DEMOLISHED
- CLEARING AND GRUBBING
- ASPHALT
- GRASS/VEGETATION
- GRAVEL

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

STANDARD SYMBOLS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G004

JOB NO: 000000

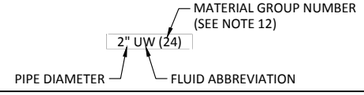
Path: C:\Vault\Chugach Electric\Portal Release Structure\G004.dwg Plot date: Sep 26, 2023 03:57pm, CAD User: HaberFlavia

FLUID ABBREVIATION	FUNCTION	ALLOWABLE PIPING MATERIAL GROUP NO. (SEE NOTE 1 AND 4)				FIELD TEST REQUIREMENTS (SEE NOTE 3 AND NOTE 4)		
	THIS LIST MAY INCLUDE FLUIDS NOT USED IN THIS PROJECT	EXPOSED PIPING (SEE NOTE 14)		BURIED PIPING (SEE NOTE 13)		MINIMUM TEST PRESSURE PSI	TEST MEDIUM	LEAKAGE ALLOWANCE (SEE NOTE 2)
		3" DIA AND SMALLER	4" DIA AND LARGER	3" DIA AND SMALLER	4" DIA AND LARGER			
COMMONLY USED FUNCTIONS								
DR	DRAIN	2	2	2	2	NOTE 6	WATER	(D)
RW	RAW WATER	2,8	2,8	8	8	150	WATER	(A)

PIPING MATERIAL SCHEDULE (SEE NOTE 1)

GROUP NO.	PIPE MATERIAL	FITTINGS / JOINTS	LININGS AND COATINGS (SEE NOTE 13)
2	STEEL, ASTM A53, SCHEDULE 40, BLACK WELDED, GALVANIZED	2 1/2" AND SMALLER, MALLEABLE IRON, ASME B16.3, THREADED, BANDED, GALVANIZED 150 PSI. 3" AND LARGER, CAST IRON, ASME B16.1, 125 PSI FLANGED OR MECHANICAL COUPLING.	SEE SECTION 40 23 15
8	WELDED STEEL PIPE (AWWA C200 & MODIFIED PER SECTION 331111) (ALL PIPE CALLOUT DIAMETERS ARE 'ID' OF MORTAR LINING)	WELDED STEEL, AWWA C208 MODIFIED PER SECTION 331111, FABRICATED.	SEE SECTION 33 11 11

TYPICAL PIPE DESIGNATION:



NOTES:

NOTE 1
ALTHOUGH SEVERAL PIPE MATERIAL GROUPS MAY BE LISTED ON THIS SHEET FOR A GIVEN FLUID SERVICE, CONTRACTOR SHALL PROVIDE ONLY THE PIPE MATERIAL GROUP SHOWN ON THE DRAWINGS AND SPECIFIED FOR THAT FLUID SERVICE.

NOTE 2
LEAKAGE ALLOWANCE IS AS FOLLOWS
A. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE.
B. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE FOR UNBURIED PIPE AND NOT MORE THAN 0.02 GALLON PER HOUR PER INCH DIAMETER PER 100 FEET OF BURIED PIPE.
C. PIPES SO DESIGNATED SHALL NOT SHOW A LEAKAGE OF MORE THAN 0.15 GALLON PER HOUR PER INCH OF DIAMETER PER 100 FEET OF PIPE.
D. PIPES SO DESIGNATED SHALL NOT SHOW A LOSS OF PRESSURE OF MORE THAN 5 PERCENT.
E. PIPE SO DESIGNATED SHALL NOT SHOW A LOSS OF VACUUM OF MORE THAN 4 INCHES MERCURY COLUMN.

NOTE 3
FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.

NOTE 4
NO SUBSTITUTIONS U.N.O. IN THE SPECIFICATIONS.

NOTE 5
NOT USED

NOTE 6
STATIC WATER TEST WITH SURFACE 5 FEET ABOVE HIGH POINT OF PIPE.

NOTE 7
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE PLUMBING CODE.

NOTE 8
NOT USED

NOTE 9
NOT USED

NOTE 10
NOT USED

NOTE 11
NOT USED

NOTE 12
CHANGE IN PIPING MATERIAL GROUP NUMBER IS INDICATED THUS: ——◆

NOTE 13
FOR FULL PIPE LINING AND COATING REQUIREMENTS, SEE SPECIFICATIONS.

NOTE 14
EXPOSED OUTDOOR PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS TO BE SELECTED BY OWNER.

NOTE 15
NOT USED

NOTE 16
NOT USED

NOTE 17
NOT USED

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
PIPING SCHEDULE

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

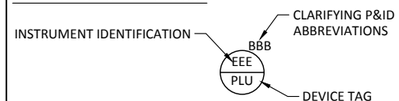
DRAWING
G005

JOB NO: 0000000

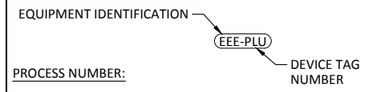
Path: C:\Vault\Chugach Electric\Portal Release Structure\G005.dwg Plot date: Sep 26, 2023 03:57pm, CAD User: HaberFlavia

INSTRUMENTATION / EQUIPMENT TAGS

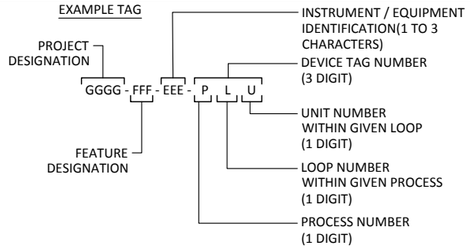
EXAMPLE INSTRUMENT CALLOUT



EXAMPLE EQUIPMENT CALLOUT



EXAMPLE TAG



PROCESS NUMBER:

0 MPH COMMON
1 TURBINE/GENERATOR
2 PUMPS/MOTORS
3 TIV
4 HVAC
5 LUBE/WATER COOLING
6 HPU
7 PLUMBING
8 VFD
9 CONTROLS INSTRUMENTATION

NOTE:

PROJECT AND FEATURE DESIGNATION FOR ALL COMPONENTS ON THIS FEATURE SET SHALL BE "EFWP-DOM" FOR "EKLUTNA FISH & WILDLIFE PROJECT - EKLUTNA RIVER RELEASE FACILITY". THIS HAS BEEN OMITTED ON THE DRAWINGS FOR BREVITY.

GENERAL INSTRUMENT OR FUNCTIONAL SYMBOLS

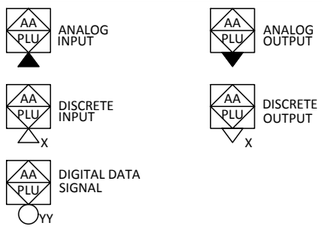
	FIELD MOUNTED	PRIMARY OR PANEL MOUNTED - ACCESSIBLE (1)	PRIMARY OR PANEL MOUNTED - INACCESSIBLE (2)	SECONDARY OR MCC MOUNTED - ACCESSIBLE (1)	SECONDARY OR MCC MOUNTED - INACCESSIBLE (2)
INSTRUMENT	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU
SHARED DISPLAY SHARED CONTROL OR HMI	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU
INDICATING LIGHTS	EEE / PLU	EEE / PLU	N/A	EEE / PLU	N/A

(1) NORMALLY ACCESSIBLE TO OPERATOR
(2) NORMALLY INACCESSIBLE TO OPERATOR (BEHIND-THE-PANEL)

SPECIAL CASE INSTRUMENT OR FUNCTIONAL SYMBOLS

- SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS
- RELAY INTERLOCK LOGIC - SEE SCHEMATICS OR SPECIFICATIONS FOR MORE INFORMATION
- LSH / PLU — LEVEL (FLOAT)
- LE / PLU — LEVEL (ULTRASONIC)
- 24 VDC — POWER SUPPLY (SIZE AS NOTED)
- AS — AIR SUPPLY
- PRIMARY ELECTRICAL POWER (120V / 60 HZ UNLESS INDICATED OTHERWISE)
- INDICATES VENDOR PACKAGE
- CR — CONTROL RELAY
- LIGHTNING SURGE ARRESTOR
- M — MOTOR

SIGNAL SYSTEM INTERFACES



AA = I/O DESIGNATION (MV = MULTIVARIABLE)

YY = DIGITAL PROTOCOL

X: H-MAINTAINED/LATCHING
M = MOMENTARY/FOLLOWER

ANALOG I/O DESIGNATORS

CR	CHLORINE RESIDUAL
DP	DIFFERENTIAL PRESSURE
FL	FLOW
LE	LOWER EXPLOSIVE LIMIT
LV	LEVEL
MO	MANIPULATED OUTPUT
PH	ACIDITY
PO	POSITION
PR	PRESSURE
PV	PROCESS VARIABLE
SP	SPEED
TE	TEMPERATURE
TU	TURBIDITY

DIGITAL PROTOCOL DESIGNATORS

DN	DEVICENET
IP	ETHERNET /IP
MB	MODBUS RTU
PB	PROFIBUS
PL	PARALLEL
SL	SERIAL
TC	MODBUS TCP

DISCRETE I/O DESIGNATORS

AM	AUTO-MANUAL
AU	AUTO
CL	CLOSED
EN	ENABLE
EL	POWER AVAILABLE
FA	FIRE ALARM
FW	FORWARD / REVERSE
HH	HI-HI LEVEL
HI	HI LEVEL
LL	LOW-LOW LEVEL
LO	LOW LEVEL
MN	MANUAL
OO	ON-OFF
OP	OPEN
RB	RUN BOOSTER
RC	RUN CLOSED
RE	REMOTE
RF	RUN FORWARD
RG	RUNNING
RN	RUN-STOP
RO	RUN-OPEN
RR	RUN-REVERSE
RV	REVERSE
YA	FAULT
SU	SUPERVISORY
SW	SELECTION
TR	TROUBLE

INSTRUMENTATION IDENTIFICATION TABLE (ISA)

FIRST LETTER			SUCCEEDING LETTER(S)		
LETTER	MEASURED INITIATING VARIABLE	VARIABLE MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT OR ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS (+)		ALARM		
B	BURNER, COMBUSTION				
C	CONDUCTIVITY			CONTROL	CLOSED
D	DENSITY (S.G.)	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	GAUGE		GLASS, GAUGE, VIEWING DEVICE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION	MOMENTARY			MIDDLE, INTERMEDIATE
N	TORQUE		ISOLATE	ISOLATOR	
O	USER CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE (VACUUM), PNEUMATIC		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION/ RESISTANCE (ELECTRICAL)		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTI VARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	INTRUSION	X-AXIS			
Y	EVENT, STATE OR PRESENCE	Y-AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z-AXIS		DRIVER, ACTUATOR, FINAL CONTROL ELEMENT	

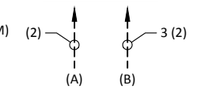
EQUIPMENT IDENTIFICATION TABLE

AC	AIR COMPRESSOR	GEN	GENERATOR	PV	PHOTOVOLTAIC
ACC	ACCUMULATOR	GSU	GENERATOR STEP-UP TRANSFORMER	RCT	RECTIFIER
ACT	ACTUATOR	GTC	GENERATOR POWER TERMINAL CABINET	RIO	REMOTE I/O UNIT
AF	AIR FILTER	HB	HOSE BIB	RTD	RESISTANCE TEMPERATURE DETECTOR
AFD	ADJUSTABLE FREQUENCY DRIVE	HMI	HUMAN-MACHINE INTERFACE	RTU	REMOTE TELEMETRY UNIT
AH	AIR HANDLING UNIT	HOI	HOIST/CRANE	SEC	SECURITY CONTROL PANEL
ARC	ARC PLENUM AND EXHAUST DUCT	HPU	HYDRAULIC POWER UNIT	SEP	SEPTIC SYSTEM
ATS	AUTOMATIC TRANSFER SWITCH	HTR	HEATER	SHG	SODIUM HYPOCHLORITE GENERATOR
BAT	BATTERY	INV	INVERTER	SNK	SINK
BC	BATTERY CHARGER	LCP	LOCAL CONTROL PANEL	SPU	SPEED PICKUP SENSOR
BRG	BEARING	LCS	LOCAL CONTROL STATION	STR	STRAINER
BRK	BREAKER	LPU	LUBRICATING OIL PUMP CONTROL UNIT	SVR	SERVER
CAM	CAMERA	MB	METER BASE	SWG	SWITCHGEAR
CSE	COMBINATION SERVICE ENCLOSURE	MC	MECHANICAL COUPLING	TIV	TURBINE INLET VALVE
CV	CHECK VALVE	MCC	MOTOR CONTROL CENTER	TNK	TANK
D	DAMPER	MCP	MAIN CONTROL PANEL	TOI	WATER CLOSET
DCU	DISTRIBUTED CONTROL UNIT	MES	MANAGED ETHERNET SWITCH	TRS	TRAVELING SCREEN
DS	DISCONNECT	MOV	MOTOR OPERATED VALVE	TUR	TURBINE
EAP	ENGINEERING ACCESS POINT	MS	MOTOR STARTER	UPS	UNINTERRUPTABLE POWER SUPPLY
ECP	ENVIRONMENTAL CONTROL PANEL (HVAC)	MTR	MOTOR	UVR	UV REACTOR
EEW	EMERGENCY EYEWASH STATION	MTS	MANUAL TRANSFER SWITCH	V	VALVE
EF	EXHAUST FAN	NET	NETWORK / COMMUNICATIONS RACK	VCP	VENDOR CONTROL PANEL
EXC	EXCITER	OWS	OIL WATER SEPARATOR	VFD	VARIABLE FREQUENCY DRIVE
FAS	FIRE ALARM SYSTEM	P	PUMP	VL	VENTILATION LOUVER
FD	FLOOR DRAIN	PB	PANELBOARD / LOAD CENTER	VSP	VENDOR SUPPLIED PANEL
FIL	FILTER	PCP	PLANT CONTROL PANEL	WS	WATER SOFTENER
FOR	FIBER OPTIC REPEATER	PCU	POWER CONTROL UNIT	XFR	TRANSFORMER
FOT	FIBER OPTIC TRANSCEIVER	PFL	PRE-FILTER	XVR	TRANSCEIVER
FPP	FIBER PATCH PANEL / CONNECTOR HOUSING	PLC	PROGRAMMABLE LOGIC CONTROLLER	YLT	EVENT PILOT LIGHT
G	GATE	PRV	PRESSURE REDUCING VALVE	ZZK	SECURITY GATE INTERFACE
GBK	GENERATOR BRAKE	PS	POWER SUPPLY / ISOLATOR / CONVERTER		

INSTRUMENTATION LINE SYMBOLOGY

- PRIMARY PROCESS (CLOSED CONDUIT, DASHED LINE INDICATES ALTERNATE FLOW STREAM)
- PRIMARY PROCESS (OPEN CHANNEL)
- ANALOG SIGNAL, (4 TO 20 mAdc, ECT)
- DISCRETE SIGNAL, (ON/OFF, ECT)
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- DIGITAL DATA LINK
- PACKAGE SYSTEM EQUIPMENT
- STRUCTURE/FACILITY BOUNDARY
- CABLE FURNISHED WITH EQUIPMENT
- M — MECHANICAL POWER/LINKAGE
- E — ELECTRICAL POWER

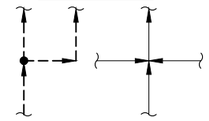
PARALLELING LINES



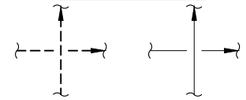
(A) TOTAL OF 2 SIGNALS

(B) 3 TYPICAL SETS OF 2 SIGNALS EACH. TOTAL OF 6 SIGNALS.

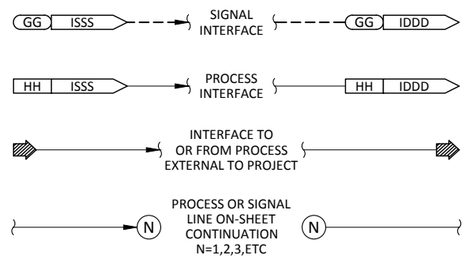
CONNECTING LINES



NON-CONNECTING LINES



SYSTEM CONTINUATION INTERFACES



GG SIGNAL INTERFACE NO.
HH PROCESS INTERFACE NO.
DDD DESTINATION DRAWING NO.
SSS SOURCE DRAWING NO.

P&ID ABBREVIATIONS

AC	ALTERNATING CURRENT
AM	AUTO-MANUAL
COD	CHEMICAL OXYGEN DEMAND
DEV	DEVIATION
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
ECS	ENVIRONMENTAL CONTROL SYSTEM (HVAC)
EPO	EMERGENCY POWER OFF
FOC	FIBER OPTIC CABLE
FOS	FAST-OFF-SLOW
FOSA	FAST-OFF-SLOW-AUTO
FOSR	FAST-OFF-SLOW-REMOTE
HI	HIGH
HML	HIGH-MID-LOW
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
ISR	INTRINSICALLY SAFE RELAY
LEL	LOWER EXPLOSIVE LIMIT
LO	LOW
LOR	LOCAL-OFF-REMOTE
LOS	LOCKOUT STOP
LR	LOCAL-REMOTE
MC	MODULATE-CLOSE
MOA	MANUAL-OFF-AUTO
MSC	MANUFACTURER SUPPLIED CABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	OPEN-CLOSE(D)
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OI	OPERATOR INTERFACE
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
PC	PERSONAL COMPUTER
PCS	PLANT CONTROL SYSTEM
pH	HYDROGEN ION CONCENTRATION
PID	PROPORTIONAL INTEGRAL DERIVATIVE CONTROL
POT	POTENTIOMETER
RC	RUN CLOSE
RO	RUN OPEN
RL	RAISE-LOWER
RM	REMOTE MULTIPLEXING MODULE
RSL	RAISE-STOP-LOWER
RVSS	REDUCED VOLTAGE SOLID-STATE STARTER
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SEL	SELECT
SET	SET POINT
SF	SLOWER-FASTER
SHC	SODIUM HYPOCHLORITE
SR	START-RESET
SS	START-STOP
SSC	SUPERVISORY SET POINT CONTROL
ST	START
SW	SEAL WATER
TC	THERMOCOUPLE
TCR	TOTAL CHLORINE RESIDUAL
TEMP	TEMPERATURE
TSP	TWISTED SHIELD PAIR
TURB	TURBIDITY
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
VSP	VENDOR SUPPLIED PANEL
VTO	VENT TO OUTSIDE
WSEL	WATER SURFACE ELEVATION

NOTES:

1. FOR MECHANICAL ELEMENT SYMBOLS, SEE MECHANICAL LEGEND.
2. FOR ELECTRICAL ELEMENT SYMBOLS, SEE ELECTRICAL LEGEND.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

INSTRUMENTATION AND EQUIPMENT LEGEND

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

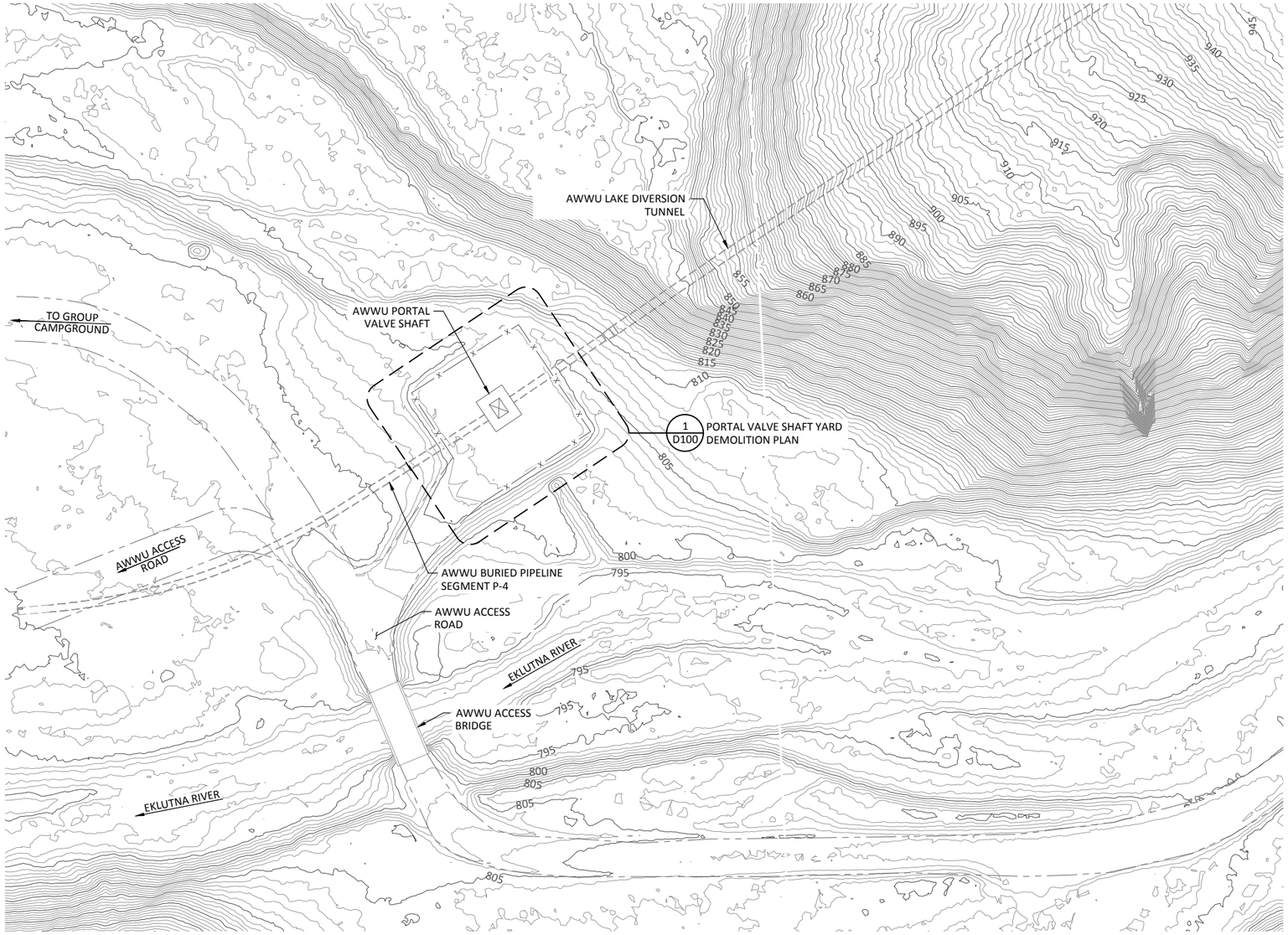
DRAWING
G006

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\G006.dwg Plot date: Sep 26, 2023 03:58pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



DEMOLITION KEY PLAN

SCALE: 1"= 40'

0" 40' 80'

N

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

DEMOLITION KEY PLAN

DESIGNED S. ELLENSON

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

D001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\D001.dwg Plot date: Sep 26, 2023 04:06pm, CAD User: HaberFlavia

SHEET NOTES:

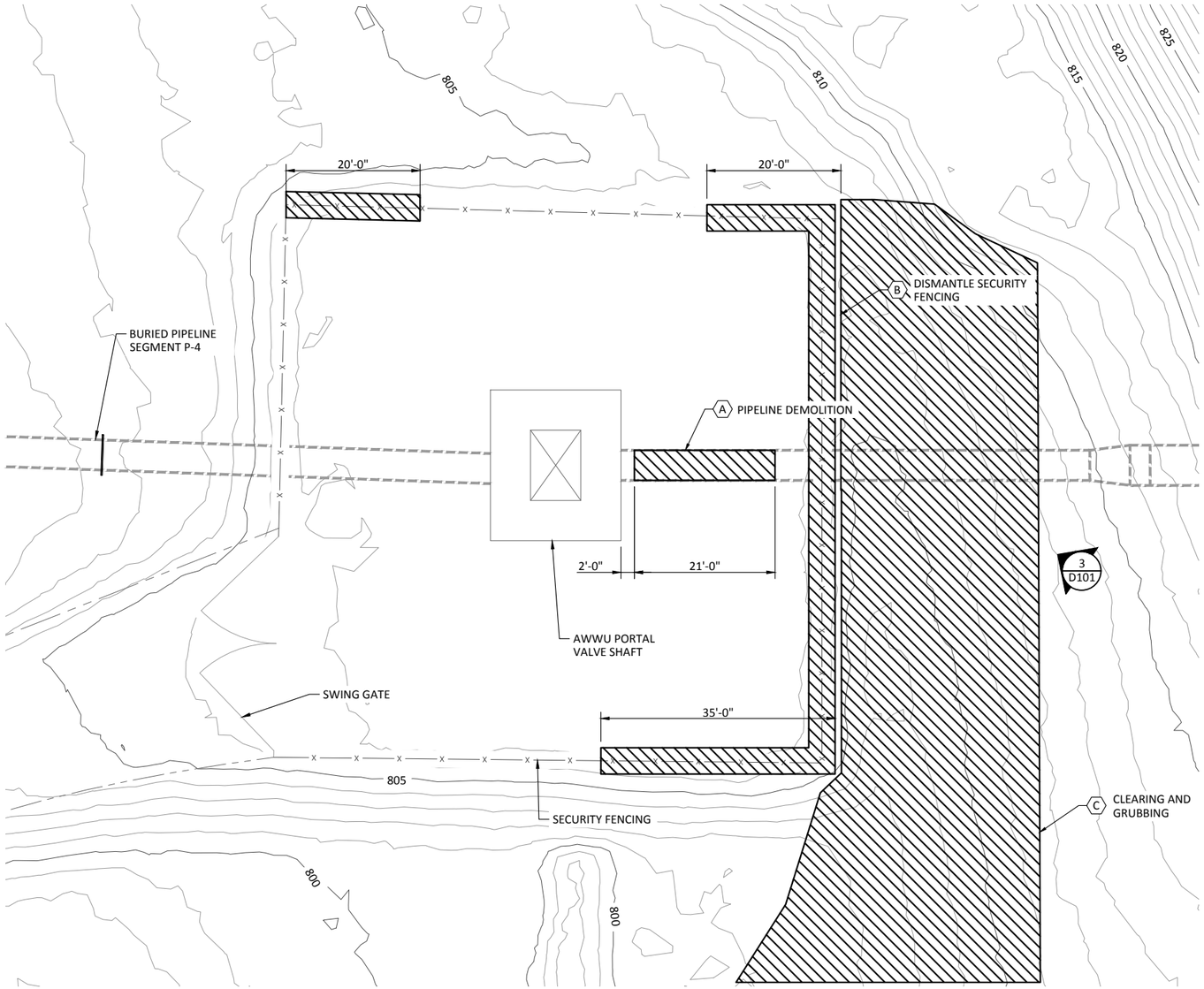
1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

SHEET KEY NOTES:

A. EXCAVATE AND EXPOSE BURIED STEEL PIPELINE UPSTREAM OF PORTAL VALVE SHAFT. DEMOLISH AND DISPOSE OF 21-FT SEGMENT OF PIPELINE.

B. DISMANTLE SECURITY FENCING TO EXTENTS SHOWN. PRESERVE AND PROTECT FOR RE-INSTALLATION FOLLOWING PROJECT CONSTRUCTION.

C. CLEAR AND GRUB LAND NORTHEAST OF PORTAL VALVE SHAFT TO EXTENTS SHOWN .



PORTAL VALVE SHAFT YARD DEMOLITION PLAN

SCALE: 1"= 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

PORTAL VALVE SHAFT YARD DEMOLITION PLAN

DESIGNED S. ELLENSON

DRAWN F. HABER

CHECKED J. BOAG

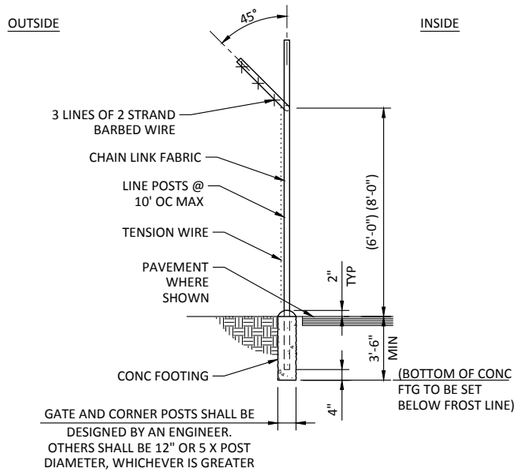
PROJECT DATE 10/6/23

DRAWING

D100

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\D100.dwg Plot date: Sep 28, 2023 12:49pm, CAD User: HaberFlavia

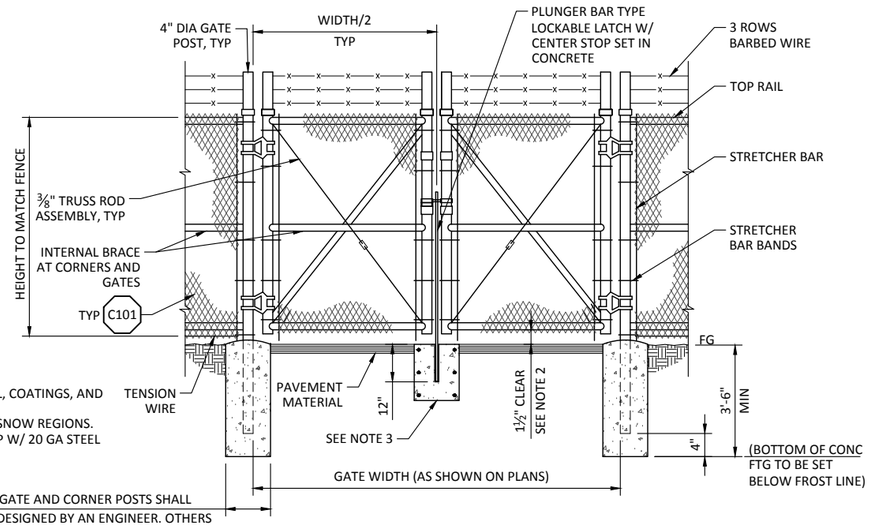


NOTES:
1. SEE SPECIFICATIONS FOR FENCE MATERIAL, COATINGS, AND INSTALLATION REQUIREMENTS.
2. EXTENSION ARM MAY BE TURNED IN AT OPTION OF OWNER.

CHAIN LINK FENCE

SCALE: NTS

C101



NOTES:
1. SEE SPECIFICATIONS FOR FENCE MATERIAL, COATINGS, AND INSTALLATION REQUIREMENTS.
2. SEE SPECIFICATIONS FOR CLEARANCES IN SNOW REGIONS.
3. 12" DIAMETER x 18" DEEP CONCRETE STOP W/ 20 GA STEEL PLUNGER SLEEVE, DIA = ROD O.D. +½".

DOUBLE LEAF GATE

SCALE: NTS

C102

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

CIVIL GENERAL NOTES AND STANDARD DETAILS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

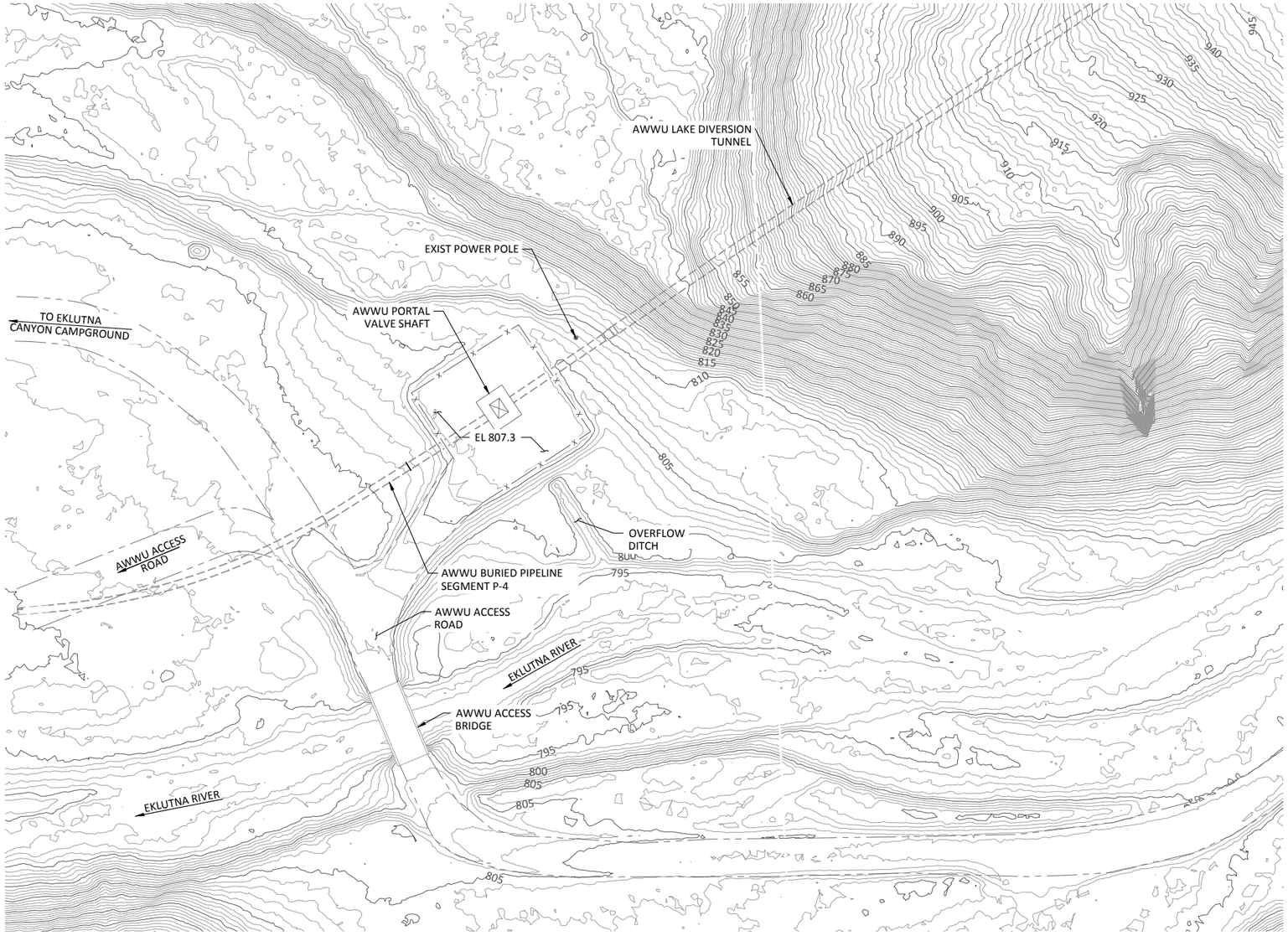
DRAWING
GC001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GC001.dwg Plot date: Sep 28, 2023 01:12pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



PORTAL VALVE SHAFT YARD EXISTING SITE PLAN

SCALE: 1"= 40'

0" 40' 80'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

PORTAL VALVE SHAFT YARD
EXISTING SITE PLAN

DESIGNED S. ELLENSON

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C001

JOB NO: 000000

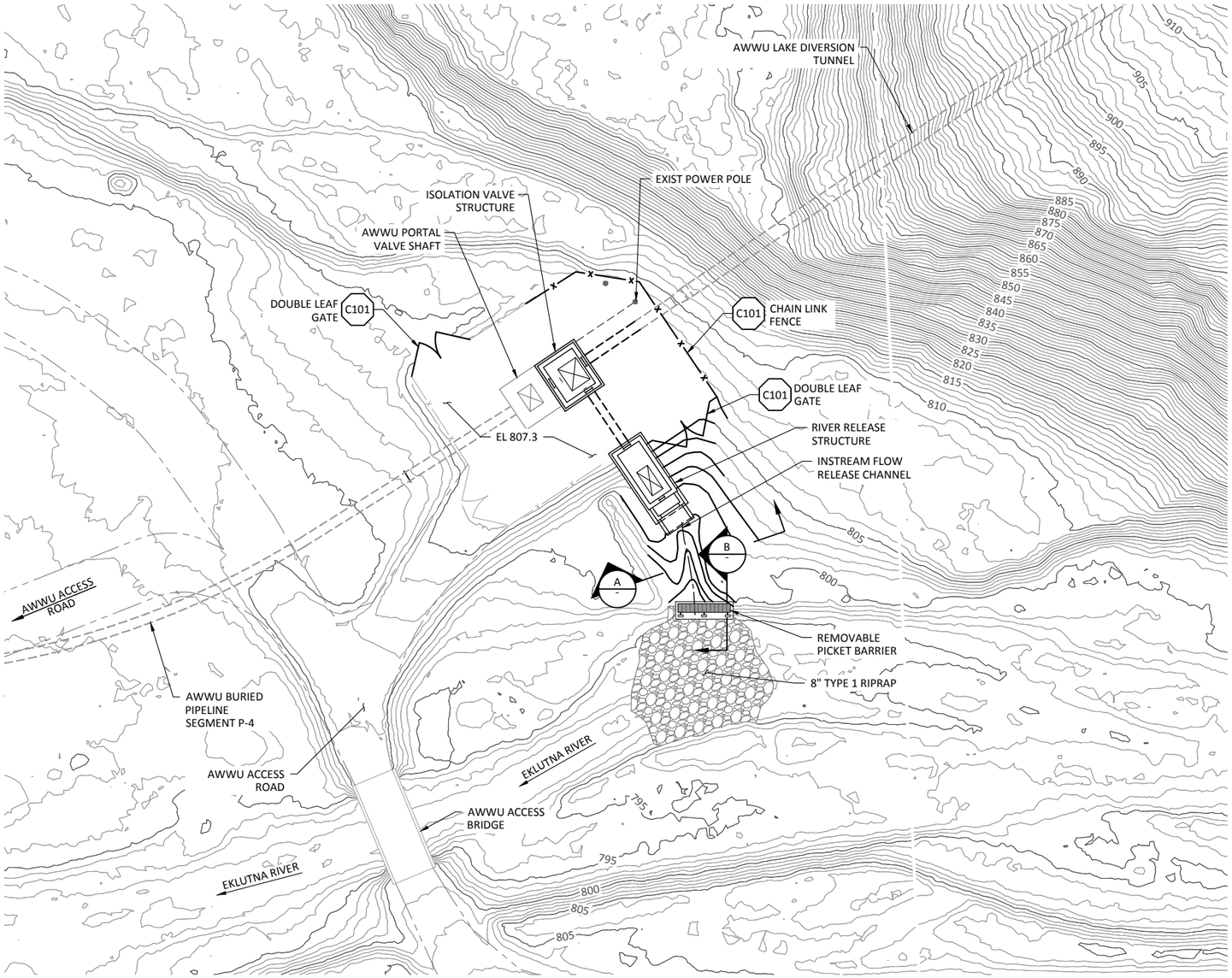
Path: C:\Vault\Chugach Electric\Portal Release Structure\C001.dwg Plot date: Sep 28, 2023 01:13pm, CAD User: HaberFlavia

GENERAL NOTES:

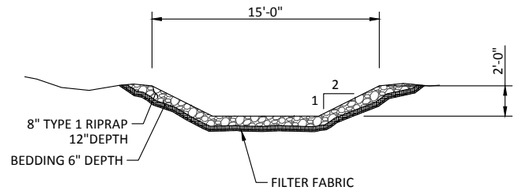
1. SURVEY BASED ON LIGHT DETECTION AND RANGING (LIDAR) AERIAL IMAGERY DATA CAPTURED IN MAY 2022.

PROJECTION: UTM ZONE 6 NORTH
HORIZONTAL DATUM: NAD83 (2011)
VERTICAL DATUM: NAVD88 (GEOID 12B)

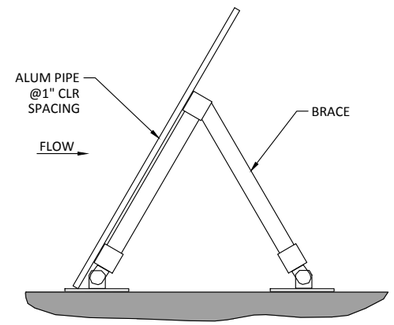
2. ELEVATIONS ARE TO FINISHED GRADE UNLESS OTHERWISE SHOWN.
3. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN



PORTAL VALVE SHAFT YARD EXISTING SITE PLAN
SCALE: 1"= 30'
0" 30' 60'



A - SECTION
SCALE: 1"= 5'
0" 5' 10'



B - SECTION
SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

PORTAL VALVE SHAFT YARD
GRADING PLAN

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
C100

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\C100.dwg Plot date: Sep 28, 2023 01:13pm, CAD User: HaberFlavia

GENERAL STRUCTURAL NOTES:
THE FOLLOWING NOTES ARE GENERAL AND APPLY TO THE ENTIRE PROJECT, UNLESS SPECIFICALLY NOTED OTHERWISE (UNO)

1) GENERAL:

A. CONSTRUCTION DOCUMENTS:
   1. THE CONTRACTOR SHALL REVIEW THE APPROVED CONTRACT DOCUMENTS AND NOTIFY THE ENGINEER OF ANY ERRORS OR DISCREPANCIES PRIOR TO THE START OF CONSTRUCTION.
   2. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF ANY UNIDENTIFIED EXISTING UNDERGROUND UTILITIES ARE DISCOVERED.
   3. THE STRUCTURAL CONTRACT DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, BRACING AND/OR SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC.
   4. UNDER NO CIRCUMSTANCES CAN STRUCTURAL COMPONENTS BE SUBSTITUTED, OMITTED, OR ALTERED FROM THE APPROVED SET OF CONSTRUCTION DOCUMENTS WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.
B. DIMENSIONS AND NOTATIONS:
   1. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. DO NOT SCALE DRAWINGS.
   2. ABBREVIATIONS USED ON THE APPROVED CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED TYPICAL ABBREVIATIONS FOR THE INDUSTRY. THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE ENGINEER IMMEDIATELY OF ANY ABBREVIATIONS THAT ARE UNKNOWN TO THE CONTRACTOR.
C. TYPICAL NOTES AND DETAILS:
   1. SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER STANDARD TYPICAL NOTES AND DETAILS.
   2. STANDARD TYPICAL NOTES AND DETAILS ARE TO BE USED WHEN REFERRED TO OR WHEN NO OTHER MORE RESTRICTIVE OR DIFFERENT DETAILS ARE SHOWN ON THE DRAWINGS.
   3. WORK NOT PARTICULARLY SHOWN OR SPECIFIED SHALL BE THE SAME AS SIMILAR PARTS THAT ARE SHOWN OR SPECIFIED.
D. CODE REQUIREMENTS:
   1. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF REGULATING AGENCIES WHICH MAY HAVE AUTHORITY OVER ANY PORTION OF THE WORK.
   2. SPECIFICATIONS, CODES AND STANDARDS NOTED SHALL BE OF THE LATEST APPROVED ISSUE, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE.
   3. MINIMUM UNIFORM (BLANKET) ROOF SNOW LOAD, AS DEFINED BY LOCAL BUILDING OFFICIAL OR STATE, SHALL BE DESIGNED FOR, AND IT IS THE RESPONSIBILITY OF THE ENGINEER TO CONFIRM IF ONE EXISTS BY CONTACTING THE LOCAL BUILDING OFFICIAL.
E. DEFERRED SUBMITTALS:
   1. DEFERRED STRUCTURE SUBMITTAL ITEMS HAVE NOT BEEN PERMITTED UNDER THE BASE BUILDING APPLICATION.
   2. THE CONTRACTOR SHALL SUBMIT COMPONENT SYSTEM DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS, STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE JURISDICTION HAVING AUTHORITY, TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE FOR REVIEW AND FORWARD THE REVIEWED DOCUMENTS TO THE BUILDING OFFICIAL IN COMPLIANCE WITH SECTION 107.3.4.1 OF THE CBC.
   3. DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THE COMPONENT SYSTEM DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.
   4. THE FOLLOWING CONTRACTOR-DESIGNED PROJECT ELEMENTS ARE DEFINED AS DEFERRED STRUCTURAL SUBMITTAL ITEMS:

      PRE-ENGINEERED METAL BUILDINGS

2) CODES, STANDARDS, AND REFERENCES:

A. ASCE 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES.
B. ACI 318-14: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.
C. ACI 350-06: CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES.
D. AISC 360-16 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.

3) FOUNDATIONS AND GEOTECHNICAL:

A. GEOTECHNICAL DESIGN CRITERIA IS BASED ON THE RECOMMENDATIONS DOCUMENTED IN THE DESIGN DOCUMENTATION REPORT:

4) GRATING:

A. WEIGHT OF GRATING SECTION SHALL NOT EXCEED 80 LBS.
B. PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL, APPROX 4" FROM PANEL CORNERS.
C. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
D. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
E. PROVIDE GRATING FASTENERS AS REQUIRED.
F. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN ¼" NOR GREATER THAN ½"
G. ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS.
H. PROVIDE MINIMUM BEARING PER MANUFACTURERS RECOMMENDATIONS FOR ALL GRATING.

5) NON-SHRINK GROUT:
1. ALL GROUT WORK SHALL CONFORM TO THE LATEST EDITION OF ACI 301.
2. FORMWORK: DESIGN, ERECT, SUPPORT, BRACE AND MAINTAIN FORMWORK TO SUPPORT VERTICAL, LATERAL, STATIC AND DYNAMIC LOADS THAT MIGHT BE APPLIED UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

6) STRUCTURAL AND MISCELLANEOUS STEEL:

A. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM STANDARDS:
   a) WIDE FLANGE SHAPES — A992, GR 50 GALV
   b) OTHER SHAPES, PLATES, ANGLES AND BARS — A36 GALV
   c) STEEL PIPE — A53, GRADE B GALV
   d) HOLLOW STRUCTURAL SECTIONS — A500, GRADE B GALV
C. WELDS: PROVIDE 70KSI LOW HYDROGEN ELECTRODE OR PROCESS IN ACCORDANCE WITH AWS A5.1.
D. BOLTS, U.N.O.:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316
H. DRILL AND EPOXY ANCHOR BOLTS:
   1. STAINLESS STEEL ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316 OR EQUAL APPROVED BY ENGINEER
I. EPOXY BOLT OR EXPANSION BOLT SUBSTITUTIONS FOR EMBEDDED BOLTS IS PROHIBITED WITHOUT WRITTEN CONSENT FROM THE ENGINEER.
J. UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL EPOXY BOLTS SHALL BE AS SPECIFIED.
K. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE AISC CODE OF STANDARD PRACTICE, EXCEPT AS MODIFIED IN THESE NOTES AND THE PROJECT SPECIFICATIONS.
L. ALL STAINLESS STEEL SHALL BE TYPE 316.
M. SPLICING OF STEEL MEMBERS, UNLESS SHOWN ON THE DRAWINGS, IS PROHIBITED WITHOUT WRITTEN APPROVAL OF THE PROJECT ENGINEER.
N. GALVANIC PROTECTION SHALL BE PROVIDED BETWEEN DISSIMILAR METALS.
O. WELDING SHOWN FOR STAINLESS STEEL ELEMENTS SHALL COMPLY WITH AWS D1.6/D1.6M.

7) CONCRETE:

A. ALL CONCRETE WORK SHALL CONFORM TO THE LATEST EDITION OF ACI 301 AND ACI 117, EXCEPT AS MODIFIED BY THE FOLLOWING SUPPLEMENTAL REQUIREMENTS:
B. ALL CONCRETE SHALL BE NORMAL WEIGHT CONCRETE.
C. CONCRETE MIX DESIGN SHALL BE ESTABLISHED IN ACCORDANCE WITH CHAPTER 5 OF ACI 350.
D. COMPRESSIVE STRENGTH (28 DAYS)
   F'C — 4,500 PSI
E. REINFORCEMENT FOR CONCRETE:
1. ALL REINFORCING SHALL BE SUPPORTED IN FORMS SPACED WITH NECESSARY ACCESSORIES AND SHALL BE SECURELY WIRED TOGETHER IN ACCORDANCE WITH THE LATEST EDITION OF THE CRSI "MANUAL OF STANDARD PRACTICE"
2. CLEAR COVER
   a) CONCRETE CAST AGAINST EARTH = 3"
   b) ALL OTHER CONCRETE, UNO = 2"
F. SLAB-ON-GRADE REINFORCEMENT SHALL BE PLACED AT THE MID-DEPTH OF THE SLAB, UNO.
G. FORMWORK: DESIGN, ERECT, SUPPORT, BRACE AND MAINTAIN FORMWORK TO SUPPORT VERTICAL, LATERAL, STATIC AND DYNAMIC LOADS THAT MIGHT BE APPLIED UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

8) ALUMINUM:

A. ALL ALUMINUM WORK SHALL CONFORM TO THE LATEST EDITION OF THE ALUMINUM DESIGN MANUAL BY THE ALUMINUM ASSOCIATION.
B. UNLESS OTHERWISE INDICATED, ALUMINUM METALWORK SHALL BE FABRICATED FROM ALLOY 6061-T6, EXCEPT GRATING WHICH SHALL BE PER DESIGN.

9) REINFORCEMENT:

A. ASTM A615 - FY = 60,000 PSI
B. SEE SPECIFICATIONS FOR REINFORCING PLACEMENT REQUIREMENTS.
C. ABSOLUTELY NO WELDING OF REINFORCING BARS OR TORCHING TO BEND REINFORCING BARS SHALL BE ALLOWED WITHOUT SPECIFIC APPROVAL FROM THE STRUCTURAL ENGINEER.

10) TESTS AND INSPECTIONS:

A. INSPECTIONS
   1. CONSTRUCTION SHALL BE SUBJECT TO INSPECTION BY THE BUILDING OFFICIAL OR THE AUTHORITY HAVING JURISDICTION AND SUCH CONSTRUCTION OR WORK SHALL REMAIN ACCESSIBLE AND EXPOSED FOR INSPECTION PURPOSES UNTIL APPROVED.
   2. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY THE BUILDING OFFICIAL OR THE AUTHORITY HAVING JURISDICTION WHEN WORK IS READY FOR INSPECTION. IN ADDITION, THE CONTRACTOR IS RESPONSIBLE TO PROVIDE ACCESS TO AND MEANS FOR INSPECTIONS OF SUCH WORK THAT ARE REQUIRED BY THE BUILDING OFFICIAL OR AUTHORITY HAVING JURISDICTION.

B. STATEMENT OF SPECIAL INSPECTIONS
   1. THE DESIGN ENGINEER HAS PREPARED AND SUBMITTED A STATEMENT OF SPECIAL INSPECTIONS TO THE BUILDING OFFICIAL SPECIFYING THE SCOPE OF WORK TO BE INSPECTED BY A SPECIAL INSPECTION AGENCY (IN ADDITION TO THE INSPECTIONS BY THE BUILDING OFFICIAL OR AUTHORITY HAVING JURISDICTION) TO SATISFY THE REQUIREMENTS OF THE CALIFORNIA BUILDING CODE, SECTION 1704. THE CONTRACTOR SHALL REVIEW THIS DOCUMENT AND SUBMIT A WRITTEN STATEMENT OF RESPONSIBILITY TO THE BUILDING OFFICIAL AND OWNER (OR THE OWNER'S AUTHORIZED AGENT) PRIOR TO COMMENCEMENT OF THE WORK THAT ACKNOWLEDGES AWARENESS OF THE REQUIREMENTS CONTAINED IN THE STATEMENT OF SPECIAL INSPECTIONS.
   2. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING THEIR WORK WITH THE SPECIAL INSPECTION AGENCY. THE CONSTRUCTION OR WORK FOR WHICH SPECIAL INSPECTION OR TESTING IS REQUIRED SHALL REMAIN ACCESSIBLE AND EXPOSED FOR SPECIAL INSPECTION AND TESTING PURPOSES UNTIL COMPLETION OF THE REQUIRED SPECIAL INSPECTIONS OR TESTS.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

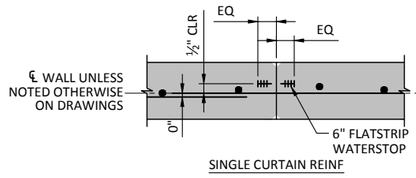
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
STRUCTURAL GENERAL NOTES

DESIGNED K. HEINDEL
DRAWN D. JOHNSTON
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
GS001

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GS001.dwg Plot date: Sep 26, 2023 04:37pm, CAD User: HaberFlavia

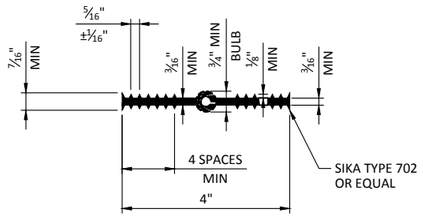


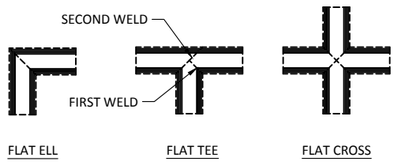
S121 WITH WATERSTOP
SCALE: NTS

S122 NO WATERSTOP
SCALE: NTS

S123 WITH WATERSTOP
SCALE: NTS

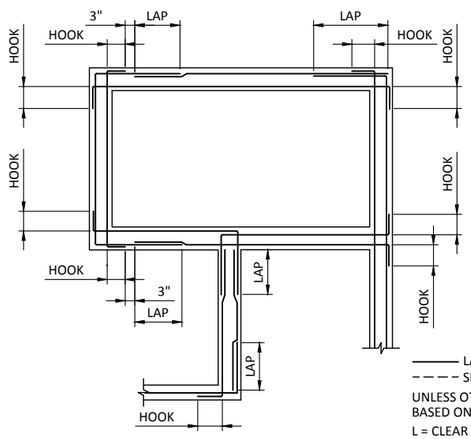
S124 NO WATERSTOP
SCALE: NTS



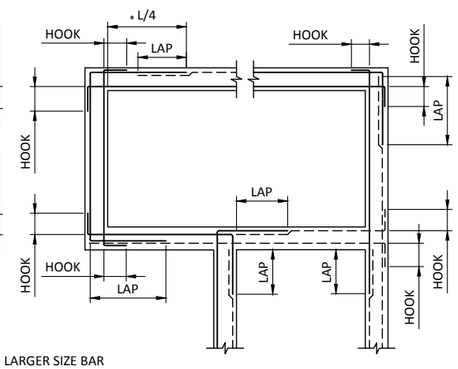


NOTES:
1. WHERE WATERSTOP IS REQUIRED IN SINGLE CURTAIN WALL REINFORCEMENT, PLACE WATERSTOP ON WATER SIDE OF WALL.
2. STAGGER SPLICES UNLESS NOTED OTHERWISE.

S107 4" CENTER-BULB WATERSTOP
SCALE: NTS



S108 PREFABRICATED WATERSTOP JOINTS
SCALE: NTS



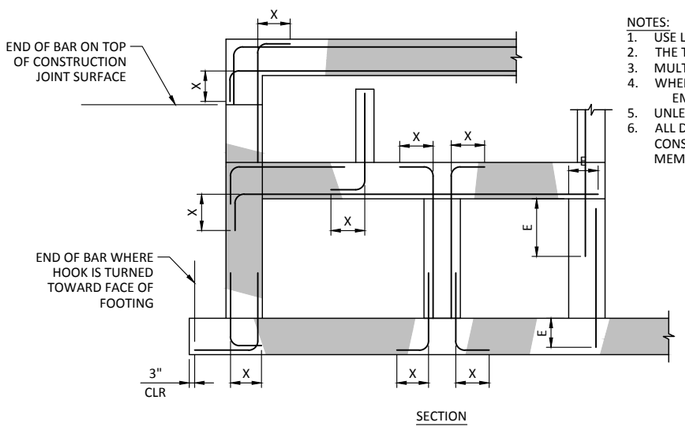
——— LARGER SIZE BAR
– – – – SMALLER SIZE BAR

UNLESS OTHERWISE NOTED LAPS ARE BASED ON THE SMALLER SIZE BARS

L = CLEAR SPAN

*USE THIS DETAILING PROCEDURE WHEN LARGER OR CLOSER SPACED BARS ARE CALLED OUT FOR CORNERS

VERTICAL WALL CONSTRUCTION JOINT
SCALE: NTS



NOTES:
1. USE LAP LENGTHS AS DETERMINED FROM THESE TABLES UNLESS SHOWN OTHERWISE.
2. THE TABLES SHOWN ARE FOR f'c=4000psi, fy=60,000psi, 1.5" MIN CONCRETE COVER AND 3" MIN BAR SPACING.
3. MULTIPLY THE LAP AND E SHOWN IN THESE TABLES BY 1.5 FOR EPOXY COATED REINFORCING.
4. WHEN BARS OF DIFFERENT SIZES ARE LAP SPLICED, LAP LENGTH SHALL BE THE LARGER OF: EMBEDMENT LENGTH OF LARGER BAR LAP OR LENGTH OF SMALLER BAR.
5. UNLESS NOTED OTHERWISE USE REBAR COUPLERS FOR SPLICES OF #11 AND LARGER BARS.
6. ALL DOWEL BARS SHALL EXTEND AN EMBEDMENT LENGTH E INTO ANOTHER MEMBER OR ACROSS A CONSTRUCTION JOINT UNLESS SHOWN TO SPLICE WITH OTHER BARS OR TO EXTEND TO THE FAR FACE OF THE MEMBER AND END WITH A STANDARD HOOK.

BAR SIZE	LENGTH (*) HOOK X	LAP	EMBEDMENT E
#3	6"	16" (21")	12" (16")
#4	8"	16" (21")	12" (16")
#5	10"	20" (26")	15" (20")
#6	12"	28" (37")	22" (28")
#7	14"	48" (62")	37" (48")
#8	16"	62" (81")	48" (62")
#9	19"	79" (102")	61" (79")
#10	22"	100" (130")	77" (100")
#11	24"	123" (160")	95" (123")

* USE LENGTH IN PARENTHESIS FOR WALL HORIZONTAL REBARS AND SLAB BARS WITH 12" OR MORE OF FRESH CONCRETE UNDERNEATH

S141 HORIZONTAL REINFORCEMENT AT WALL INTERSECTIONS
SCALE: NTS

S143 STANDARD 90° BAR HOOKS, EMBEDMENT LENGTHS AND LAP LENGTHS
SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

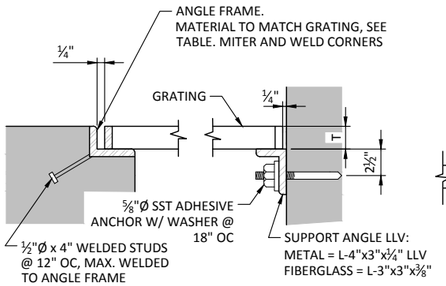
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
STRUCTURAL STANDARD DETAILS 1

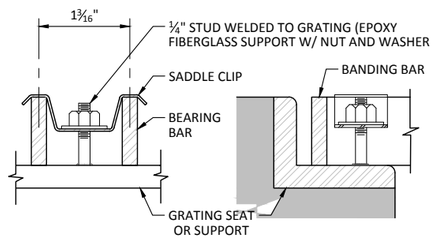
DESIGNED K. HEINDEL
DRAWN D. JOHNSTON
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
GS002

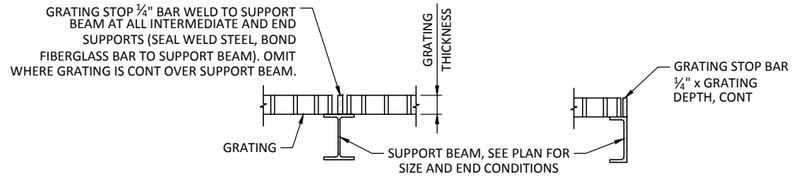
JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GS002.dwg Plot date: Sep 26, 2023 04:37pm, CAD User: HaberFlavia





GRATING CLIP DETAIL



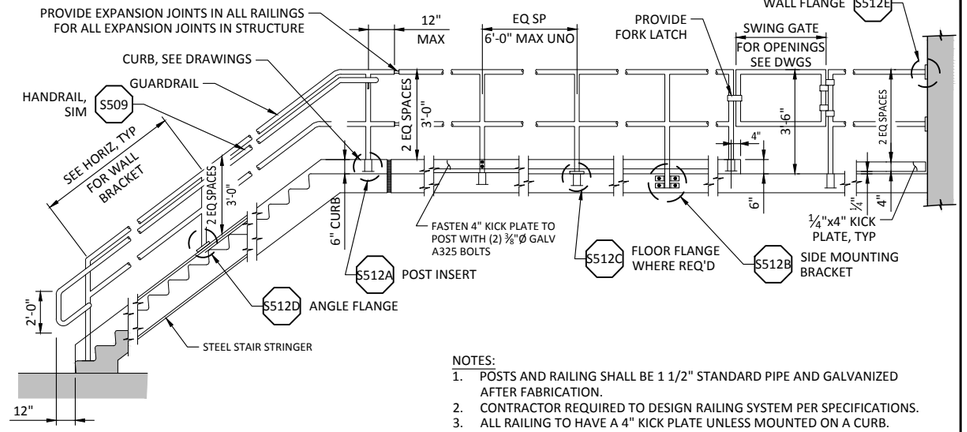
GRATING STOP DETAIL

NOTES:
1. UNLESS INDICATED OTHERWISE, ALL GRATING SHALL BE ALUM.
2. GRATING DEPTH TO BE DETERMINED BY MANUFACTURER AND APPROVED BY ENGINEER, UNO.
3. ALL ENDS AND OPENINGS SHALL BE BANDED.
4. WEIGHT OF GRATING SECTION SHALL NOT EXCEED 80 LBS.
5. METAL BEARING BARS SHALL BE DEPTH T x 3⁄16" @ 1 3⁄16" OC.. CROSS BARS SHALL BE @ 4" OC.
6. PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL, APPROX 4" FROM PANEL CORNERS. MAXIMUM CLIP SPACING AT 36" OC.
7. MATERIALS:
   - A. ALUM GRATING - USE ALUM ANGLE SUPPORTS AND SST BOLTS AND CLIPS. IF SUPPORTED BY STEEL BEAMS, USE STEEL STOP BARS. ALUM IN CONTACT WITH CONC OR STEEL SHALL BE COATED PER THE PROTECTIVE COATING SPECS.
   - B. GALV STEEL GRATING - USE STEEL ANGLE SUPPORTS, BOLTS AND CLIPS. GALV AFTER FABRICATION.
   - C. SST GRATING - USE SST ANGLE SUPPORTS, BOLTS AND CLIPS
   - D. FIBERGLASS GRATING - USE FIBERGLASS FOR ALL COMPONENTS EXCEPT DRILLED ANCHORS; ALL CUT EDGES SHALL BE SEALED WITH RESIN; BONDING: USE EPOXY ADHESIVE BONDING AGENT

GRATING FRAME TABLE SIZED TO MATCH GRATING (FOR FIBERGLASS USE CONTINUOUS PROTRUDED FIBERGLASS SEAT & ANCHOR)			
GRATING DEPTH (T)	STEEL ANGLE (STEEL)	GRATING DEPTH (T)	STEEL ANGLE (STEEL)
1"	1¾ x 1¼ x ¼ (1¼ x 1¼ x ¼)	2"	*2½ x 2½ x ½
1¼"	2 x 1½ x ¼ (1½ x 1½ x ¼)	2¼"	2½ x 2½ x ¼
1½"	1¾ x 1¾ x ¼	2½"	3 x 3 x ½
1¾"	2 x 2 x ¼		

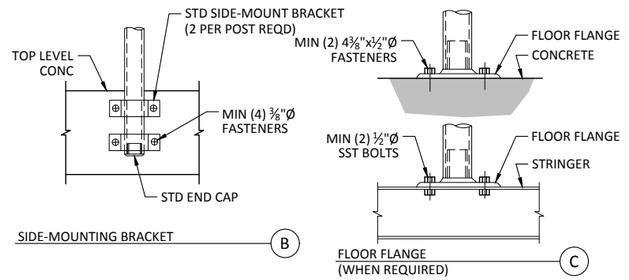
* OR USE 2½"x2½"x¼" W/ ¼" SHIM PLATE WELDED TO BOTTOM

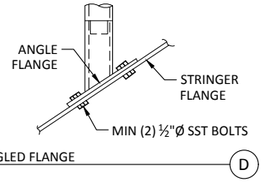
S501 GRATING
SCALE: NTS

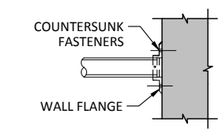


NOTES:
1. POSTS AND RAILING SHALL BE 1 1/2" STANDARD PIPE AND GALVANIZED AFTER FABRICATION.
2. CONTRACTOR REQUIRED TO DESIGN RAILING SYSTEM PER SPECIFICATIONS.
3. ALL RAILING TO HAVE A 4" KICK PLATE UNLESS MOUNTED ON A CURB.

S510 TWO-RAIL RAILING GUARDRAIL DETAIL
SCALE: NTS

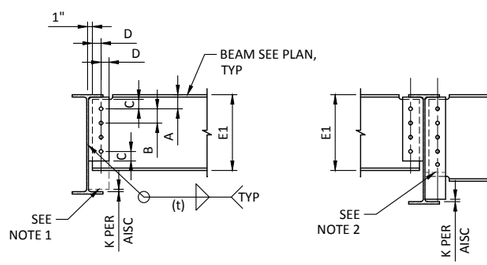






NOTES:
1. IF FASTENING TO CONCRETE, FASTENERS SHALL BE ADHESIVE ANCHORS.
2. CONTRACTOR REQUIRED TO DESIGN RAILING SYSTEM PER SPECIFICATIONS.

S512 RAILING, GUARDRAIL AND HANDRAIL SUPPORT DETAIL
SCALE: NTS

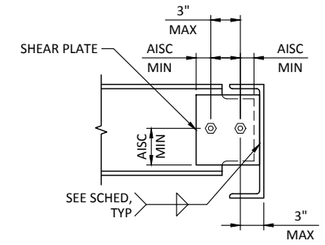


BEAM: ONE SIDE ONLY

BEAM: BOTH SIDES

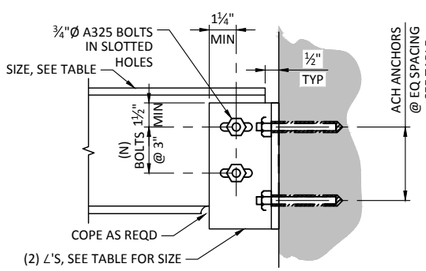
BEAM TO BEAM CONNECTION SCHEDULE								
BEAM SIZE	NO OF A325N BOLTS REQ'D ¾" Ø	NO OF A325N BOLTS REQ'D 1" Ø	CONN PLATE THICKNESS (IN)	WELD SIZE (t)	A (IN)	B (IN)	C (IN)	D (IN)
W8	2		5⁄16	3⁄16	2½"	2½"	1½"	1½"
W10	2		5⁄16	3⁄16	3	3	1½"	1½"

S562 BEAM TO BEAM CONNECTION - PLATE CONNECTION
SCALE: NTS



6" OR LESS CONNECTION

NOTES:
1. EXTEND CONN PLATE WHEN E1 IS GREATER THAN OR EQUAL TO W12 BM.
2. LIMIT OF CONN PLATE WHEN E2-E1 IS LESS THAN OR EQUAL TO 6 INCHES.



BEAM TO CONC CONNECTION SCHEDULE			
BEAM SIZE	DOUBLE ANGLE SIZE	# OF BOLTS (N)	ADHESIVE ANCHORS NUMBER AND SIZE

S563 BEAM TO CONC CONNECTION
SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
STRUCTURAL STANDARD DETAILS 2

DESIGNED K. HEINDEL
DRAWN D. JOHNSTON
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

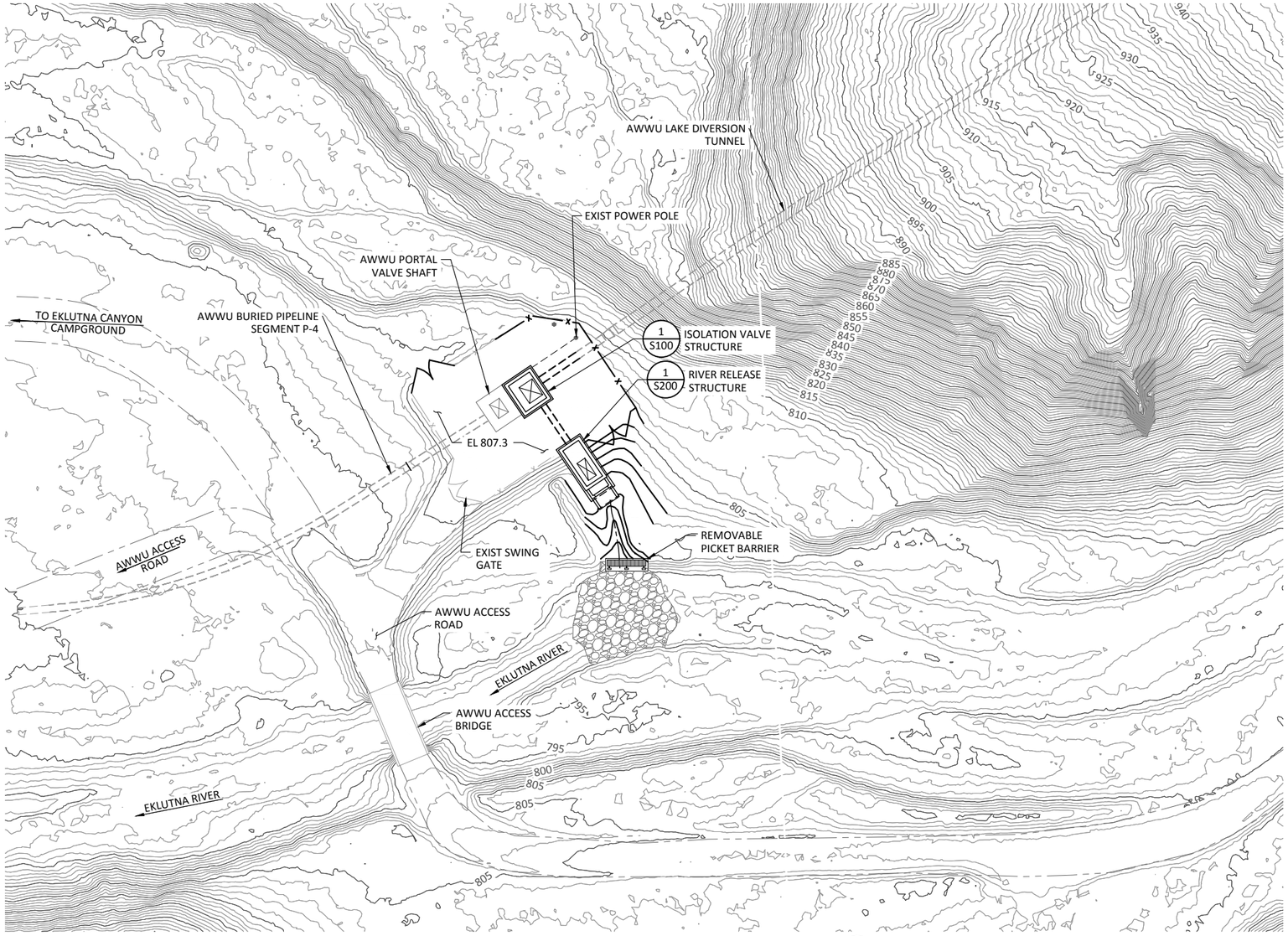
DRAWING
GS003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GS003.dwg Plot date: Sep 26, 2023 04:39pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



STRUCTURAL KEY PLAN
SCALE: 1"= 40'

0" 40' 80'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
STRUCTURAL KEY PLAN

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

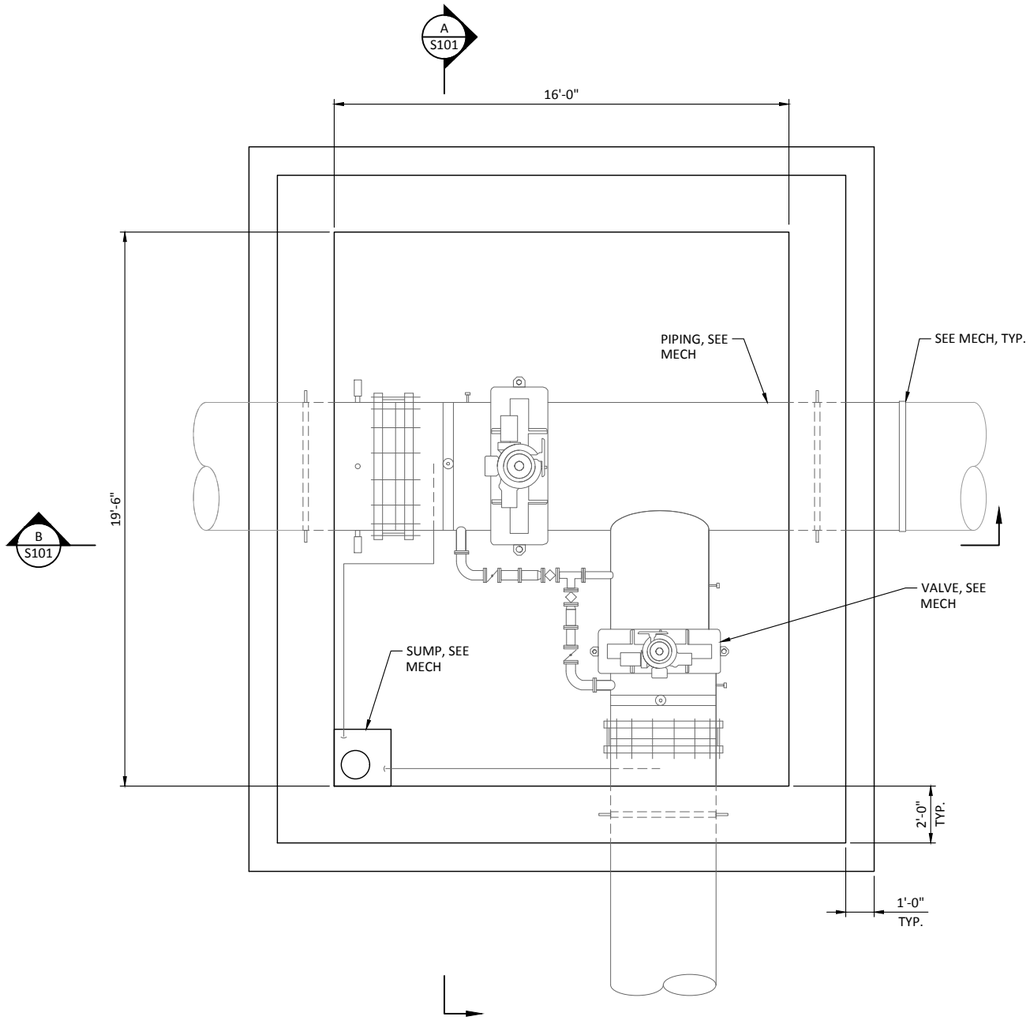
DRAWING
S001

JOB NO: 0000000

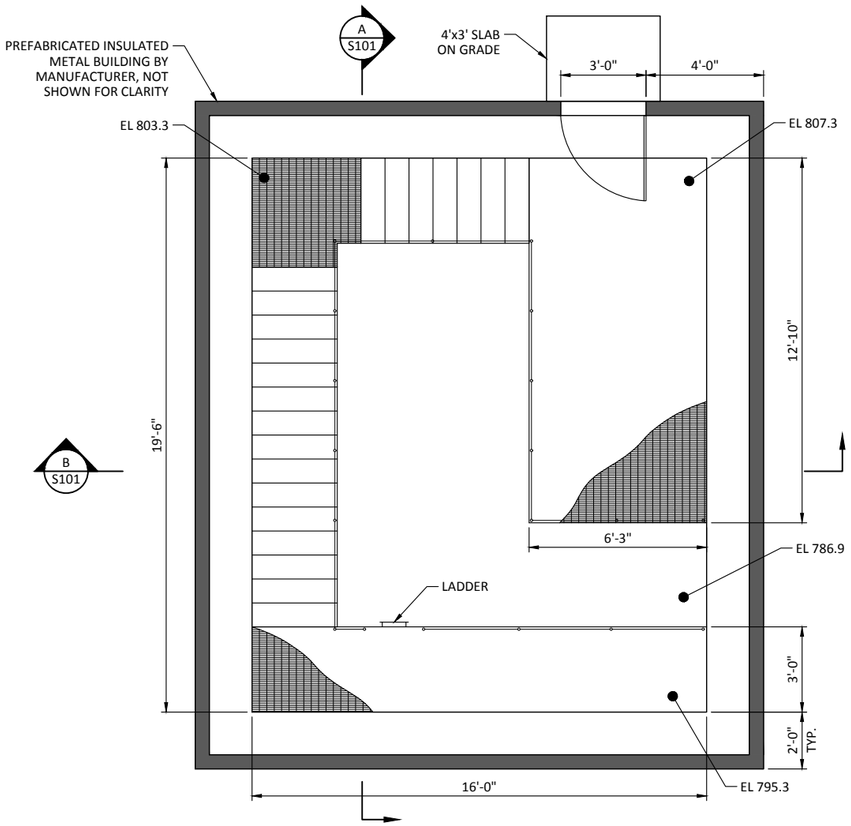
Path: C:\Vault\Chugach Electric\Portal Release Structure\S001.dwg Plot date: Sep 28, 2023 01:32pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



A S001 ISOLATION VALVE STRUCTURE FOUNDATION PLAN
SCALE: 3/8"= 1'-0"



A S001 ISOLATION VALVE STRUCTURE TOP PLAN
SCALE: 3/8"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

ISOLATION VALVE STRUCTURE PLAN, SECTIONS AND DETAILS

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

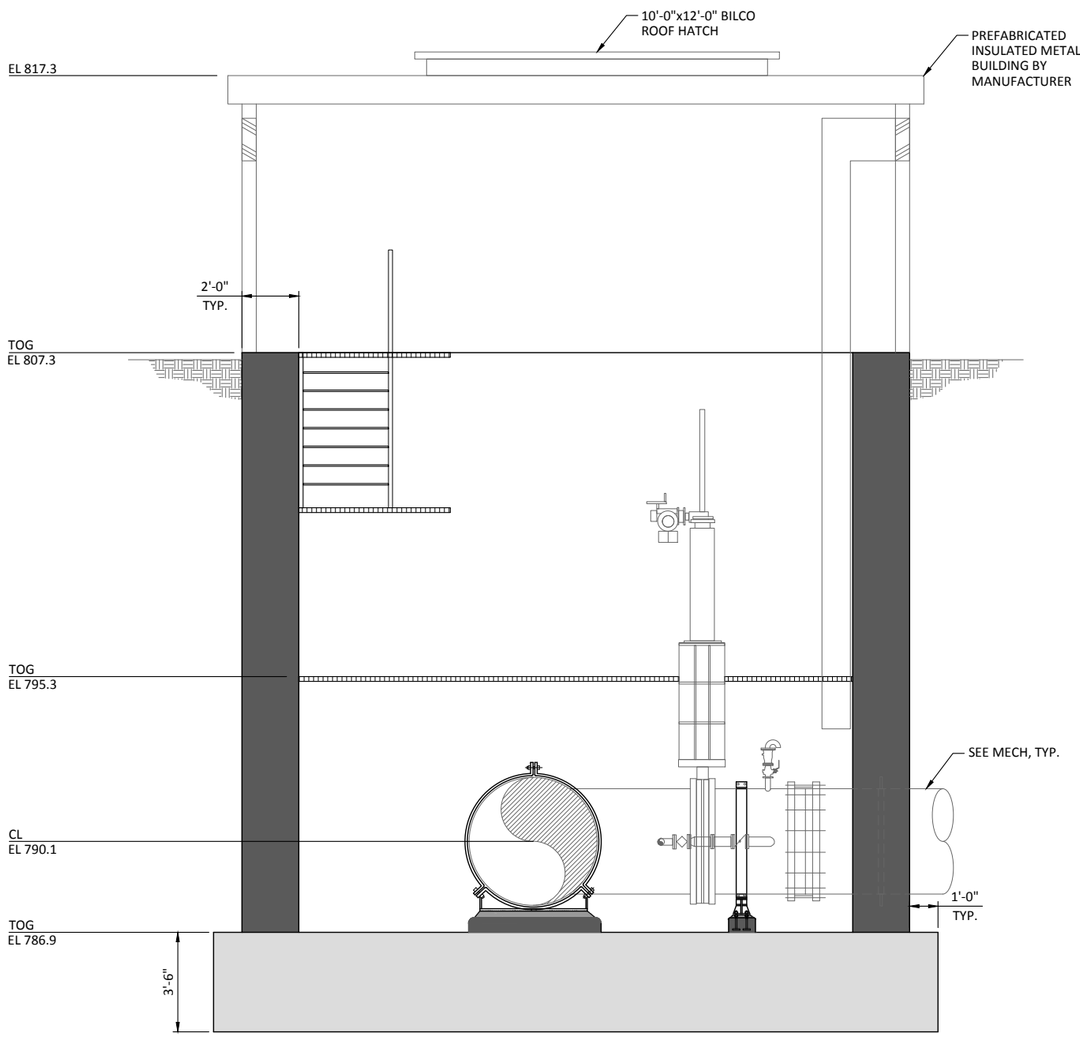
DRAWING
S100

JOB NO: 000000

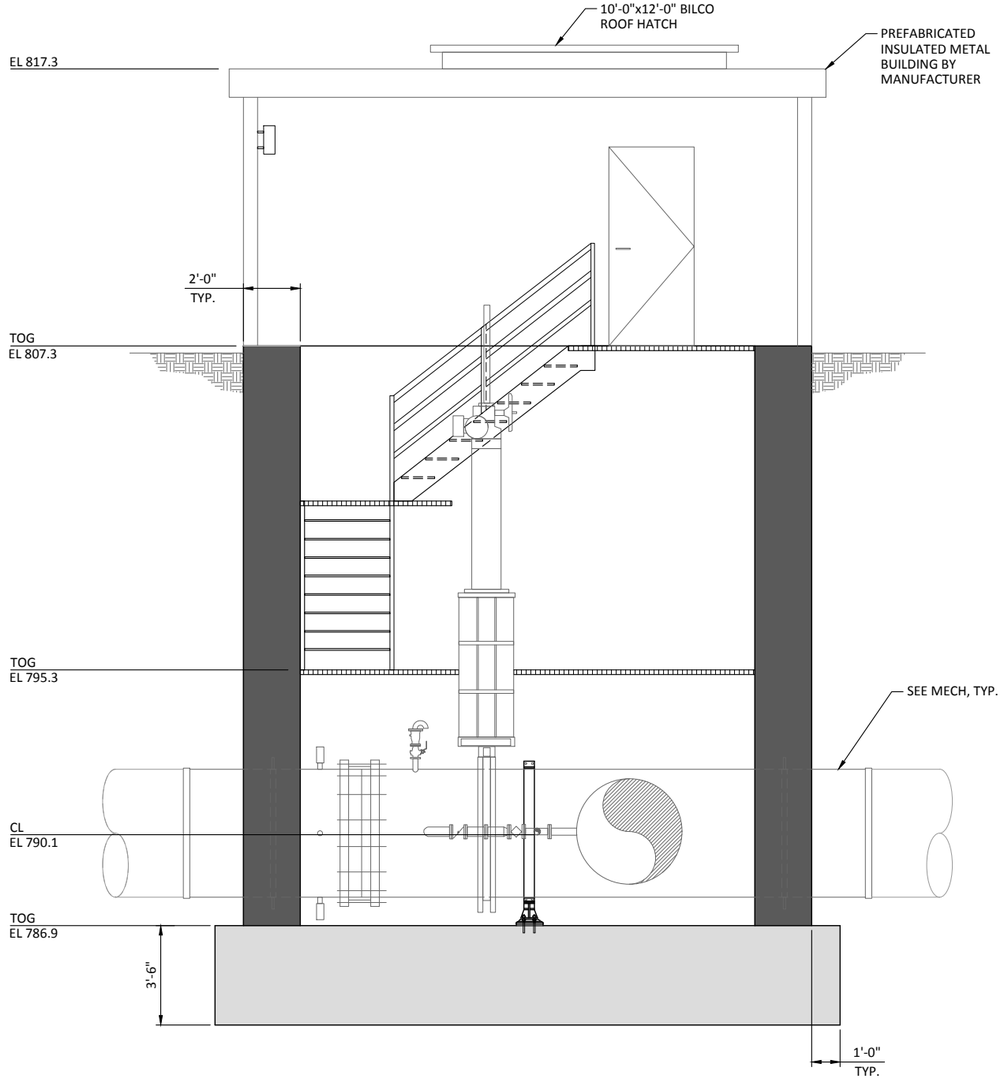
Path: C:\Vault\Chugach Electric\Portal Release Structure\S100.dwg Plot date: Sep 28, 2023 01:41pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



A S100 SECTION
SCALE: 3/8"= 1'-0"
0' 2' 4'



B S100 SECTION
SCALE: 3/8"= 1'-0"
0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

ISOLATION VALVE STRUCTURE SECTIONS

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

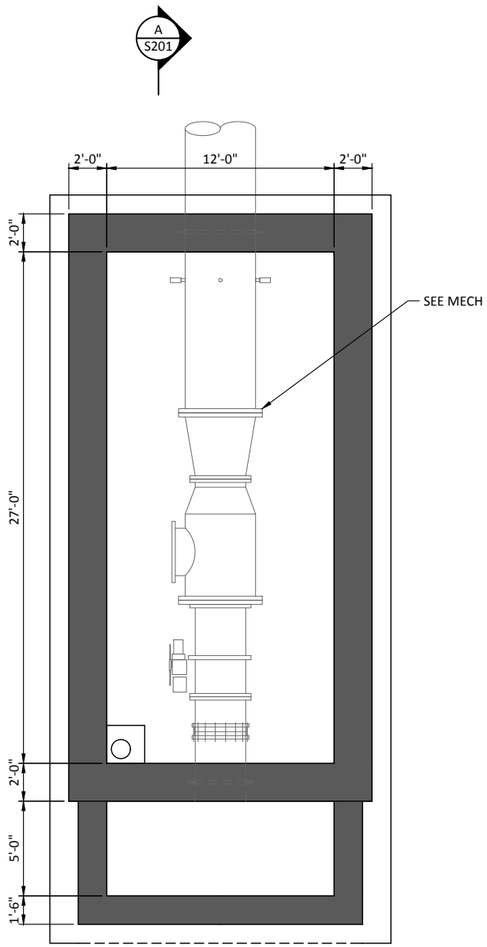
DRAWING
S101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\S101.dwg Plot date: Sep 26, 2023 04:42pm, CAD User: HaberFlavia

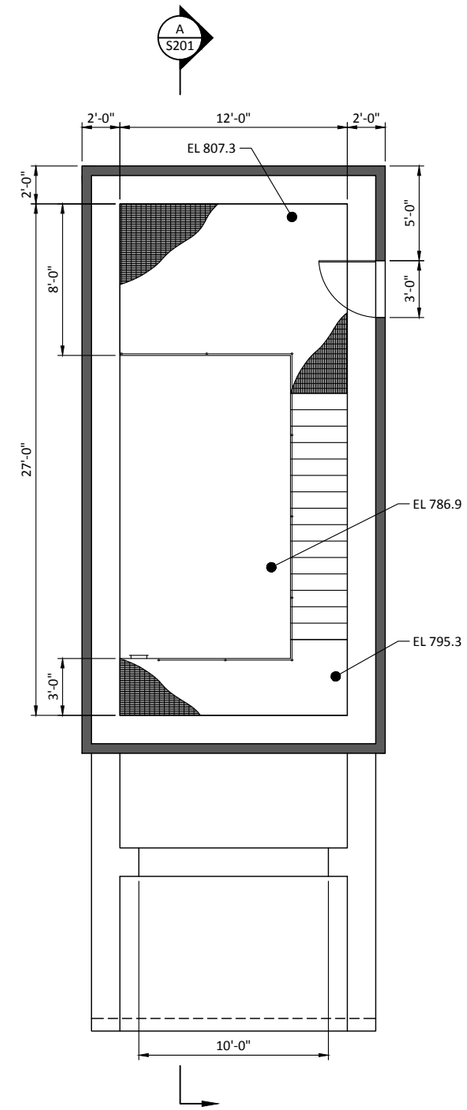
SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



B S001 RIVER RELEASE STRUCTURE FOUNDATION PLAN

SCALE: 1/4"= 1'-0"



B S001 RIVER RELEASE STRUCTURE TOP PLAN

SCALE: 1/4"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

RIVER RELEASE STRUCTURE PLAN, SECTIONS AND DETAILS

DESIGNED K. HEINDEL

DRAWN J. HOLT

CHECKED M. MERKLEIN

PROJECT DATE 10/6/23

DRAWING

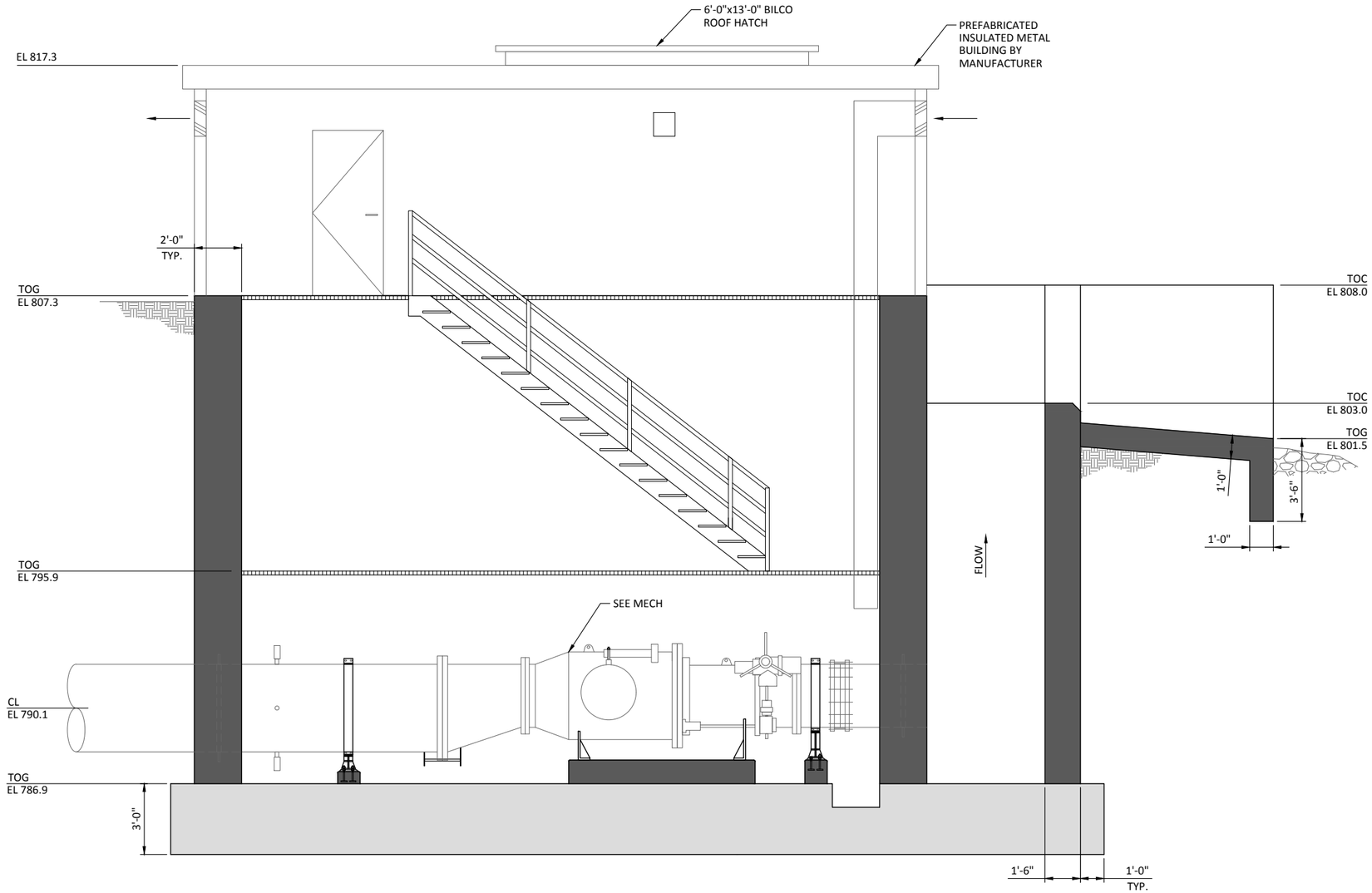
S200

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\S200.dwg Plot date: Sep 26, 2023 04:43pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



A / S200 SECTION
SCALE: 3/8"= 1'-0"

0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

RIVER RELEASE STRUCTURE SECTIONS

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
S201

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\S201.dwg Plot date: Sep 28, 2023 01:41pm, CAD User: HaberFlavia

VALVE SCHEDULE

EQUIPMENT NUMBER	LOCATION	SERVICE	FLUID	TYPE	DIAMETER (IN)	ASME PRESSURE CLASS	ENDS	ACTUATOR TYPE (NORMAL POSITION)	MATERIAL	SPEC SECTION	COMMENTS
V-100	ISOLATION GATE STRUCTURE	ISOLATION VALVE	RAW WATER	GATE	54	150	FLXFL	ELECTRIC (OPEN)			
V-101	ISOLATION GATE STRUCTURE	BYPASS/FILLING	RAW WATER	ECC. PLUG	3	150	FLXFL	MANUAL (HANDWHEEL)			
V-102	ISOLATION GATE STRUCTURE	PRESSURE REDUCTION	RAW WATER	ORIFICE	3	150	FLXFL	N/A			
V-103	ISOLATION GATE STRUCTURE	BYPASS/ISOLATION	RAW WATER	BUTTERFLY	4	150	FLXFL	MANUAL (HANDWHEEL)			
V-104	ISOLATION GATE STRUCTURE	AIR RELEASE/VACUUM	RAW WATER	COMBO AIR VENT	2	150	FLXFL	N/A			
V-110	ISOLATION GATE STRUCTURE	ISOLATION VALVE	RAW WATER	GATE	42	150	FLXFL	ELECTRIC (OPEN)			
V-111	ISOLATION GATE STRUCTURE	BYPASS/FILLING	RAW WATER	ECC. PLUG	3	150	FLXFL	MANUAL (HANDWHEEL)			
V-112	ISOLATION GATE STRUCTURE	PRESSURE REDUCTION	RAW WATER	ORIFICE	3	150	FLXFL	N/A			
V-113	ISOLATION GATE STRUCTURE	BYPASS/ISOLATION	RAW WATER	BUTTERFLY	4	150	FLXFL	MANUAL (HANDWHEEL)			
V-114	ISOLATION GATE STRUCTURE	AIR RELEASE/VACUUM	RAW WATER	COMBO AIR VENT	2	150	FLXFL	N/A			
V-200	EKLUTNA RIVER RELEASE STRUCTURE	FLOW CONTROL	RAW WATER	SLEEVE	30	150	FLXFL	ELECTRIC (OPEN)			BAILEY MODEL B-10 OR EQUIVALENT

PUMP SCHEDULE

EQUIPMENT NUMBER	LOCATION	SERVICE	EQUIPMENT DESCRIPTION	FLUID	FLOW CAPACITY (GPM) AND TDH (FT)	MOTOR SIZE (HP)	ELECTRICAL SERVICE (V/PH/CY)	SPEC SECTION	COMMENTS
P-100	ISOLATION GATE STRUCTURE	SUMP	SUBMERSIBLE PUMP	RAW WATER	50 @ 30	0.75	120 / 1 / 60		
P-200	RIVER RELEASE VALVE STRUCTURE	SUMP	SUBMERSIBLE PUMP	RAW WATER	50 @ 30	0.75	120 / 1 / 60		

FLOW METER SCHEDULE

ISA TAG	LOCATION	SERVICE	FLUID	EQUIPMENT DESCRIPTION	FLOW RANGE (CFS) / DIA (IN)	ELECTRICAL SERVICE (V/PH/CY)	COMMENTS
FE-100	ISOLATION GATE STRUCTURE	FLOW MEASUREMENT	RAW WATER	TRANSIT TIME UTRASONIC, 4 PATH	0 - 63/ 54"	120/1/60	
FE-200	RIVER RELEASE VALVE STRUCTURE	FLOW MEASUREMENT	RAW WATER	TRANSIT TIME UTRASONIC, 4 PATH	0 - 80/ 42"	120/1/60	

INSTRUMENTATION SCHEDULE

ISA TAG	LOCATION	SERVICE	EQUIPMENT DESCRIPTION	FLUID	SIGNAL OUTPUT	ELECTRICAL SERVICE	MEASUREMENT RANGE	SPEC SECTION	COMMENTS
LE-010	ISOLATION GATE STRUCTURE	PRESSURE MEASUREMENT	PRESSURE TRANSDUCER	RAW WATER	ANALOG; 4-20 mA	24 VDC	0 - 75 PSI		
LE-011	ISOLATION GATE STRUCTURE	PRESSURE MEASUREMENT	PRESSURE TRANSDUCER	RAW WATER	ANALOG; 4-20 mA	24 VDC	0 - 75 PSI		
LE-012	ISOLATION GATE STRUCTURE	PRESSURE MEASUREMENT	PRESSURE TRANSDUCER	RAW WATER	ANALOG; 4-20 mA	24 VDC	0 - 75 PSI		

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

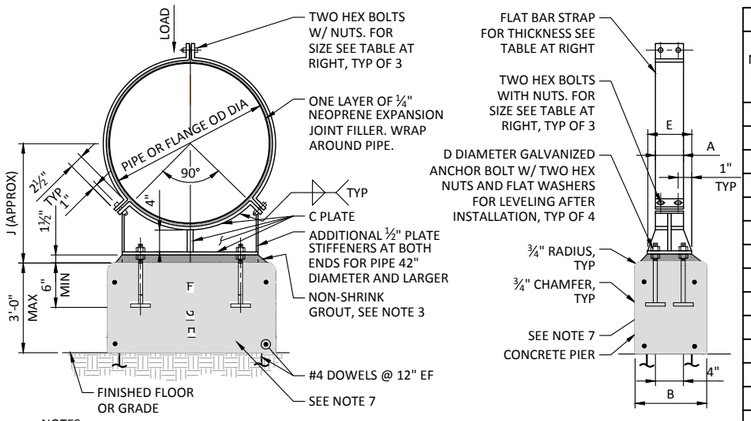
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
MECHANICAL EQUIPMENT SCHEDULE

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
GM001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GM001.dwg Plot date: Sep 28, 2023 02:09pm, CAD User: HaberFlavia



DIMENSIONS IN INCHES																
NOMINAL PIPE SIZE	A	B	C	D	E	STRAP		SUPPORTING								
						BOLT SIZE	FLAT BAR	PIPE				FLANGE				
								F	G	H	J	F	G	H	J
6	4	12	⅜	⅝	6	½	¼	4½	8	14	10	6½	11	16	13
8	4	12	⅜	⅝	6	½	¼	5	9½	14	11	7½	13	18	14
10	4	12	⅜	⅝	6	½	¼	6	11	16	12	9	15	20	15
12	4	12	⅜	⅝	6	½	¼	7	13	18	13	10	17	22	16
14	4	12	⅜	⅝	6	½	¼	8	13	18	14	11	18	23	17
16	4	12	⅜	⅝	6	½	¼	9	15	21	15	12	20	26	18
18	4	12	⅜	⅝	6	½	¼	10	16	22	16	13	21	26	19
20	5	12	⅜	⅝	6	⅝	⅜	10	18	24	17	15	23	28	21
22	5	12	⅜	⅝	6	⅝	⅜	12	19	24	18	16	25	30	22
24	5	12	⅜	⅝	6	⅝	⅜	13	21	26	19	16	26	32	23
26	5	12	⅜	¾	6	⅝	⅜	14	22	28	20	18	28	34	24
30	5	12	⅜	¾	6	⅝	⅜	16	25	30	22	20	31	36	26
34	5	15	⅜	¾	6	⅝	⅜	18	28	33	24	22	35	41	29
36	6	15	⅜	¾	6	¾	⅜	19	29	34	25	24	36	42	30
42	6	18	½	1	8	¾	⅜	21	33	39	28	27	41	47	33
48	6	18	½	1	8	¾	⅜	24	38	44	31	30	46	52	37
54	6	18	½	1	8	¾	⅜	28	42	48	34	34	50	56	40
60	6	18	½	1⅛	8	¾	⅜	32	46	52	37	36	56	62	44
66	6	18	½	1⅛	8	¾	⅜	33	51	58	40	40	61	68	47
72	6	18	½	1⅛	8	¾	⅜	36	55	62	43	44	65	72	50

NOTES:
1. WHEN SUPPORTING PIPE AND FLANGE ALTERNATELY ON THE SAME LINE, CONCRETE PIERS FOR PIPE SUPPORTS SHALL ALL HAVE THE SAME DIMENSION 'H' FOR FLANGE SUPPORT
2. PIPE SUPPORTS SHALL BE LOCATED IN PLAN AT POINTS MARKED THUS: (X)
3. WHERE DIFFERENTIAL SETTLEMENT IS LIKELY TO OCCUR, OMIT GROUT AS DIRECTED BY THE ENGINEER.
4. GALVANIZE ALL PARTS AFTER FABRICATION.
5. WHERE DIRECTED BY THE STRUCTURAL ENGINEER, BOTTOM OF PIERS SHALL EXTEND BELOW BOTTOM OF SLAB
6. WHERE PIPE SUPPORT OCCURS ON GRADE REFER TO STRUCTURAL DRAWINGS FOR DETAILS.
7. GALVANIZED ANCHOR BOLT OR CONCRETE ANCHOR WITH TWO NUTS AND ONE LOCKWASHER. PROVIDE BAR 4x½x4" WELDED TO BOLT, TYP OF 4. SEE SPECIFICATIONS.

M110 PIPE SUPPORT WITH STRAP

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY
MECHANICAL STANDARD DETAILS

DESIGNED S. ELLENSON
DRAWN D. JOHNSTON
CHECKED J. BOAG
PROJECT DATE 10/6/23

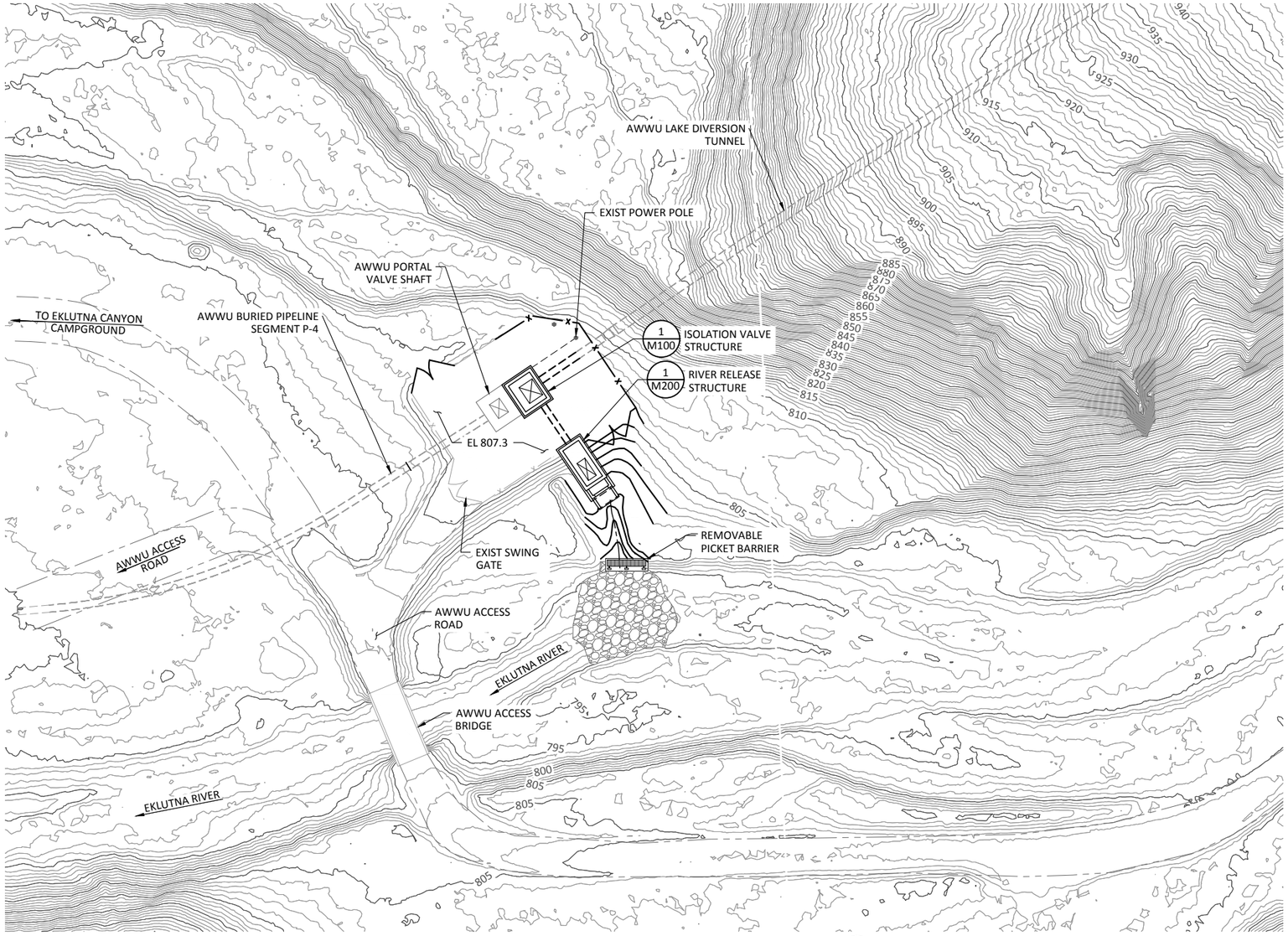
DRAWING
GM002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GM002.dwg Plot date: Sep 26, 2023 04:49pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



MECHANICAL KEY PLAN

SCALE: 1"= 40'

0" 40' 80'

N

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

MECHANICAL KEY PLAN

DESIGNED S. ELLENSON

DRAWN J. HOLT

CHECKED J. BOAG

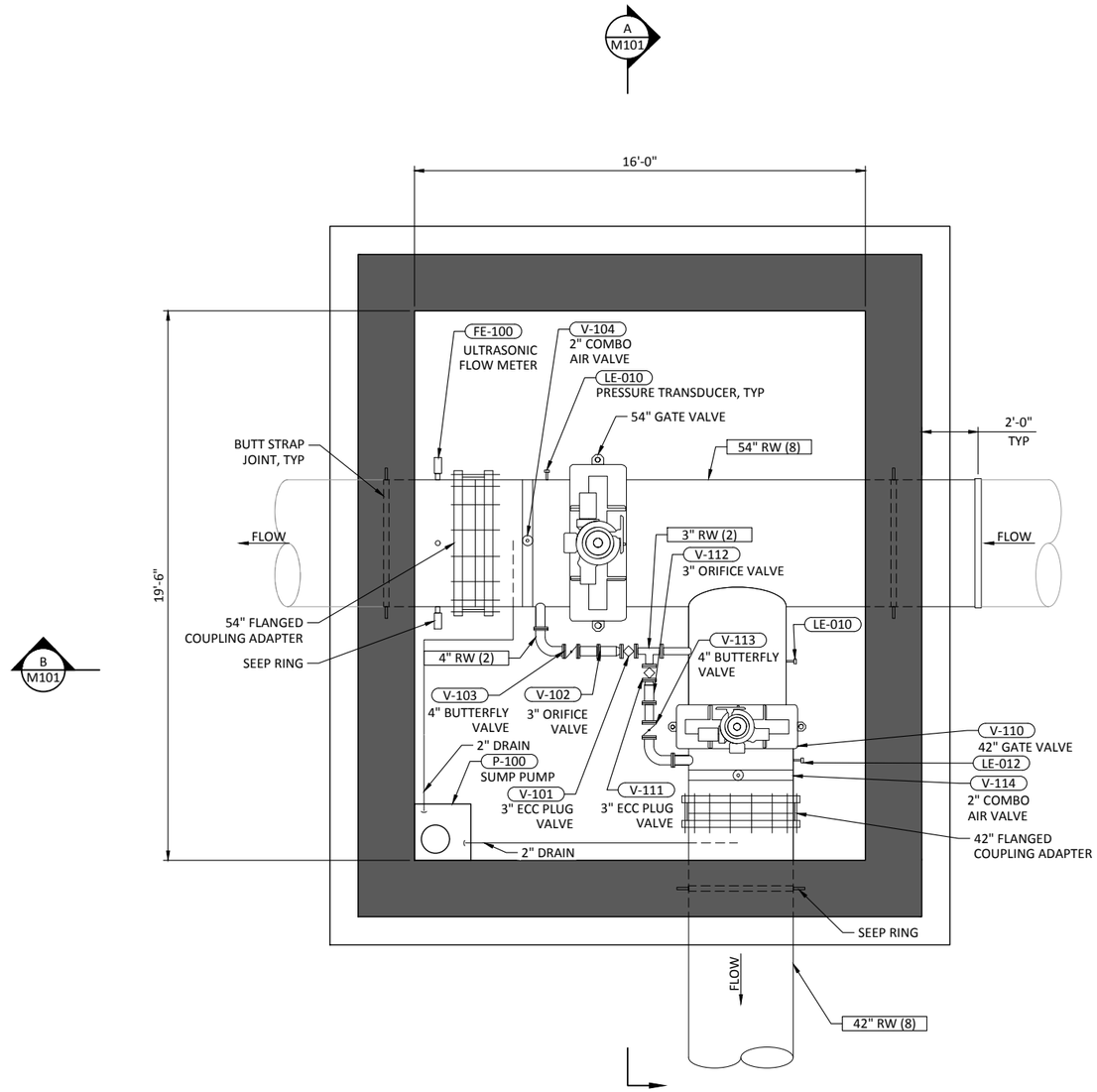
PROJECT DATE 10/6/23

DRAWING

M001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\M001.dwg Plot date: Sep 28, 2023 02:10pm, CAD User: HaberFlavia



1 M001 ISOLATION VALVE STRUCTURE MECHANICAL PLAN

SCALE: 3/8"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

ISOLATION VALVE STRUCTURE
MECHANICAL PLAN

DESIGNED S. ELLENSON

DRAWN J. HOLT

CHECKED J. BOAG

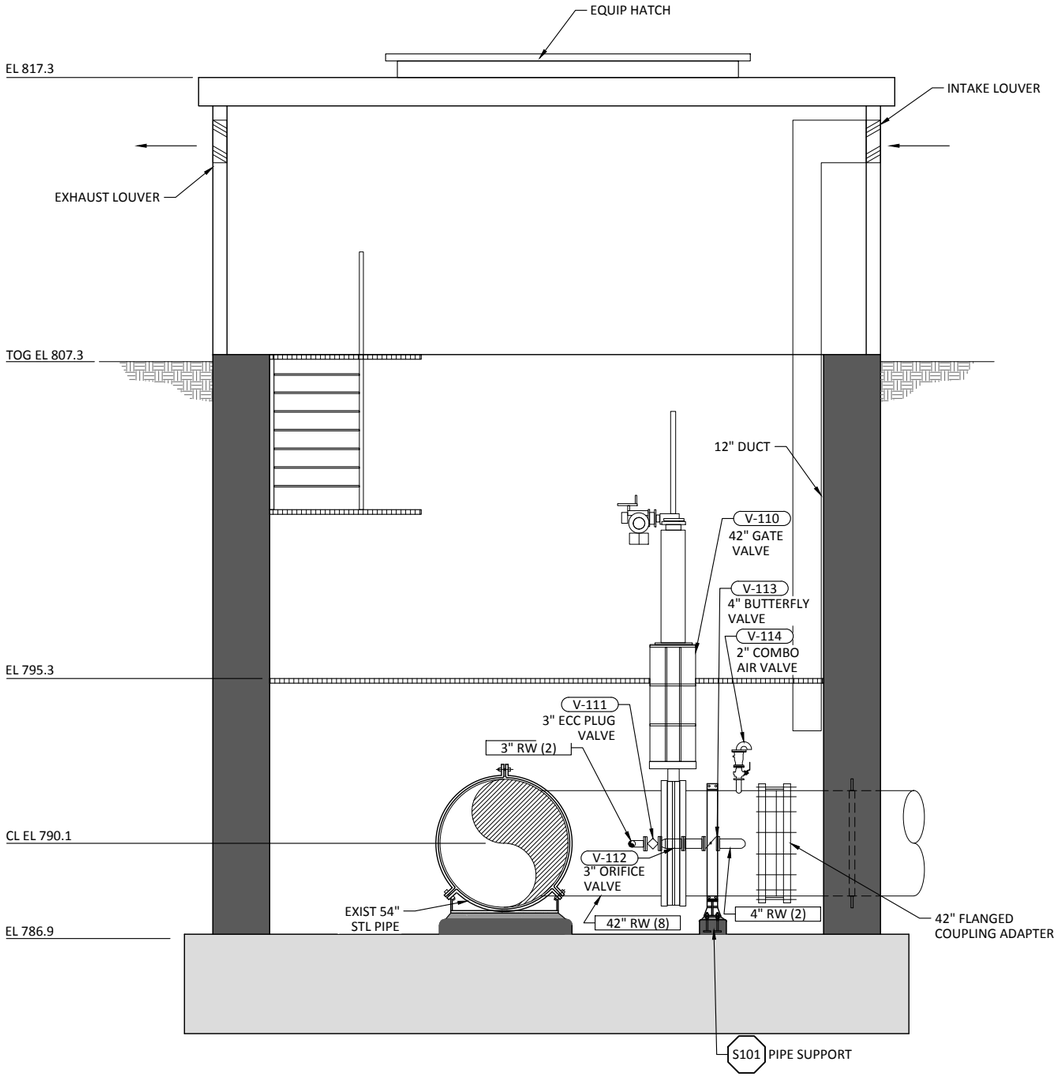
PROJECT DATE 10/6/23

DRAWING

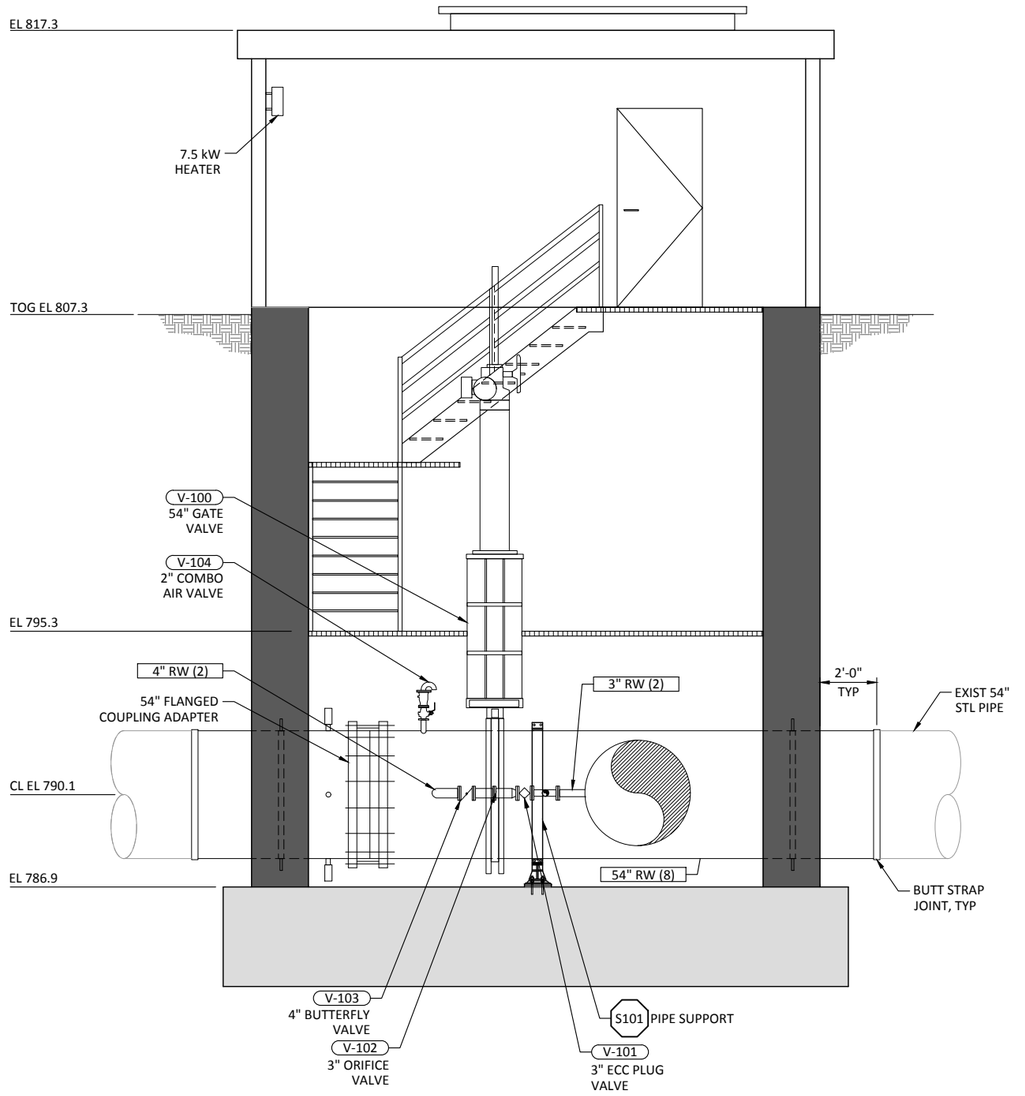
M100

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\M100.dwg Plot date: Sep 28, 2023 02:31pm, CAD User: HaberFlavia



A SECTION
SCALE: 3/8"= 1'-0"
0' 2' 4'



B SECTION
SCALE: 3/8"= 1'-0"
0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

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MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

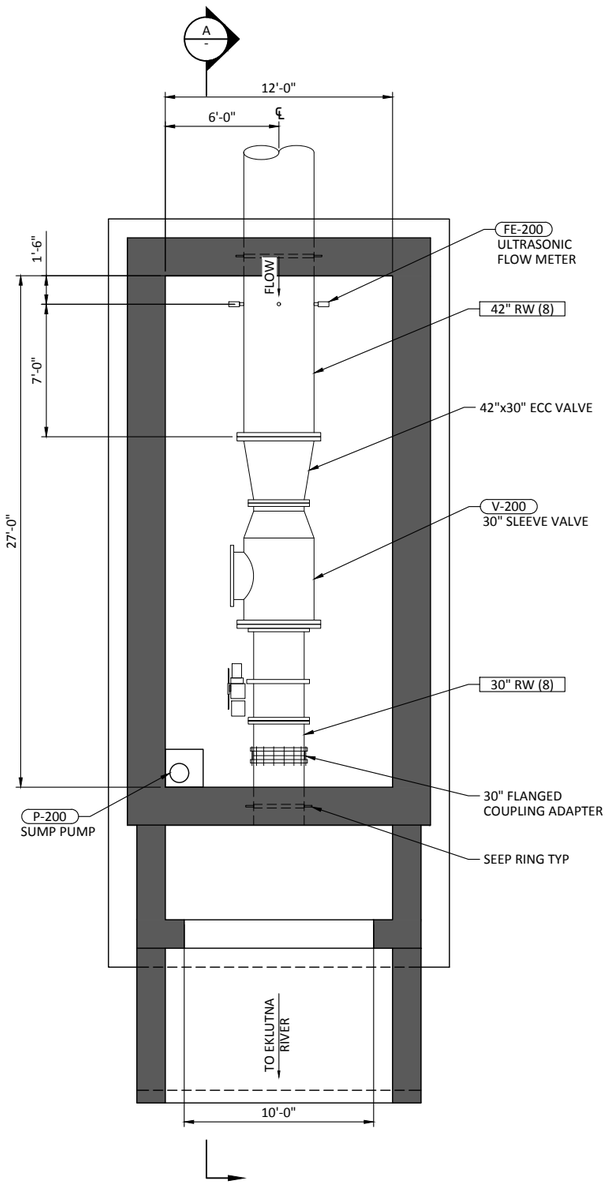
ISOLATION VALVE STRUCTURE MECHANICAL SECTIONS

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
M101

JOB NO: 000000

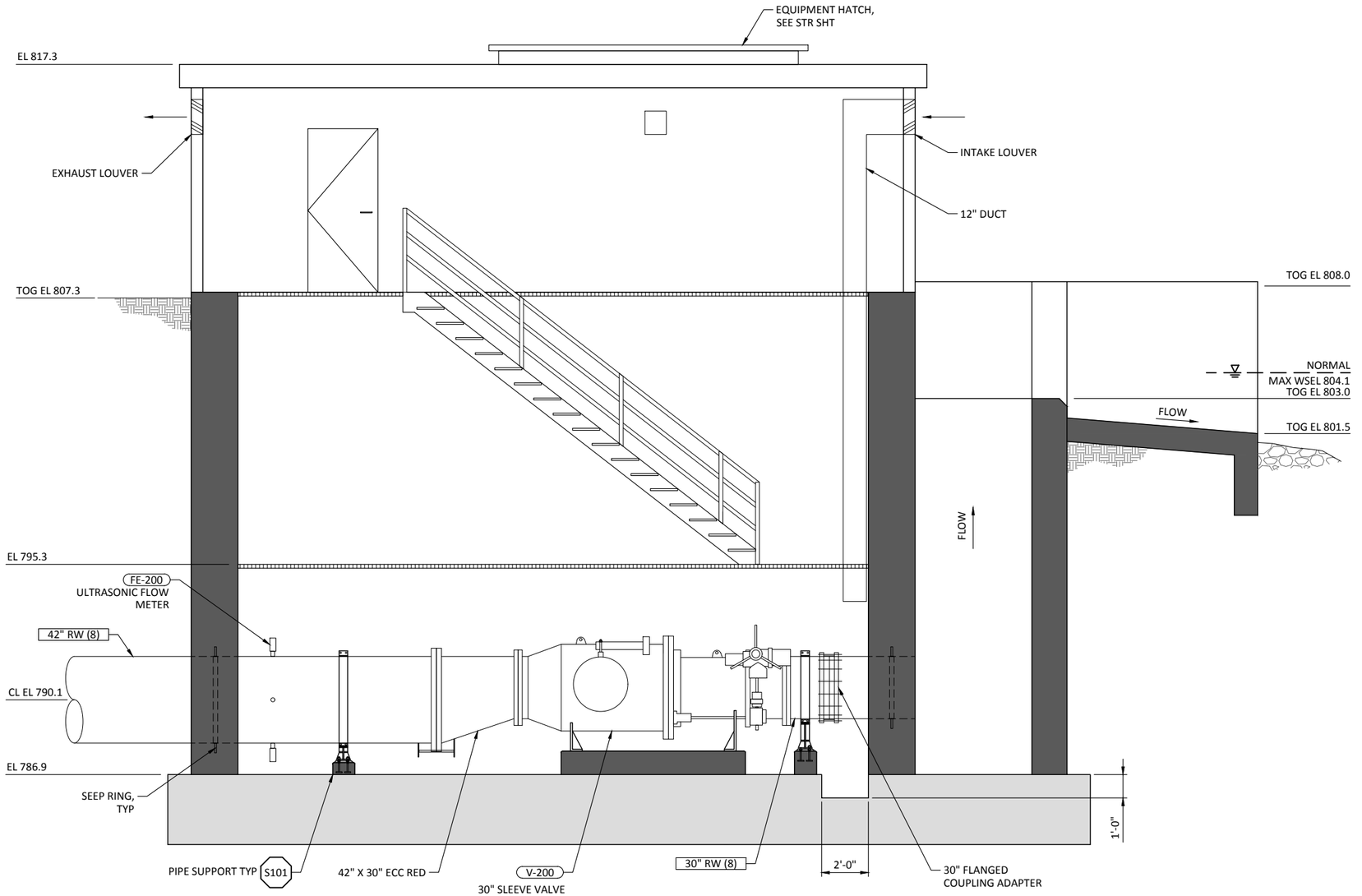
Path: C:\Vault\Chugach Electric\Portal Release Structure\M101.dwg Plot date: Sep 28, 2023 02:31pm, CAD User: HaberFlavia



1 M001 RIVER RELEASE STRUCTURE PLAN

SCALE: 1/4"= 1'-0"

0' 4' 8'



A - SECTION

SCALE: 3/8"= 1'-0"

0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

RIVER PORTAL RELEASE VALVE SHAFT MECHANICAL
PLAN, SECTIONS AND DETAIL

DESIGNED S. ELLENSON

DRAWN J. HOLT

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

M200

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\M200.dwg Plot date: Sep 28, 2023 02:31pm, CAD User: HaberFlavia

IEEE STANDARD CONTROL AND PROTECTION DEVICES FUNCTION NUMBERS

01	MASTER ELEMENT
02	TIME-DELAY STARTING OR CLOSING RELAY (TDPU)
03	CHECKING OR INTERLOCKING RELAY
04	MASTER CONTACTOR
05	STOPPING DEVICE
06	STARTING CIRCUIT BREAKER
07	RATE-OF-CHANGE RELAY
08	CONTROL POWER DISCONNECTING DEVICE
09	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRONICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM - CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OF SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY OR POLARIZING VOLTAGE DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD (OVER/UNDER EXCITATION) RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR PHASE-BALANCE CURRENT RELAY
47	PHASE-SEQUENCE OR PHASE-BALANCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE-OF-RISE RELAY
51	AC INVERSE TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	EXCITER OR DC GENERATOR RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY (TDDO)
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	PULSE TRANSMITTER
78	PHASE-ANGLE MEASURING OR OUT-OF-STEP PROTECTIVE RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	CARRIER OR PILOT-WIRE RECEIVER RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY
95	RESERVED FOR FUTURE APPLICATION
96	RESERVED FOR FUTURE APPLICATION
97	RESERVED FOR FUTURE APPLICATION
98	CREEP DETECTOR DEVICE
99	RESERVED FOR FUTURE APPLICATION

METERING SYSTEMS AND DEVICES INDEX

A	AMMETER
AH	AMPERE HOUR METER
AS	AMMETER SELECTOR SWITCH
C	COUNTER
CMA	CONTACT MAKING AMMETER
CMC	CONTACT MAKING CLOCK
CMV	CONTACT MAKING VOLTMETER
CS	CONTROL STATION
DM	DEMAND METER
ETM	ELAPSE TIME METER
F	FREQUENCY METER
G	GALVANOMETER
GD	GROUND FAULT DETECTOR
KV	KILO-VOLTMETER
KW	KILO-WATTMETER
KWH	KILO-WATT HOUR METER
mA	MILLI-AMMETER (TRANSDUCER)
MOC	MECHANISM-OPERATED CONTACT
OHM	OHMMETER
OSC	OSCILLOGRAPH
PB	PUSHBUTTON
PF	POWER FACTOR METER
PH	PHASE METER
PI	POSITION INDICATOR
REC	RECORDER
RF	REACTIVE FACTOR METER
RPM	SPEED INDICATOR
SW	TRANSFER SWITCH
SY	SYNCHROSCOPE
T	TEMPERATURE METER
TLM	TELEMETER
TOC	TRUCK-OPERATED CONTACT
TS	TIME SWITCH
V	VOLTMETER
VAR	VARMETER
VH	VAR HOUR METER
VS	VOLTMETER SELECTOR SWITCH
W	WATTMETER
WH	WATT HOUR METER
WHDM	WATT HOUR DEMAND METER

NOTE: "R" IN FRONT OF LETTERS INDICATES A RECORDING TYPE METER.

PILOT - INDICATOR LIGHT INDEX

A	AMBER
B	BLUE
C	CLEAR
G	GREEN
NE	NEON
O	ORANGE
OP	OPALESCENT
P	PURPLE
R	RED
W	WHITE
Y	YELLOW

FIRST LETTER SUFFIX OF IEEE DEVICE DESIGNATION

A	GOVERNOR SYSTEM (OR ACTUATOR SYSTEMS - GATES)
B	BATTERY CHARGING AND MONITORING SYSTEM OR BUS
C	HIGH-VOLTAGE CABLE SYSTEM OR CLOSING RELAY/CONTACTOR
D	DATA ACQUISITION SYSTEM
E	EXCITATION SYSTEM INCLUDING TRANSFORMER AND REGULATOR BUT NOT MAIN FIELD
F	FIRE AND CO2 SYSTEM
G	MAIN GENERATOR INCLUDING AUXILIARY SYSTEMS OR GROUND
G/M	GENERATOR MOTOR INCLUDING AUXILIARY SYSTEMS IN PUMPED STORAGE APPLICATIONS
H	TURBINE OR MAIN PUMP INCLUDING AUXILIARY SYSTEMS
I	ISOLATED AND OTHER POWER BUS SYSTEMS (NOT HIGH VOLTAGE CABLE)
J	POWER CIRCUIT BREAKER INCLUDING AUXILIARY SYSTEMS
K	POWER TRANSFORMER INCLUDING AUXILIARY SYSTEMS
L	ANNUNCIATOR SYSTEM, SECURITY SYSTEM, LINE, OR LOWERING RELAY/CONTACTOR
M	MAIN PUMP MOTOR INCLUDING AUXILIARY SYSTEMS AND VARIABLE SPEED DRIVE
N	AIR (PNEUMATIC) SYSTEM OR NEUTRAL
O	OPENING RELAY/CONTACTOR
P	PENSTOCK OR DISCHARGE LINE SYSTEM
Q	OIL STORAGE, HANDLING, PURIFICATION SYSTEM
R	FIELD FLASHING SYSTEM, PHASE REVERSAL SWITCH INCLUDING AUXILIARY SYSTEM, OR RAISING RELAY/CONTACTOR
S	STATION SERVICE SUBSTATION SYSTEM INCLUDING ENGINE/GENERATOR SYSTEM
T	TONE AND TRANSFER TRIP SYSTEM OR TRANSFORMER
U	UNIT CONTROL CIRCUIT SYSTEM OR UNINTERRUPTIBLE POWER SUPPLY SYSTEM
V	INTAKE AND/OR DISCHARGE VALVE SYSTEM
W	WATER SYSTEMS INCLUDING INTAKE/OUTLET WORKS AND PLANT WATER AND SUMP SYSTEMS
X	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY
Y	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY
Z	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY

SECOND AND SUBSEQUENT LETTER SUFFIXES OF THE IEEE DEVICE DESIGNATION

A	ABNORMAL, A.C., ACCELERATION, ADMISSION, ALARM, AMPERES, AUTOMATIC, AUXILIARIES, PHASE A, ECT.
B	BACKUP, BEARING, BLOCK, BLOWER, BOOSTER, BRAKES, BUS, BUTTON, BYPASS, PHASE B, ETC.
C	CABLE, CARRIER, CHARGER, CHECK, CHLORINATION, CLOSE, COLLECTOR, COMMON, COMPENSATOR, COMPRESSOR, CONTROL, COOLING, CURRENT, CYCLE, CYLINDER, PHASE C, CONVEYOR, ECT.
D	D.C, DECELERATION, DELAY, DEPRESS, DETECTOR, DIELECTRIC, DIFFERENTIAL, DISCHARGE, DISCONNECT, DISCORDANCE, DOMESTIC, DOWN, DOWNSTREAM, DRAFT TUBE, DRAIN, ETC.
E	EJECTOR, ELEVATOR, EMERGENCY, EXPLOSIVE, ETC.
F	FAILURE, FAN, FAULT, FEEDER, FIELD, FILTER, FIRE, FLAME, FLOW, FOLLOWER, FORWARD, FREQUENCY, FULL, FUMES, FUSE, ETC.
G	GAS, GATE, GATING (SCR), GENERATE, GROUND, GUIDE BEARING, ETC.
H	HALON, HAND, HEAT, HEATER, HIGH, HOIST, HORN, HOT, HOUSING, HYDROPNEUMATIC TANK, ETC.
I	INDICATION, INITIAL, INLET, INOUT, INSTANTANEOUS, INTAKE, INTERFACE, INTERLOCK, INTERRUPT, INVERTER, IONIZATION, ETC.
J	JACKING, JET, ETC.
K	KEY, TRANSFORMER
L	LAMPS, LEFT, LEVEL, LIGHTS, LIMITS, LINE, LIQUID, LOCAL, LOGIC, LOSS, LOUVERS, LOW, LOWER, LUBRICATION, ETC.
M	MAIN, MALFUNCTION, MANUAL, METER, METERING, MOTOR, ETC.
N	NEGATIVE, NETWORK, NEUTRAL, NORMAL, ETC.
O	OPEN, OUTLET, OUTPUT, ETC.
P	PACKING BOX, PARALLEL, PARAMETER, PENSTOCK, PHASE, PHASEBACK, PILOT, PIT, POSITION, POTENTIAL, POTHEAD, POWER, PRESSURE, PRIMARY, PROTECTION, PULSE, PUMP, PURIFICATION, PUSH, ETC.
Q	OIL, ETC.
R	RAISE, REACTOR, RECLOSE, RECORD, RECTIFIER, REED, REFRIGERATION, REGULATE, RELAY, RELEASE, RELIEF, REMOTE, RESERVOIR, RESET, RESISTOR, RIGHT, ROTATION, ROTOR, RUNNER, ETC.
S	SEALS, SECONDARY, SELECTOR, SEWAGE, SHORTING, SHUTDOWN, SIGNAL, SKIMMER, SLUDGE, SMOKE, SOLENOID, SPEED, SPIRAL OR SCROLL CASE, SPLICE, STABILIZER, STANDBY, STARTING, STATOR, STEPPING, STORAGE, STRAINER, SUCTION, SUMP, SUPPLY, SWITCH, SYNCHRONIZING, ETC.
T	TANK, TEMPERATURE, TEST, THERMAL, THRUST BEARING, THYRATRON, TIE, TIME, TRANSDUCER, TRANSER, TRANSMITTER, TRIP, TROUBLE, TRASHRAKE, ETC.
U	UNIT, UNLOADER, UNWATERING, UP, UPPER, UPSTREAM, ETC.
V	VALVE, VARS, VIBRATION. VOLTAGE, ETC.
W	WATER, WATTS, WINDINGS, ETC.
X	AUXILIARY DEVICE, ETC.
Y	AUXILIARY TO DEVICE X, ANTIPUMP RELAY, ETC.
Z	AUXILIARY TO DEVICE Y

ABBREVIATIONS

A, AMP	AMP, AMPERE
AAAC	ALL ALUMINUM ALLOY CONDUCTOR
AC	ALTERNATING CURRENT
AF	AMPERE FRAME SIZE
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AH	AMPERE HOURS
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AL	ALUMINUM
A/R	AS REQUIRED
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AVR	AUTOMATIC VOLTAGE REGULATOR
BAT	BATTERY
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CLF	CURRENT LIMITING FUSE
CO	CONDUIT ONLY
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DPDT	DOUBLE-POLE, DOUBLE-THROW
DPST	DOUBLE-POLE, SINGLE-THROW
EDH	ELECTRIC DUCT HEATER
EG	ENGINE GENERATOR
EPT	EXCITATION POWER TRANSFORMER
EUH	ELECTRIC UNIT HEATER
EV	ELECTRICAL VAULT
F, FU	FUSE
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FAS	FIRE ALARM SYSTEM
FREQ	FREQUENCY
FS	FLOAT SWITCH
FT	FLOW TRANSMITTER
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
GEN	GENERATOR
GFI	GROUND-FAULT INTERRUPTION
GFP	GROUND-FAULT PROTECTION
GND	GROUND
GPR	GENERATOR PROTECTION RELAY
GSU	GENERATOR STEP-UP TRANSFORMER
HMI	HUMAN-MACHINE INTERFACE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HPU	HYDRAULIC POWER UNIT
HTR	HEATER
HZ	HERTZ (CYCLES PER SECOND)
IC	INTERRUPTING CAPACITY
I & C	INSTRUMENTATION AND CONTROL
I/O	INPUT/OUTPUT
INST	INSTANTANEOUS
INTLK	INTERLOCK
IP	INTERNET PROTOCOL
K	KEY INTERLOCK
kV	KILOVOLTS
kVA	KILOVOLT AMPERES (APPARENT POWER)
kVAR	KILOVARS (REACTIVE POWER)
kW	KILOWATTS (REAL POWER)
kWH	KILOWATT HOUR
LC	LIGHTING CONTROLLER
LCP	LOCAL CONTROL PANEL
LE	LEVEL ELEMENT
LIT	LEVEL INDICATING TRANSMITTER
LOR	LOCAL-OFF-REMOTE
LP	LIGHTING PANEL
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
mA	MILLIAMPERES
M	MOTOR, MAN, MANUAL
MAG	MAGNETIC
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MFM	MULTIFUNCTIONAL METER
MPR	MOTOR PROTECTION RELAY
MTS	MANUAL TRANSFER SWITCH
mV	MILLIVOLTS
MVA	MEGAVOLT AMPERES (APPARENT POWER)
MVAR	MEGAVARS (REACTIVE POWER)
MW	MEGAWATTS (REAL POWER)
MWH	MEGAWATT HOUR
NEUT	NEUTRAL
NGR	NEUTRAL GROUNDING RESISTOR
OHM	OHMMETER
OL	OVERLOAD
OPER	OPERATOR, OPERATED
PB	PANELBOARD, PULLBOX, PUSH BUTTON
PC	PHOTOCELL
PCB	POWER CIRCUIT BREAKER
PCC	POINT OF COMMON CONNECTION
PF	POWER FACTOR
PH, Ø	PHASE
PMP	PUMP
PNL	PANEL
PLC	PROGRAMMABLE LOGIC CONTROLLER
POI	POINT OF INTER-CONNECTION
PS	PRESSURE SWITCH
PTT	PUSH-TO-TEST
PWR	POWER
R	RELAY, REVERSE, RUN
RCP	RECEPTACLE
RIO	REMOTE I/O
RTD	RESISTANCE TEMPERATURE DETECTOR
RVNR	REDUCED VOLTAGE NON-REVERSING
RVR	REDUCED VOLTAGE REVERSING
S	SYNC SCOPE
SA	SURGE ARRESTER
SC	SURGE CAPACITOR
SDP	STANDBY DISTRIBUTION PANEL
SEL	SELECTOR, SCHWEITZER ENGINEERING LABORATORIES
SPD	SURGE PROTECTION DEVICE
SPDT	SINGLE-POLE, DOUBLE-THROW
SPST	SINGLE-POLE, SINGLE-THROW
S/S	STATION SERVICE
SV	SOLENOID VALVE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
T	THERMOSTAT
TB	TERMINAL BLOCK, TERMINAL BOX
TD	TEMPERATURE DETECTOR, TIME DELAY
TEL	TELEPHONE
TS	THERMOSTAT
TSP	TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD
TX	TRANSMITTER
UH	UNIT HEATER
UP	UTILITY POWER
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VC	VIDEO CAMERA
VCB	VACUUM CIRCUIT BREAKER
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE, WATTS
WP	WEATHER PROOF
XD	TRANSDUCER
XFMR	TRANSFORMER
XLP	CROSS LINKED POLYETHYLENE
XP	EXPLOSION PROOF

PRELIMINARY
NOT FOR CONSTRUCTION

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0	10/6/23	SPE	15% DESIGN

WARNING
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

ELECTRICAL ABBREVIATIONS AND DEVICE INDEXES

DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GE001.dwg Plot date: Sep 26, 2023 05:07pm, CAD User: HaberFlavia

DIAGRAMS

HIGH - MEDIUM VOLTAGE SWITCHING

- POWER CIRCUIT BRK, DRAWOUT
- POWER CIRCUIT BRK, NON-DRAWOUT
- HV ISOLATING SW MOTOR OPERATED
- HV INTERRUPTER SW FUSED
- CENTER-BREAK SW MOTOR OPERATED
- DUAL-BREAK SW MOTOR OPERATED
- LOAD-BREAK SW MOTOR OPERATED
- HORN GAP SW

TRANSFORMERS:

- POWER XFMR
- MAG CORE XFMR
- LOAD TAP CHANGING XFMR
- SPLIT SECONDARY XFMR
- AUTO-XFMR

INSTRUMENT TRANSFORMERS:

- POTENTIAL XFMR
- POTENTIAL XFMR DUAL SECONDARY
- (3) 800:5 CURRENT XFMR, QTY & RATIO AS INDICATED
- (1) 50:5 CORE BALANCE CURRENT XFMR RATIO AS INDICATED
- (3) 800:5 BUSHING CURRENT XFMR, QTY & RATIO AS INDICATED
- kWH KILOWATT-HOUR METER

MACHINES:

- M XXHP MOTOR-DC
- M XXHP MOTOR-AC
- G XXKW XXPF AC GENERATOR

TRANSFORMERS WINDING CONNECTIONS:

- DELTA 3PH3W
- DELTA CENTER TAP GND 3PH4W
- DELTA CORNER GRD 3PH3W
- BROKEN DELTA 3PH2W
- OPEN DELTA 2PH2W
- WYE 3PH3W
- WYE GRD 3PH4W
- ZIG-ZAG 3PH3W
- ZIG-ZAG GRD 3PH4W

HIGH - MEDIUM VOLTAGE DEVICES

- L/A OR LIGHTNING ARRESTER
- WT WAVE TRAP
- M 57 GROUND SW MOTOR OPER
- MV CABLE TERMINATION
- CABLE POTHEAD OIL-FILLED

MISC DEVICES & CONNECTIONS:

- IN/OUT LINE
- 01 02 PROTECTIVE DEVICE ELEMENT, SEE DEVICE FUNCTION INDEX
- TEST SWITCH
- TEST SWITCH, CURRENT SHORTING
- BATTERY
- GROUND
- DISCONNECTING DEVICE
- NEUTRAL CONNECTION
- ISOL PH BUS FLEX CONN
- ISOL PH BUS REMOVEABLE LINK

MISC DEVICES & CONNECTIONS:

- DEVICE TERMINAL POINT
- TERMINAL BLOCK
- EXTERNAL EQUIPMENT INTERCONNECTION
- XX XX RELAY, SOLENOID, OR CONTACTOR COIL
- TD XX TRANSDUCER
- I XX INDICATING METER
- TLM XX TELEMETRY
- X PUSH-TO-TEST LIGHT
- X PILOT/INDIC LIGHT
- XA FUSE, SIZE AS INDICATED
- FUSE DUMMY
- XA DISC SW FUSED
- FUSIBLE LINK
- CAPACITOR
- 3% REACTOR
- RES RESISTOR
- RES RESISTOR VARIABLE
- OR HEATER ELEMENT
- RECTIFIER SOLID STATE
- AC DC+ DC- AC RECTIFIER FULLWAVE
- DC BRAKE
- GROUND
- CHASSIS GROUND
- CURRENT SHUNT

LOW VOLTAGE SWITCHING:

- DISCONNECTING SWITCH, MANUALLY GANG-OPERATED
- MOLDED CASE OR AIR CIRCUIT BREAKER
- CONTACTOR WITH THERMAL OL TRIP
- CONTACTOR WITH MAGNETIC OL TRIP
- CONTACTOR WITH THERMAL AND MAGNETIC OL TRIP
- E CIR BKR DRAWOUT ELEC OPER
- E CIR BKR THERMO O/L DRAWOUT ELEC OPER
- E CIR BKR MAG O/L DRAWOUT ELEC OPER
- E CIR BKR THERMO/MAG O/L DRAWOUT ELEC OPER

SELECTOR:

J K A1 A2 — TWO-POSITION X-CONTACT CLOSED

	J	K
A1	X	
A2		X

J K L A1 A2 — THREE-POSITION X-CONTACT CLOSED

	J	K	L
A1	X		
A2			X

A B 1 2 3 4 — TWO-POSITION SELECTOR PUSHBUTTON X-CONTACT CLOSED

CONTACTS	SELECTOR POSITION			
	A		B	
	BUTTON		BUTTON	
	FREE	CONTACTS	FREE	CONTACTS
1-2	X			
3-4		X	X	X

CONTROL SWITCHING:

- XX PB SWITCH NORM OPEN
- XX PB SWITCH NORM CLOSED
- XX OFF MAN AUTO SELECTOR SWITCH
- XX LIMIT SW NORM OPEN
- XX LIMIT SW NORM CLOSED
- XX LIMIT SW NORM OPEN HELD CLOSED
- XX LIMIT SW NORM CLOSED HELD OPEN
- SOLENOID
- XX CONTACT NORM OPEN
- XX CONTACT NORM CLOSED
- XX FLOW OPER NORM OPEN
- XX FLOW OPER NORM CLOSED
- XX LEVEL OPER NORM OPEN
- XX LEVEL OPER NORM CLOSED
- XX SWITCH NORM OPEN
- XX SWITCH NORM CLOSED
- XX TEMP ACT SW NORM OPEN
- XX TEMP ACT SW NORM CLOSED
- XX FOOT OPER NORM OPEN
- XX FOOT OPER NORM CLOSED
- XX PRESS OPER NORM OPEN
- XX PRESS OPER NORM CLOSED

PRELIMINARY
NOT FOR CONSTRUCTION

MOMENTARY CONTACTS:

- NO NC SINGLE CIRCUIT
- NO & NC DOUBLE CIRCUIT

MAINTAINED CONTACTS:

- TWO SINGLE CIRCUIT
- ONE DOUBLE CIRCUIT
- ESS E-STOP, 2NC

INSTANT OPERATION CONTACTS WITH BLOWOUT

- XA NO
- XA NC

INSTANT OPERATION CONTACTS WITHOUT BLOWOUT

- XA NO
- XA NC

TIMED CONTACTS - CONTACT ACTION DELAYED AFTER COIL IS ENERGIZED

- XX SEC NOTC
- XX SEC NCTC

TIMED CONTACTS - CONTACT ACTION DELAYED AFTER COIL IS DE-ENERGIZED

- XX SEC NOTC
- XX SEC NCTC

SUPPLEMENTARY CONTACTS SYMBOLS:

- SPST, NO SINGLE-BREAK
- SPST, NO DOUBLE-BREAK
- SPST, NC SINGLE-BREAK
- SPST, NC DOUBLE-BREAK
- SPDT, SINGLE-BREAK
- SPDT, DOUBLE-BREAK
- DPST, NO, SINGLE-BREAK
- DPST, NO, DOUBLE-BREAK
- DPST, NC, SINGLE-BREAK
- DPST, NC, DOUBLE-BREAK
- DPDT, SINGLE-BREAK
- DPDT, DOUBLE-BREAK

NOTE:

1. "X" OR "XX" SHOWN ON SYMBOLS WILL BE SUBSTITUTED WITH DEVICE FUNCTION NUMBERS, LETTER SUFFIXES, PILOT LIGHT COLORS, OR OTHER DESCRIPTIVE TEXT, WHICH ARE DEFINED ELSEWHERE IN THESE LEGEND DRAWINGS.

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen LLC

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

ELECTRICAL STANDARD SYMBOLS 1

DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GE002.dwg Plot date: Sep 28, 2023 02:48pm, CAD User: HaberFlavia

PRIVATE TELEPHONE SYSTEM

- SB SWITCHBOARD
- TC TERMINAL CABINET
- D DESK PHONE
- W WALL PHONE

PRIVATE ETHERNET NETWORK SYSTEM

- DATA JACK
- VOICE/DATA JACK

PAGE/SOUND SYSTEM

- A AMPLIFIER
- WS SPEAKER, WALL MTD
- CS SPEAKER, CEIL MTD
- WH HORN, WALL MTD
- CH HORN, CEIL MTD
- MIC MICROPHONE
- P HANDSET

INTRUSION ALARM/ACCESS SYSTEM

SA SECURITY ALARM
- A POINT OF CONTACT
- C SECURITY PROXIMITY CARD READER (+48" AFF)
- E SECURITY ELEVATOR LOCKOUT CONTROL
- K SECURITY KEYPAD
- P SECURITY PANIC BUTTON (MOUNT UNDER CABINET)

SCD SECURITY DOOR CONTACT
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- S SURFACE MOUNTED CONTACT/MAGNET COMBO WITH TAMPER RESISTANT METAL-CLAD PIGTAIL.
- M FULLY RECESSED CONTACT/MAGNET COMBO INSTALLED IN DOOR FRAME HEADER/TOP OF DOOR.

SLD SECURITY DOOR LOCK CONNECTION (LOCK BY OTHERS)
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- S ELECTRICAL STRIKE IN DOOR FRAME LATCH.
- M MAGNETIC LOCK ON DOOR FRAME HEADER.

SM— SECURITY MOTION SENSOR - ARROW INDICATES DIRECTION OF SENSING; 360° INDICATES SENSING IN ALL DIRECTIONS

SM SECURITY MONITOR AND MULTIPLEXOR/DVM

REXD REQUEST TO EXIT SIGNAL DEVICE
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- P PASSIVE INFRARED DETECTOR MOUNTED ABOVE DOOR FRAME. PROVIDE J-BOX TYPE 'B' HORIZONTALLY MOUNTED 6" ABOVE DOOR.

P POWERED DOOR OPERATOR ACTUATOR

CCTV SYSTEM

- CCTV CAMERA FIXED POSITION
- PTZ CCTV CAMERA, PAN-TILT-ZOOM
- CCTV MONITOR
- CCTV MONITOR

LOW VOLTAGE ELECTRICAL MATERIALS

- CB CIRCUIT BREAKER SWITCH
- UF UNFUSED DISCONNECT SWITCH
- F FUSED DISCONNECT SWITCH
- MOTOR STARTER MANUAL
- MOTOR STARTER MAGNETIC
- CB MOTOR STARTER MAG. COMBINATION C.B. SW.
- F MOTOR STARTER MAG. COMBINATION FUSED D.S.
- VFD VARIABLE FREQUENCY DRIVE
- PUSHBUTTON SW. EMERG. STOP
- PUSHBUTTON SW. STOP/START
- PUSHBUTTON STATION
- SELECTOR SWITCH
- CS CONTROL STATION
- FS FLOAT SWITCH
- LI LEVEL SWITCH
- BI BIN LEVEL SWITCH
- LS LIMIT SWITCH
- PS PRESSURE SWITCH
- PE ELECTRICAL/PNEUMATIC SWITCH
- PT PRESSURE TRANSMITTER
- SV SOLENOID VALVE
- T THERMOSTAT
- TS TEMPERATURE SWITCH
- 2 MOTOR
- POINT OF CONNECTION
- J JUNCTION BOX OR CONDUIT FITTING

$ WALL SWITCH
- (1a) NUMBER & LETTER IN PARENTHESES INDICATES PANELBOARD CIRCUIT & SWITCHING ZONE
- 3 THREE WAY
- 4 FOUR WAY
- D DIMMER
- OS OCC SENSOR
- T TIMER
- XP EXPLOSIVE PROOF
- WP WATERPROOF

$M MOTOR SWITCH
- M MOTOR RATED TOGGLE SWITCH WITHOUT OVERLOADS
- MS MANUAL MOTOR STARTER WITH OVERLOADS

- DS DAYLIGHT SENSOR
- OS WALL MOUNTED OCCUPANCY SENSOR
- OS CEILING MOUNTED OCCUPANCY SENSOR
- PC PHOTOCELL, SUBSCRIPT INDICATES CIRCUIT

CONVENIENCE RECEPTACLE - DUPLEX
- C CLOCK
- CR CORROSION RESISTANT
- GFI GROUND FAULT INTERRUPTER
- TL TWIST LOCK, NEMA CONFIGURATION AS INDICATED
- U UPS FED
- WP WEATHERPROOF

SUBSCRIPT NUMBER AT RECEPTACLE INDICATES CIRCUIT

- QUADRUPLEX RECEPTACLE
- SINGLE RECEPTACLE
- FLOOR RECEPTACLE
- SPECIAL PURPOSE RECEPTACLE, NEMA CONFIGURATION AS INDICATED

SITE ELECTRICAL

- POLE CONCRETE
- POLE WOOD
- POLE MOUNTED TRANSFORMER
- DOWN GUY
- SIDEWALK GUY
- M MANHOLE
- H HANDHOLE
- V VAULT
- S PAD MOUNTED SWITCH
- T TRANSFORMER VAULT
- PAD MOUNTED TRANSFORMER

GROUNDING

- GROUND ROD
- GROUND ROD WITH ACCESS BOX
- GROUND CONNECTION EXOTHERMIC
- GROUND CONNECTION MECHANICAL BOLTED
- GROUND CONNECTION COMPRESSION
- GROUND COIL (PIGTAIL) 5'0" (1.5M)
- GROUND GRADIENT MAT (SAFETY MAT) 4'X 4'
- GROUND GRADIENT MAT (SAFETY MAT) 4'X 6'

ELECTRICAL LIGHTING FIXTURES

- SURFACE/PENDANT LINEAR FIXTURE
- SURFACE/PENDANT LINEAR FIXTURE WITH BATTERY BACKUP
- RECESSED LINEAR FIXTURE
- RECESSED LINEAR FIXTURE WITH BATTERY BACKUP
- DOWNLIGHT FIXTURE SURFACE/PENDANT CEILING MOUNT
- DOWNLIGHT OR SCONCE FIXTURE SURFACE WALL MOUNT
- R DOWNLIGHT FIXTURE RECESSED CEILING MOUNT
- R DOWNLIGHT OR SCONCE FIXTURE RECESSED WALL MOUNT
- H HAZARDOUS AREA LIGHT FIXTURE CEILING MOUNT
- EXIT SIGN, ARROW INDICATES DIRECTION SURFACE/PENDANT CEILING MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE
- EXIT SIGN, ARROW INDICATES DIRECTION SURFACE WALL MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE
- R EXIT SIGN, ARROW INDICATES DIRECTION RECESSED WALL MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE

- R EMERGENCY DOWNLIGHT FIXTURE SURFACE/PENDANT CEILING MOUNT
- EMERGENCY DOWNLIGHT OR SCONCE FIXTURE SURFACE WALL MOUNT
- R EMERGENCY DOWNLIGHT FIXTURE RECESSED CEILING MOUNT
- R EMERGENCY DOWNLIGHT OR SCONCE FIXTURE RECESSED WALL MOUNT
- EMERGENCY LIGHTING UNIT, 1 HEAD
- EMERGENCY LIGHTING UNIT, 2 HEAD
- EMERGENCY LIGHTING UNIT, 3 HEAD
- SURFACE MTD. DISTR. PANELBOARD
- FLUSH MTD. DISTR. PANELBOARD
- LF-1 LF-1 POLE-MOUNTED AREA LIGHT, NUMBER OF FIXTURES AND CONFIGURATION AS SHOWN AND PER SCHEDULE
- A (2a) LETTER NEXT TO LUMINAIRE INDICATES TYPE PER SCHEDULE. NUMBER AND LOWER CASE LETTER IN PARENTHESES INDICATES CIRCUIT AND SWITCHING ZONE IN PANELBOARD.

PLAN LINETYPES AND CONVENTIONS

- EXPOSED CONDUCTOR/CONDUIT
- CONCEALED/EMBEDDED CONDUCTOR/CONDUIT
- CONDUCTOR/CONDUIT DOWN
- CONDUCTOR/CONDUIT UP
- G GROUNDING ELECTRODE CONDUCTOR, BARE COPPER
- G GROUND CONNECTION, EXOTHERMIC OR WELDED
- G GROUND CONNECTION, BOLTED
- EOH OH POWER
- EUG UG POWER
- [3/4"C, 3#12, 1#12G] CIRCUIT CALLOUT, CONDUIT AND CONDUCTOR SIZES AS INDICATED; "n-" IN FRONT OF CALLOUT INDICATES "n" PARALLEL SETS
- RXX RACEWAY CALLOUT, INDEX NUMBER AS INDICATED IN RACEWAY SCHEDULE

DIAGRAM LINETYPES AND CONVENTIONS

- ENCLOSURE
- CONDUCTOR, CABLE, CIRCUIT, OR BUS
- INTERCONNECTION WITH EXTERNAL EQUIPMENT
- GANG OPERATED INTERLOCK
- OR CONDUCTOR, CROSSING OF PATHS OR CONDUCTORS NOT CONNECTED
- CONDUCTOR, JUNCTION OF CONNECTED PATHS, CONDUCTORS OR WIRES

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MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA RIVER RELEASE FACILITY

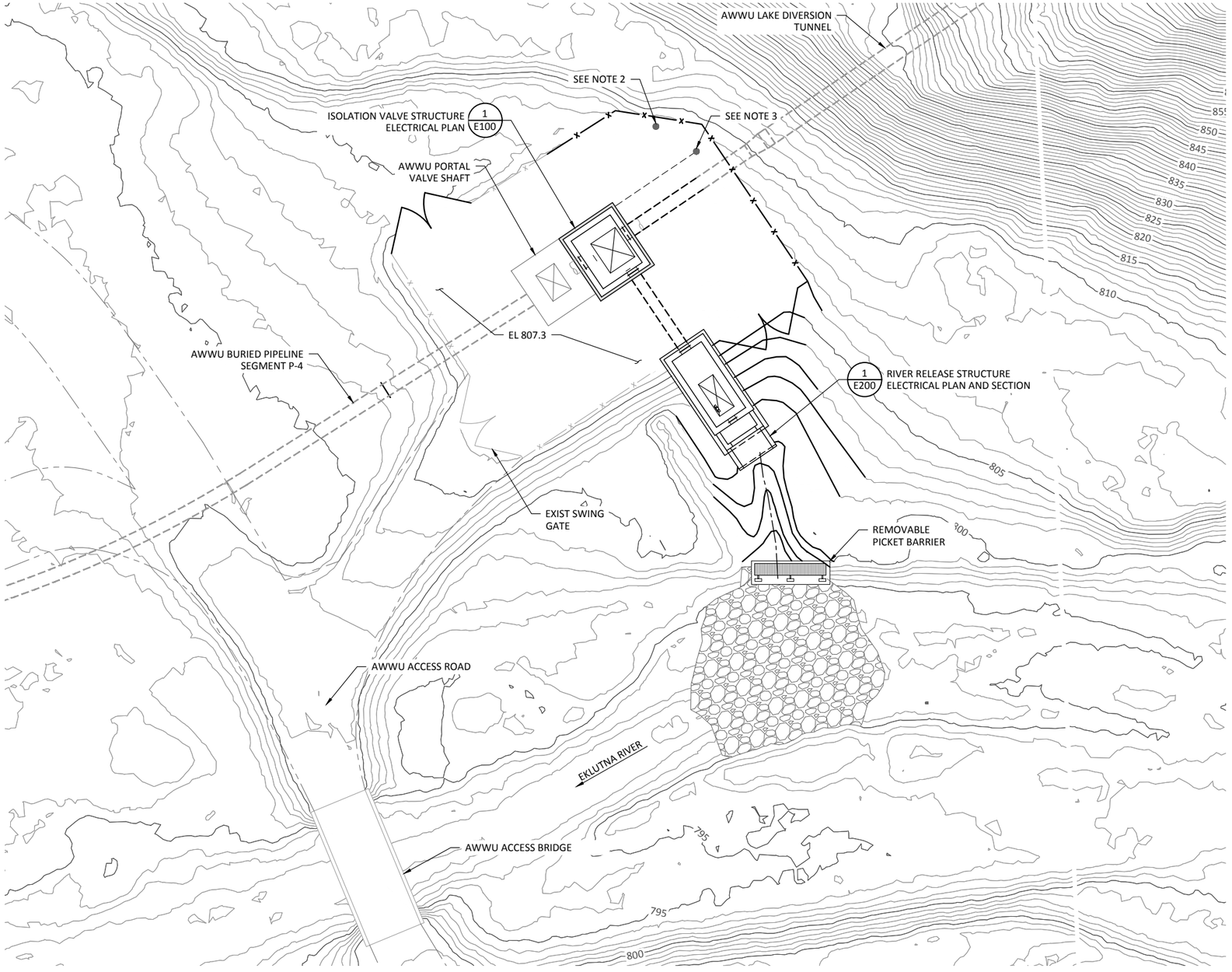
ELECTRICAL STANDARD SYMBOLS 2

DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\GE003.dwg Plot date: Sep 26, 2023 05:08pm, CAD User: HaberFlavia



ELECTRICAL SITE AND KEY PLAN

SCALE: 1"= 20'

0" 20' 40'

N

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. EXISTING 7.2 kV SINGLE-PHASE POWER SERVICE POLE. EXTEND POWER LINE TO NEW DEAD-END POLE FOR NEW POWER SERVICE DROP.
3. NEW POWER POLE SERVICE DROP. PROVIDE METER SOCKET AND SERVICE DISCONNECT. COORDINATE REQUIREMENTS WITH UTILITY.

PRELIMINARY
NOT FOR CONSTRUCTION

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WARNING

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MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

ELECTRICAL SITE AND KEY PLAN

DESIGNED C. CURTIS

DRAWN J. HOLT

CHECKED J. BAKKEN

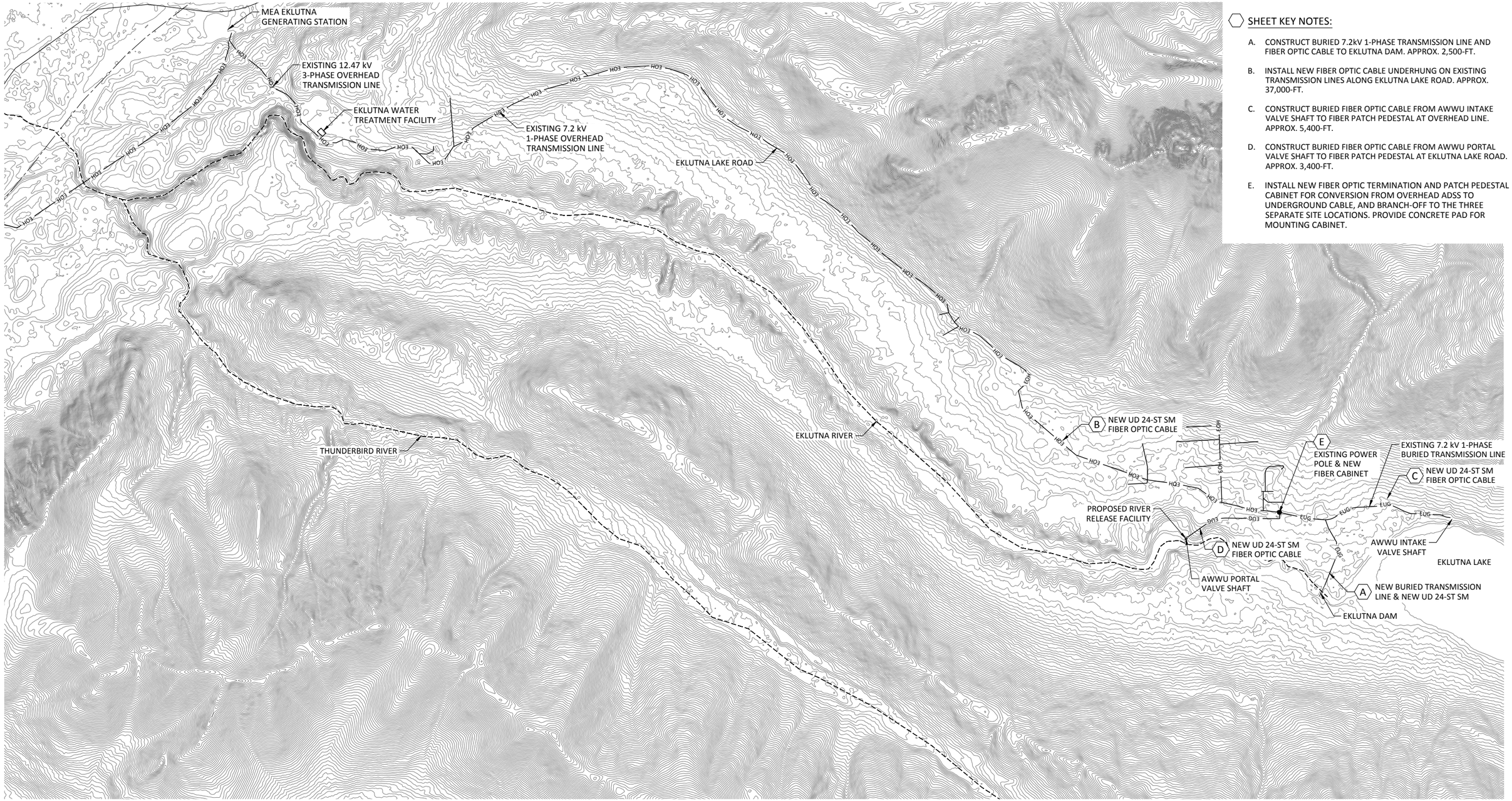
PROJECT DATE 10/6/23

DRAWING

E001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\E001.dwg Plot date: Sep 28, 2023 02:48pm, CAD User: HaberFlavia



SHEET KEY NOTES:

A. CONSTRUCT BURIED 7.2kV 1-PHASE TRANSMISSION LINE AND FIBER OPTIC CABLE TO EKLUTNA DAM. APPROX. 2,500-FT.

B. INSTALL NEW FIBER OPTIC CABLE UNDERHUNG ON EXISTING TRANSMISSION LINES ALONG EKLUTNA LAKE ROAD. APPROX. 37,000-FT.

C. CONSTRUCT BURIED FIBER OPTIC CABLE FROM AWWU INTAKE VALVE SHAFT TO FIBER PATCH PEDESTAL AT OVERHEAD LINE. APPROX. 5,400-FT.

D. CONSTRUCT BURIED FIBER OPTIC CABLE FROM AWWU PORTAL VALVE SHAFT TO FIBER PATCH PEDESTAL AT EKLUTNA LAKE ROAD. APPROX. 3,400-FT.

E. INSTALL NEW FIBER OPTIC TERMINATION AND PATCH PEDESTAL CABINET FOR CONVERSION FROM OVERHEAD ADSS TO UNDERGROUND CABLE, AND BRANCH-OFF TO THE THREE SEPARATE SITE LOCATIONS. PROVIDE CONCRETE PAD FOR MOUNTING CABINET.

TRANSMISSION AND COMMUNICATION UPGRADES PLAN

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

TRANSMISSION AND COMMUNICATION UPGRADES PLAN

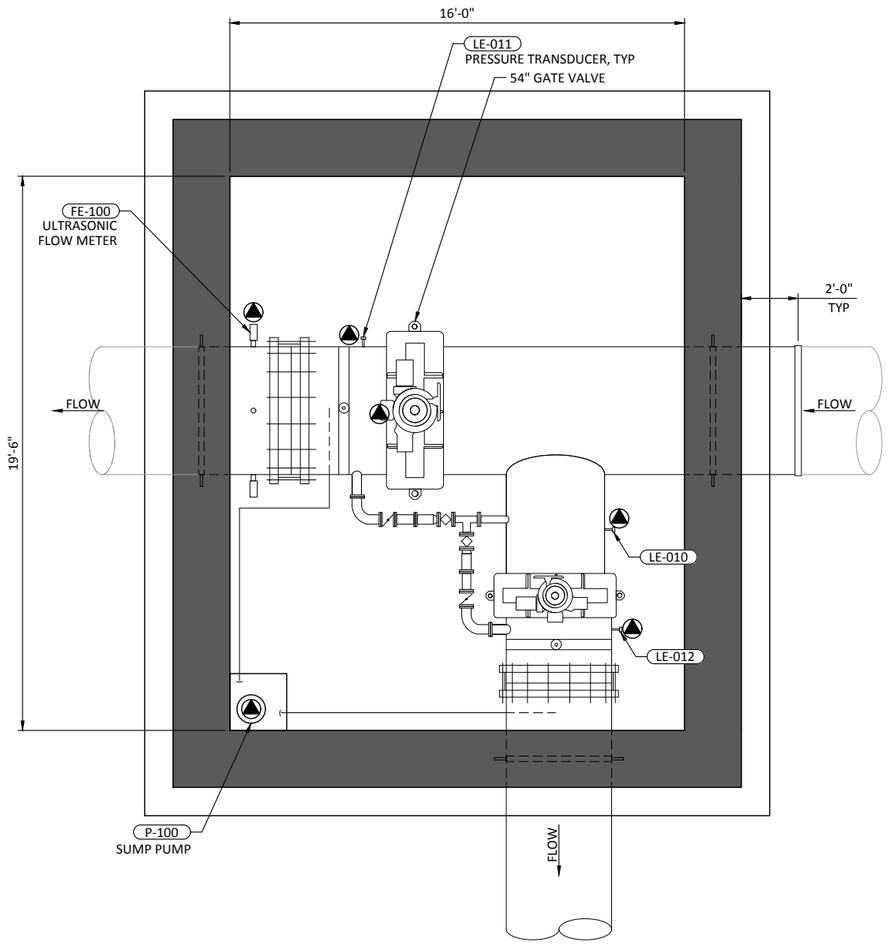
DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING

E003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\E003.dwg Plot date: Sep 28, 2023 02:57pm, CAD User: HaberFlavia



1 / M001 ISOLATION VALVE STRUCTURE ELECTRICAL PLAN

SCALE: 3/8"= 1'-0"

0' 2' 4'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

ISOLATION VALVE STRUCTURE ELECTRICAL PLAN

DESIGNED C. CURTIS

DRAWN J. HOLT

CHECKED J. BAKKEN

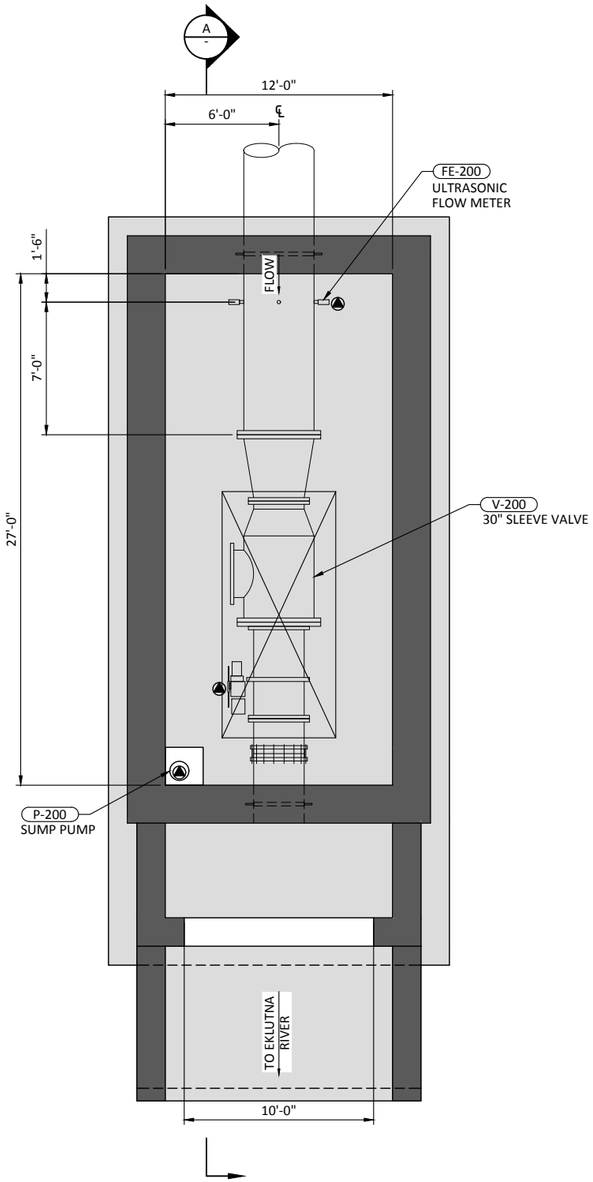
PROJECT DATE 10/6/23

DRAWING

E100

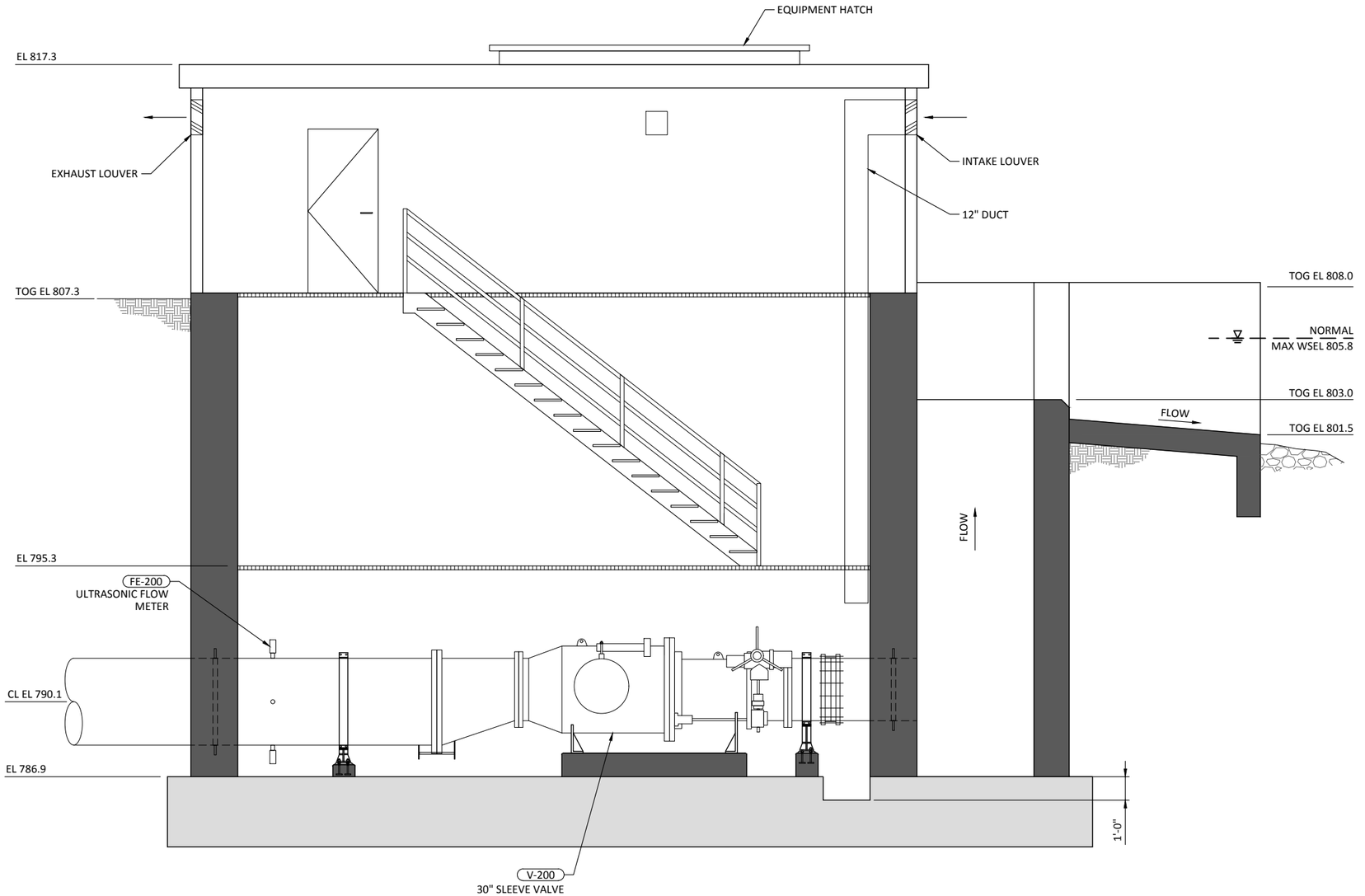
JOB NO: 0000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\E100.dwg Plot date: Sep 28, 2023 02:48pm, CAD User: HaberFlavia



1 M001 RIVER RELEASE ELECTRICAL PLAN

SCALE: 1/4"= 1'-0"



A - SECTION

SCALE: 3/8"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA RIVER RELEASE FACILITY

RIVER RELEASE STRUCTURE ELECTRICAL PLAN AND SECTION

DESIGNED C. CURTIS

DRAWN J. HOLT

CHECKED J. BAKKEN

PROJECT DATE 10/6/23

DRAWING

E200

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\Portal Release Structure\E200.dwg Plot date: Sep 28, 2023 02:49pm, CAD User: HaberFlavia

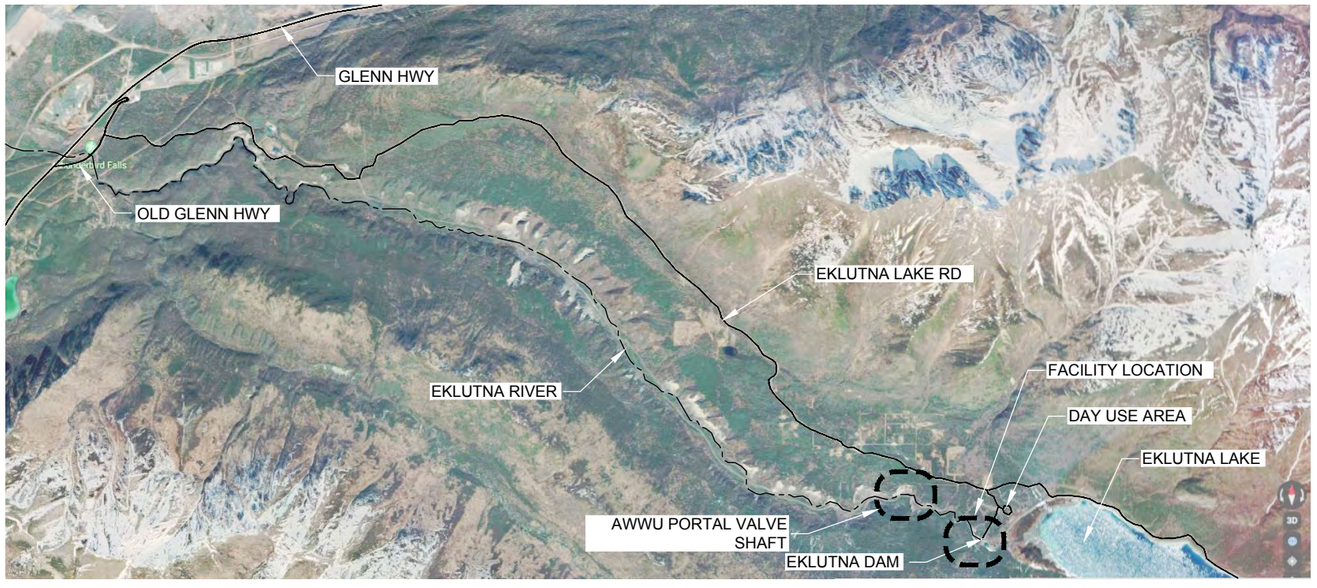
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
ANCHORAGE, ALASKA

15% DESIGN
OCTOBER 2023

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS
15% DESIGN

LOCATION MAP
NTS



VICINITY MAP
NTS

FACILITY MAP
NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

LOCATION MAP, VICINITY MAP, AND FACILITY MAP

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G001.dwg Plot date: Sep 28, 2023 09:19am, CAD User: HaberFlavia

DRAWING INDEX			
15% SUB*	SHEET NO.	DWG NO.	DESCRIPTION
		GENERAL	
			COVER SHEET
X	1	G001	LOCATION MAP, VICINITY MAP, AND FACILITY MAP
X	2	G002	DRAWING INDEX
X	3	G003	STANDARD ABBREVIATIONS
X	4	G004	STANDARD SYMBOLS
X	5	G005	PIPING SCHEDULE
X	6	G006	INSTRUMENTATION AND EQUIPMENT LEGEND
		DEMOLITION	
X	7	D001	DEMOLITION KEY PLAN
X	8	D100	EKLUTNA DAM OUTLET DEMOLITION PLAN, SECTIONS, AND DETAILS
X	9	D101	EKLUTNA DAM OUTLET DEMOLITION PHOTOS
		STRUCTURAL	
X	10	GS001	STRUCTURAL GENERAL NOTES
X	11	GS002	STRUCTURAL STANDARD DETAILS 1
X	12	GS003	STRUCTURAL STANDARD DETAILS 2
X	13	S100	EKLUTNA DAM OUTLET STRUCTURAL PLAN, SECTIONS AND DETAILS
		MECHANICAL	
X	14	GM001	MECHANICAL EQUIPMENT SCHEDULE
X	15	GM002	MECHANICAL STANDARD DETAILS
X	16	M100	EKLUTNA DAM OUTLET MECHANICAL PLAN, SECTION AND DETAILS 1
X	17	M101	EKLUTNA DAM OUTLET MECHANICAL PLAN, SECTION AND DETAILS 2
		ELECTRICAL	
X	18	GE001	ELECTRICAL ABBREVIATIONS AND DEVICE INDEXES
X	19	GE002	ELECTRICAL STANDARD SYMBOLS 1
X	20	GE003	ELECTRICAL STANDARD SYMBOLS 2
	21	E001	OVERALL ONE-LINE DIAGRAM
	22	E002	COMMUNICATIONS BLOCK DIAGRAM
X	23	E003	TRANSMISSION AND COMMUNICATION UPGRADES PLAN
X	24	E100	EKLUTNA DAM OUTLET ELECTRICAL PLAN, SECTION AND DETAILS 2

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

DRAWING INDEX

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G002.dwg Plot date: Sep 28, 2023 09:20am, CAD User: HaberFlavia

A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
A	ARCHITECTURAL (DWG DISCIPLINE), AMP
AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABAN	ABANDON
AC	ALTERNATING CURRENT
ACST	ACOUSTIC
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AIC	AMPS INTERRUPTING CAPACITY
ALIG	ALIGNMENT
ALUM	ALUMINUM
ALT	ALTERNATE, ALTITUDE
AMB	AMBIENT
ANC	ANCHOR
AP	ACCESS PANEL
APRX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURAL
ASSY	ASSEMBLY
AT	AMP TRIP
ATM	ATMOSPHERE
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
AWWU	ANCHORE WATER AND WASTEWATER UTILITY
B/B	BACK TO BACK
BAL	BALANCE
BBD	BULLETIN BOARD
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER, BOLT CIRCLE
BD	BOARD
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE, BOARD FEET
BFV	BUTTERFLY VALVE
BITUM	BITUMINOUS
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BTWLD	BUTT WELD
BV	BALL VALVE
BW	BOTH WAYS
BYP	BYPASS
C TO C	CENTER TO CENTER
C&G	CURB & GUTTER
C	CHANNEL SHAPE, CENTIGRADE, CONDUIT, CIVIL (DRAWING DISCIPLINE)
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCW	COUNTER CLOCKWISE
CF	CUBIC FEET (FOOT)
CHFR	CHAMFER
CHD	CHORD
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIPB	CONCRETE INTERLOCKING PAVER BALLAST
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT, CONTROL JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE
CONC	CONCENTRIC, CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUED
COORD	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSK	COUNTERSINK
CTR	CENTER
CTRL	CONTROL
CU	COPPER, CUBIC
CW	CLOCKWISE
CY	CUBIC YARD
d	PENNY (NAIL MEASURE)
D	DEEP, DIFFUSER
DB	DUCT BANK, DECIBEL, DRY BULB
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DN	DOWN
DP	DEPTH
DS	DOWN SPOUT
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DWG	DRAWING
DWL	DOWEL
E	EAST, ELECTRICAL (DWG DISCIPLINE)
EA	EACH, EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EG	EXISTING GRADE
EGL	ENERGY GRADE LINE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMER	EMERGENCY
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, EMERGENCY SHOWER
ESEW	EMERGENCY SHOWER AND EYE WASH
EST	ESTIMATE
EW	EACH WAY, EMERGENCY EYE/FACE WASH
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION, EXPOSED
EXT	EXTERIOR, EXTERNAL, EXTENSION
F TO F	FACE TO FACE
FAB	FABRICATE
FBO	FURNISHED BY OWNER
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FCV	FIXED CONE VALVE
FD	FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDR	FEEDER
FE	FLANGED END
FEC	FIRE EXTINGUISHER CABINET
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FIG	FIGURE
FH	FIRE HYDRANT
FIN	FINISH
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FND	FOUNDATION
FNC	FENCE
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB, FIBER OPTIC CABLE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FLOOR SINK, FAR SIDE
FT	FEET, FOOT
FTG	FOOTING, FITTING FUR FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE
G	GRILLE, GROUND, GENERAL (DWG DISCIPLINE)
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GP	GUY POLE
GR	GRADE
GRND	GROUND
GRTG	GRATING
GT	GREASE TRAP
GWB	GYPSUM WALLBOARD
GYP	GYPSUM HARDBOARD
H	HIGH
HB	HOSE BIB
HBD	HARDBOARD
HC	HANDICAPPED, HOLLOW CORE, HORIZONTAL CURVE
HC	HORIZONTAL CENTERLINE
HDR	HEADER
HDW	HARDWARE
HEX	HEXAGONAL
HH	HANDHOLE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER
HPC	HORIZONTAL POINT OF CURVATURE
HPS	HIGH PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOUR
HS	HEADED STUD, HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC HZ HERTZ, CYCLES PER SECOND
I	INSTRUMENTATION (DWG DISCIPLINE)
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE, INCANDESCENT
INF	INFLUENT
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IRR	IRRIGATION
ISO	ISOMETRIC
JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JT	JOINT
K	KIP
KB	KNEE BRACE
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KIUC	KAUAI ISLAND UTILITY COOPERATIVE
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
L	ANGLE, LENGTH, LAVATORY
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LDR	LEADER
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LMLU	LIQUID MARKER LECTURE UNIT
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT
LPS	LOW PRESSURE SODIUM
LR	LONG RADIUS
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
M	MECHANICAL (DWG DISCIPLINE)
MA	MIXED AIR
MAINT	MAINTENANCE
MAN	MANUAL
MAOP	MAXIMUM ALLOWABLE OPERATING PRESSURE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MCJ	MASONRY CONTROL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFR	MANUFACTURER
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODULAR, MODIFY
MON	MONUMENT
MPT	MALE PIPE THREAD
MSL	MEAN SEA LEVEL
MT	MOUNT
MU	MASONRY UNIT
MULL	MULLION
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NEG	NEGATIVE
NF	NEAR FACE, NON-FUSED
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
O TO O	OUT-TO-OUT
OA	OUTSIDE AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT, PROCESS (DWG DISCIPLINE)
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX
PBD	PARTICLE BOARD
PC	POINT OF CURVE, PIECE, PRECAST
PCC	POINT OF COMPOUND CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCT	PERCENT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PI	POINT OF INTERSECTION
PKG	PACKAGE
PL	PLATE, PROPERTY LINE
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
POL	POLISH
POS	POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PROP	PROPERTY
PROT	PROTECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PT	POINT, POINT OF TANGENCY
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWD	PLYWOOD
PZ	PIEZOMETER
Q	RATE OF FLOW
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
R	RADIUS, REGISTER, RISER
RA	RETURN AIR
RB	RESILIENT BASE, ROCK BERM
RCPT	RECEPTACLE
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RFL	REFLECTED, REFLECTOR
RGS	RIGID GALVANIZED STEEL
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RL	REQUIRED LAP
RND	ROUND
RNG	RENEWABLE NATURAL GAS
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
S	SOUTH, SINK, STRUCTURAL (DWG DISCIPLINE)
SA	SUPPLY AIR
SAN	SANITARY
SC	SOLID CORE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCRN	SCREEN
SE	STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS
SECT	SECTION
SEP	SEPARATE
SF	SQUARE FOOT
SH	SHOWER
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SOG	SLAB ON GRADE
SP	SOUNDPROOF, STANDPIPE
SPC	SPACING
SPEC	SPECIFICATION
SPLY	SUPPLY
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T	TILE, TREAD
TA	TEMPERED AIR
TAN	TANGENT
TBM	TEMPORARY BENCHMARK
TEMP	TEMPORARY, TEMPERATURE
THK	THICK
THRD	THREAD
THRU	THROUGH
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TP	TELEPHONE POLE, TOE PLATE, TRAP PRIMER
TPG	TOPPING
TRANS	TRANSITION
TRD	TRENCH DRAIN
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY, VOLT
VA	VOLT AMPERE
VAC	VACUUM
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCT	VINYL COMPOSITION TILE, VERTICAL CENTERLINE
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VS	VERSES, VAPOR SEAL
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W/	WITH
W/O	WITHOUT
W	WATT, WEST, WIDE, WINDOW, WIRE, WIDE FLANGE BEAM
WC	WATER CLOSET, WATER COLUMN
WD	WIDTH
WF	WIDE FLANGE, WASH FOUNTAIN
WG	WIRE GLASS, WATER GAGE
WH	WALL HYDRANT, WEEP HOLE
WL	WATER LEVEL
WLD	WELDED
WM	WIRE MESH
WP	WATERPROOF, WORKING POINT
WTHP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG
XSECT	CROSS SECTION
YH	YARD HYDRANT
YS	YIELD STRENGTH

GENERAL NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF THE WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION; "INC" MAY MEAN INCLUDED OR INCLUDING; "REINF" MAY MEAN EITHER REINFORCE OR REINFORCING.
4. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

STANDARD ABBREVIATIONS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

G003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G003.dwg Plot date: Sep 29, 2023 02:34pm, CAD User: HaberFlavia

SHEET SYMBOLS

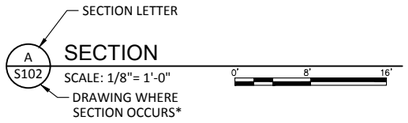
PLAN
SCALE: 1/2"= 1'-0"
0' 2' 4'

N

SECTION IDENTIFICATION

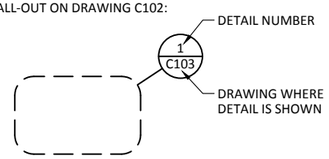
(1) SECTION CUT ON DRAWING C102:

(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

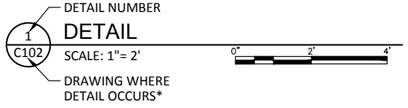


DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON DRAWING C102:



(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

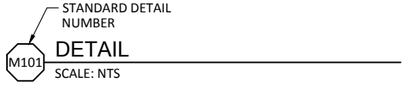


*NOTE: IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON SAME DRAWING. DRAWING NUMBER IS REPLACED BY A LINE.

STANDARD DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON PLAN OR SECTION:

(2) ON DETAIL DRAWINGS, IDENTIFIED AS:



ELEVATION/IMAGE IDENTIFICATION

SITE PLAN LINE TYPES

- FENCE LINE (X — X)
- OVERHEAD POWER (P — P)
- MAJOR CONTOUR (455)
- MINOR CONTOUR (456)
- EXIST MAJOR CONTOUR (455)
- EXIST MINOR CONTOUR (456)
- EDGE OF WATERLINE
- TOE OF SLOPE (TOE)
- TOP OF BANK (TOB)
- SANITARY SEWER (SS — SS)
- STORM DRAIN (SD — SD)
- EDGE OF PAVEMENT (EP — EP)
- EDGE OF GRAVEL (EG — EG)
- WATTLE (W)
- SILT FENCE (SF — SF)
- CONSTRUCTION FENCE (CF — CF)
- GAS LINE (GAS)
- TURBIDITY CURTAIN (TC)
- IRRIGATION LINE (IRR — IRR)
- WATER LINE (WTR)
- TELEPHONE LINE (TEL)
- COMMUNICATION LINE (COM)
- OVERHEAD ELECTRICAL/POWER (OHP)
- UNDERGROUND ELECTRICAL (EUG)
- PROPERTY LINE (P/L)
- EXISTING OVERHEAD POWER LINE (OHP)
- EXISTING OVERHEAD POWER & TELEPHONE LINE (OHP&T)
- EXISTING OVERHEAD TELEPHONE LINE (T)
- EXISTING BURIED TELEPHONE LINE EVIDENCED BY PEDESTALS & WARNING PADDLES (BT)
- EXISTING FENCE LINE
- PROJECT BOUNDARY
- TREE PROTECTION FENCE
- LIMITS OF DISTURBANCE
- SHORING

SITE PLAN SYMBOLS

- ARROW INDICATES DIRECTION OF PLAN NORTH
- CONIFER TREE: FIR, SPRUCE, LARCH OR PINE, 8" DIAMETER OR LARGER.
- DECIDUOUS TREE: COTTONWOOD, HAWTHORN, ASPEN, 8" DIAMETER OR LARGER.
- MH — MANHOLE
- EB — ELECTRIC BOX
- STORM DRAIN MANHOLE
- FH — FIRE HYDRANT
- YH-X — YARD HYDRANT
- SURVEY CONTROL POINT, AS NOTED.
- POLE ANCHOR
- POWER POLE
- LIGHT POLE
- SIGN
- SURVEY HUB
- SECTION CORNER
- BENCH MARK
- EXISTING HEADWALL
- EXISTING MONITORING STATION
- EXISTING FENCE (X — X)
- STATE PLANE COORDINATE MARKER
- EXISTING TREE LINE
- EXISTING BUILDING, STRUCTURES
- EXISTING SECTION CORNER MONUMENT FOUND AS DESCRIBED
- EXISTING 5/8" REBAR CONTROL POINT MONUMENT, BORING LOCATION
- W — EXISTING HOSE BIB
- EXISTING PORTABLE IRRIGATION WATER PUMP
- WELL — EXISTING 6" WATER WELL
- EXISTING ELECTRICAL OUTLET
- P — EXISTING POWER POLE
- T — EXISTING TELEPHONE PEDESTAL
- CONTROL POINT
- PUMP
- PUMP
- TP — TEST PIT LOCATION

MISCELLANEOUS SYMBOLS

- CHANGE OF PIPE MTL
- OR — END OF PIPE
- ℄ — CENTERLINE
- Ø — DIAMETER
- ∠ — ANGLE
- PL — PLATE
- ± — PLUS/MINUS

GENERAL NOTES:

1. ALL SYMBOLS ARE NOT NECESSARILY USED. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLS ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.

HATCH SYMBOLS

- ROCK, TYPE AS NOTED (PLAN/SECTION)
- BED ROCK
- EXISTING GRADE (SECTION)
- NEW SOIL (SECTION)
- CONCRETE EXISTING (SECTION/PLAN)
- CONCRETE 1ST STAGE (SECTION/PLAN)
- CONCRETE 2ND STAGE (SECTION/PLAN)
- SAND, GROUT (PLAN/SECTION)
- STEEL (SECTION)
- GRATING (PLAN)
- MASONRY (PLAN)
- WOOD, SIZE/TYPE AS NOTED (PLAN)
- WOOD, SIZE/TYPE AS NOTED (SECTION)
- RIP RAP (PLAN/SECTION)
- RIGID INSULATION (SECTION)
- ASPHALT CONCRETE PAVEMENT SURFACE (PLAN/SECTION)
- GRASS/VEGETATION (PLAN)
- BATT INSULATION (SECTION)
- NEW CONSTRUCTION
- EXISTING
- EXISTING TO BE REMOVED OR DEMOLISHED
- CLEARING AND GRUBBING
- ASPHALT
- GRASS/VEGETATION
- GRAVEL

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

STANDARD SYMBOLS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G004

JOB NO: 000000

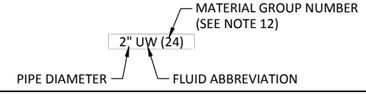
Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G004.dwg Plot date: Sep 28, 2023 09:25am, CAD User: HaberFlavia

FLUID ABBREVIATION	FUNCTION	ALLOWABLE PIPING MATERIAL GROUP NO. (SEE NOTE 1 AND 4)				FIELD TEST REQUIREMENTS (SEE NOTE 3 AND NOTE 4)		
	THIS LIST MAY INCLUDE FLUIDS NOT USED IN THIS PROJECT	EXPOSED PIPING (SEE NOTE 14)		BURIED PIPING (SEE NOTE 13)		MINIMUM TEST PRESSURE PSI	TEST MEDIUM	LEAKAGE ALLOWANCE (SEE NOTE 2)
		3" DIA AND SMALLER	4" DIA AND LARGER	3" DIA AND SMALLER	4" DIA AND LARGER			
COMMONLY USED FUNCTIONS								
VT	VENT	15	15	--	--	15 IN Hg	VACUUM	(A) (D)

PIPING MATERIAL SCHEDULE (SEE NOTE 1)

GROUP NO.	PIPE MATERIAL	FITTINGS / JOINTS	LININGS AND COATINGS (SEE NOTE 13)
15	STAINLESS STEEL, TYPE 316, ASTM A312, SCHEDULE 10S.	STAINLESS STEEL, TYPE 316 WELDED SLIP-ON FLG ASME B16.3, OR SOCKET WELDED FITTINGS SCHEDULE 40S, (NO THREADED JOINTS ALLOWED)	NOT APPLICABLE

TYPICAL PIPE DESIGNATION:



NOTES:

NOTE 1
ALTHOUGH SEVERAL PIPE MATERIAL GROUPS MAY BE LISTED ON THIS SHEET FOR A GIVEN FLUID SERVICE, CONTRACTOR SHALL PROVIDE ONLY THE PIPE MATERIAL GROUP SHOWN ON THE DRAWINGS AND SPECIFIED FOR THAT FLUID SERVICE.

NOTE 2
LEAKAGE ALLOWANCE IS AS FOLLOWS
A. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE.
B. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE FOR UNBURIED PIPE AND NOT MORE THAN 0.02 GALLON PER HOUR PER INCH DIAMETER PER 100 FEET OF BURIED PIPE.
C. PIPES SO DESIGNATED SHALL NOT SHOW A LEAKAGE OF MORE THAN 0.15 GALLON PER HOUR PER INCH OF DIAMETER PER 100 FEET OF PIPE.
D. PIPES SO DESIGNATED SHALL NOT SHOW A LOSS OF PRESSURE OF MORE THAN 5 PERCENT.
E. PIPE SO DESIGNATED SHALL NOT SHOW A LOSS OF VACUUM OF MORE THAN 4 INCHES MERCURY COLUMN.

NOTE 3
FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.

NOTE 4
NO SUBSTITUTIONS U.N.O. IN THE SPECIFICATIONS.

NOTE 5
NOT USED

NOTE 6
STATIC WATER TEST WITH SURFACE 5 FEET ABOVE HIGH POINT OF PIPE.

NOTE 7
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE PLUMBING CODE.

NOTE 8
NOT USED

NOTE 9
NOT USED

NOTE 10
NOT USED

NOTE 11
NOT USED

NOTE 12
CHANGE IN PIPING MATERIAL GROUP NUMBER IS INDICATED THUS: ——◆

NOTE 13
FOR FULL PIPE LINING AND COATING REQUIREMENTS, SEE SPECIFICATIONS.

NOTE 14
EXPOSED OUTDOOR PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS TO BE SELECTED BY OWNER.

NOTE 15
NOT USED

NOTE 16
NOT USED

NOTE 17
NOT USED

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
PIPING SCHEDULE

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

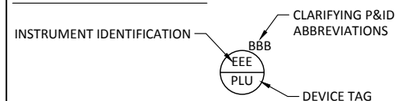
DRAWING
G005

JOB NO: 0000000

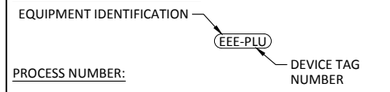
Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G005.dwg Plot date: Sep 28, 2023 09:25am, CAD User: HaberFlavia

INSTRUMENTATION / EQUIPMENT TAGS

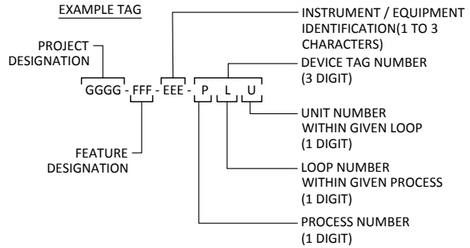
EXAMPLE INSTRUMENT CALLOUT



EXAMPLE EQUIPMENT CALLOUT



EXAMPLE TAG



PROCESS NUMBER:

0 MPH COMMON
1 TURBINE/GENERATOR
2 PUMPS/MOTORS
3 TIV
4 HVAC
5 LUBE/WATER COOLING
6 HPU
7 PLUMBING
8 VFD
9 CONTROLS INSTRUMENTATION

NOTE:

PROJECT AND FEATURE DESIGNATION FOR ALL COMPONENTS ON THIS FEATURE SET SHALL BE "EFWP-DOM" FOR "EKLUTNA FISH & WILDLIFE PROJECT - DAM OUTLET MODIFICATIONS". THIS HAS BEEN OMITTED ON THE DRAWINGS FOR BREVITY.

GENERAL INSTRUMENT OR FUNCTIONAL SYMBOLS

	FIELD MOUNTED	PRIMARY OR PANEL MOUNTED - ACCESSIBLE (1)	PRIMARY OR PANEL MOUNTED - INACCESSIBLE (2)	SECONDARY OR MCC MOUNTED - ACCESSIBLE (1)	SECONDARY OR MCC MOUNTED - INACCESSIBLE (2)
INSTRUMENT	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU
SHARED DISPLAY SHARED CONTROL OR HMI	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU	EEE / PLU
INDICATING LIGHTS	EEE / PLU	EEE / PLU	N/A	EEE / PLU	N/A

(1) NORMALLY ACCESSIBLE TO OPERATOR
(2) NORMALLY INACCESSIBLE TO OPERATOR (BEHIND-THE-PANEL)

SPECIAL CASE INSTRUMENT OR FUNCTIONAL SYMBOLS

- SINGLE INSTRUMENT OR OTHER COMPONENT HAVING MULTIPLE FUNCTIONS
- RELAY INTERLOCK LOGIC - SEE SCHEMATICS OR SPECIFICATIONS FOR MORE INFORMATION
- LSH / PLU — LEVEL (FLOAT)
- LE / PLU — LEVEL (ULTRASONIC)
- 24 VDC — POWER SUPPLY (SIZE AS NOTED)
- AS — AIR SUPPLY
- PRIMARY ELECTRICAL POWER (120V / 60 HZ UNLESS INDICATED OTHERWISE)
- INDICATES VENDOR PACKAGE
- CR — CONTROL RELAY
- LIGHTNING SURGE ARRESTOR
- M — MOTOR

SIGNAL SYSTEM INTERFACES

- AA / PLU — ANALOG INPUT
- AA / PLU — ANALOG OUTPUT
- AA / PLU / X — DISCRETE INPUT
- AA / PLU / X — DISCRETE OUTPUT
- AA / PLU / YY — DIGITAL DATA SIGNAL

AA = I/O DESIGNATION (MV = MULTIVARIABLE)

YY = DIGITAL PROTOCOL

X: H-MAINTAINED/LATCHING
M = MOMENTARY/FOLLOWER

ANALOG I/O DESIGNATORS

CR	CHLORINE RESIDUAL
DP	DIFFERENTIAL PRESSURE
FL	FLOW
LE	LOWER EXPLOSIVE LIMIT
LV	LEVEL
MO	MANIPULATED OUTPUT
PH	ACIDITY
PO	POSITION
PR	PRESSURE
PV	PROCESS VARIABLE
SP	SPEED
TE	TEMPERATURE
TU	TURBIDITY

DIGITAL PROTOCOL DESIGNATORS

DN	DEVICENET
IP	ETHERNET /IP
MB	MODBUS RTU
PB	PROFIBUS
PL	PARALLEL
SL	SERIAL
TC	MODBUS TCP

DISCRETE I/O DESIGNATORS

AM	AUTO-MANUAL
AU	AUTO
CL	CLOSED
EN	ENABLE
EL	POWER AVAILABLE
FA	FIRE ALARM
FW	FORWARD / REVERSE
HH	HI-HI LEVEL
HI	HI LEVEL
LL	LOW-LOW LEVEL
LO	LOW LEVEL
MN	MANUAL
OO	ON-OFF
OP	OPEN
RB	RUN BOOSTER
RC	RUN CLOSED
RE	REMOTE
RF	RUN FORWARD
RG	RUNNING
RN	RUN-STOP
RO	RUN-OPEN
RR	RUN-REVERSE
RV	REVERSE
YA	FAULT
SU	SUPERVISORY
SW	SELECTION
TR	TROUBLE

INSTRUMENTATION IDENTIFICATION TABLE (ISA)

FIRST LETTER			SUCCEEDING LETTER(S)		
LETTER	MEASURED INITIATING VARIABLE	VARIABLE MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT OR ACTIVE FUNCTION	FUNCTION MODIFIER
A	ANALYSIS (+)		ALARM		
B	BURNER, COMBUSTION				
C	CONDUCTIVITY			CONTROL	CLOSED
D	DENSITY (S.G.)	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	GAUGE		GLASS, GAUGE, VIEWING DEVICE	GATE	
H	HAND (MANUAL)				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOTION	MOMENTARY			MIDDLE, INTERMEDIATE
N	TORQUE		ISOLATE	ISOLATOR	
O	USER CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE (VACUUM), PNEUMATIC		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION/ RESISTANCE (ELECTRICAL)		RECORD OR PRINT		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTI VARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	INTRUSION	X-AXIS			
Y	EVENT, STATE OR PRESENCE	Y-AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z-AXIS		DRIVER, ACTUATOR, FINAL CONTROL ELEMENT	

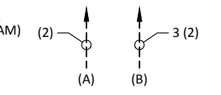
EQUIPMENT IDENTIFICATION TABLE

AC	AIR COMPRESSOR	GEN	GENERATOR	PV	PHOTOVOLTAIC
ACC	ACCUMULATOR	GSU	GENERATOR STEP-UP TRANSFORMER	RCT	RECTIFIER
ACT	ACTUATOR	GTC	GENERATOR POWER TERMINAL CABINET	RIO	REMOTE I/O UNIT
AF	AIR FILTER	HB	HOSE BIB	RTD	RESISTANCE TEMPERATURE DETECTOR
AFD	ADJUSTABLE FREQUENCY DRIVE	HMI	HUMAN-MACHINE INTERFACE	RTU	REMOTE TELEMETRY UNIT
AH	AIR HANDLING UNIT	HOI	HOIST/CRANE	SEC	SECURITY CONTROL PANEL
ARC	ARC PLENUM AND EXHAUST DUCT	HPU	HYDRAULIC POWER UNIT	SEP	SEPTIC SYSTEM
ATS	AUTOMATIC TRANSFER SWITCH	HTR	HEATER	SHG	SODIUM HYPOCHLORITE GENERATOR
BAT	BATTERY	INV	INVERTER	SNK	SINK
BC	BATTERY CHARGER	LCP	LOCAL CONTROL PANEL	SPU	SPEED PICKUP SENSOR
BRG	BEARING	LCS	LOCAL CONTROL STATION	STR	STRAINER
BRK	BREAKER	LPU	LUBRICATING OIL PUMP CONTROL UNIT	SVR	SERVER
CAM	CAMERA	MB	METER BASE	SWG	SWITCHGEAR
CSE	COMBINATION SERVICE ENCLOSURE	MC	MECHANICAL COUPLING	TIV	TURBINE INLET VALVE
CV	CHECK VALVE	MCC	MOTOR CONTROL CENTER	TNK	TANK
D	DAMPER	MCP	MAIN CONTROL PANEL	TOI	WATER CLOSET
DCU	DISTRIBUTED CONTROL UNIT	MES	MANAGED ETHERNET SWITCH	TRS	TRAVELING SCREEN
DS	DISCONNECT	MOV	MOTOR OPERATED VALVE	TUR	TURBINE
EAP	ENGINEERING ACCESS POINT	MS	MOTOR STARTER	UPS	UNINTERRUPTABLE POWER SUPPLY
ECP	ENVIRONMENTAL CONTROL PANEL (HVAC)	MTR	MOTOR	UVR	UV REACTOR
EEW	EMERGENCY EYEWASH STATION	MTS	MANUAL TRANSFER SWITCH	V	VALVE
EF	EXHAUST FAN	NET	NETWORK / COMMUNICATIONS RACK	VCP	VENDOR CONTROL PANEL
EXC	EXCITER	OWS	OIL WATER SEPARATOR	VFD	VARIABLE FREQUENCY DRIVE
FAS	FIRE ALARM SYSTEM	P	PUMP	VL	VENTILATION LOUVER
FD	FLOOR DRAIN	PB	PANELBOARD / LOAD CENTER	VSP	VENDOR SUPPLIED PANEL
FIL	FILTER	PCP	PLANT CONTROL PANEL	WS	WATER SOFTENER
FOR	FIBER OPTIC REPEATER	PCU	POWER CONTROL UNIT	XFR	TRANSFORMER
FOT	FIBER OPTIC TRANSCEIVER	PFL	PRE-FILTER	XVR	TRANSCEIVER
FPP	FIBER PATCH PANEL / CONNECTOR HOUSING	PLC	PROGRAMMABLE LOGIC CONTROLLER	YLT	EVENT PILOT LIGHT
G	GATE	PRV	PRESSURE REDUCING VALVE	ZZK	SECURITY GATE INTERFACE
GBK	GENERATOR BRAKE	PS	POWER SUPPLY / ISOLATOR / CONVERTER		

INSTRUMENTATION LINE SYMBOLOGY

- PRIMARY PROCESS (CLOSED CONDUIT, DASHED LINE INDICATES ALTERNATE FLOW STREAM)
- PRIMARY PROCESS (OPEN CHANNEL)
- ANALOG SIGNAL, (4 TO 20 mAdc, ECT)
- DISCRETE SIGNAL, (ON/OFF, ECT)
- PNEUMATIC SIGNAL
- FILLED SYSTEM SIGNAL
- HYDRAULIC SYSTEM SIGNAL
- DIGITAL DATA LINK
- PACKAGE SYSTEM EQUIPMENT
- STRUCTURE/FACILITY BOUNDARY
- CABLE FURNISHED WITH EQUIPMENT
- M — MECHANICAL POWER/LINKAGE
- E — ELECTRICAL POWER

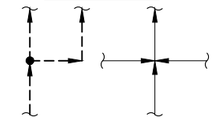
PARALLELING LINES



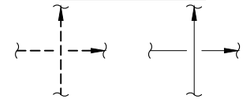
(A) TOTAL OF 2 SIGNALS

(B) 3 TYPICAL SETS OF 2 SIGNALS EACH. TOTAL OF 6 SIGNALS.

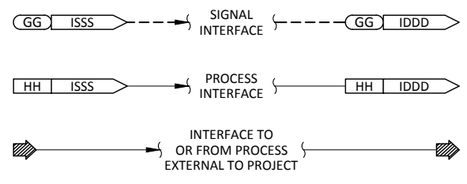
CONNECTING LINES



NON-CONNECTING LINES



SYSTEM CONTINUATION INTERFACES



GG SIGNAL INTERFACE NO.
HH PROCESS INTERFACE NO.
DDD DESTINATION DRAWING NO.
SSS SOURCE DRAWING NO.

P&ID ABBREVIATIONS

AC	ALTERNATING CURRENT
AM	AUTO-MANUAL
COD	CHEMICAL OXYGEN DEMAND
DEV	DEVIATION
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
ECS	ENVIRONMENTAL CONTROL SYSTEM (HVAC)
EPO	EMERGENCY POWER OFF
FOC	FIBER OPTIC CABLE
FOS	FAST-OFF-SLOW
FOSA	FAST-OFF-SLOW-AUTO
FOSR	FAST-OFF-SLOW-REMOTE
HI	HIGH
HML	HIGH-MID-LOW
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
ISR	INTRINSICALLY SAFE RELAY
LEL	LOWER EXPLOSIVE LIMIT
LO	LOW
LOR	LOCAL-OFF-REMOTE
LOS	LOCKOUT STOP
LR	LOCAL-REMOTE
MC	MODULATE-CLOSE
MOA	MANUAL-OFF-AUTO
MSC	MANUFACTURER SUPPLIED CABLE
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
OC	OPEN-CLOSE(D)
OCA	OPEN-CLOSE-AUTO
OCR	OPEN-CLOSE-REMOTE
OI	OPERATOR INTERFACE
OO	ON-OFF
OOA	ON-OFF-AUTO
OOR	ON-OFF-REMOTE
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE
PC	PERSONAL COMPUTER
PCS	PLANT CONTROL SYSTEM
pH	HYDROGEN ION CONCENTRATION
PID	PROPORTIONAL INTEGRAL DERIVATIVE CONTROL
POT	POTENTIOMETER
RC	RUN CLOSE
RO	RUN OPEN
RL	RAISE-LOWER
RM	REMOTE MULTIPLEXING MODULE
RSL	RAISE-STOP-LOWER
RVSS	REDUCED VOLTAGE SOLID-STATE STARTER
SCADA	SUPERVISORY CONTROL AND DATA ACQUISITION
SEL	SELECT
SET	SET POINT
SF	SLOWER-FASTER
SHC	SODIUM HYPOCHLORITE
SR	START-RESET
SS	START-STOP
SSC	SUPERVISORY SET POINT CONTROL
ST	START
SW	SEAL WATER
TC	THERMOCOUPLE
TCR	TOTAL CHLORINE RESIDUAL
TEMP	TEMPERATURE
TSP	TWISTED SHIELD PAIR
TURB	TURBIDITY
VHC	VOLATILE HYDROCARBONS
VIB	VIBRATION
VSP	VENDOR SUPPLIED PANEL
VTO	VENT TO OUTSIDE
WSEL	WATER SURFACE ELEVATION

NOTES:

1. FOR MECHANICAL ELEMENT SYMBOLS, SEE MECHANICAL LEGEND.
2. FOR ELECTRICAL ELEMENT SYMBOLS, SEE ELECTRICAL LEGEND.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

INSTRUMENTATION AND EQUIPMENT LEGEND

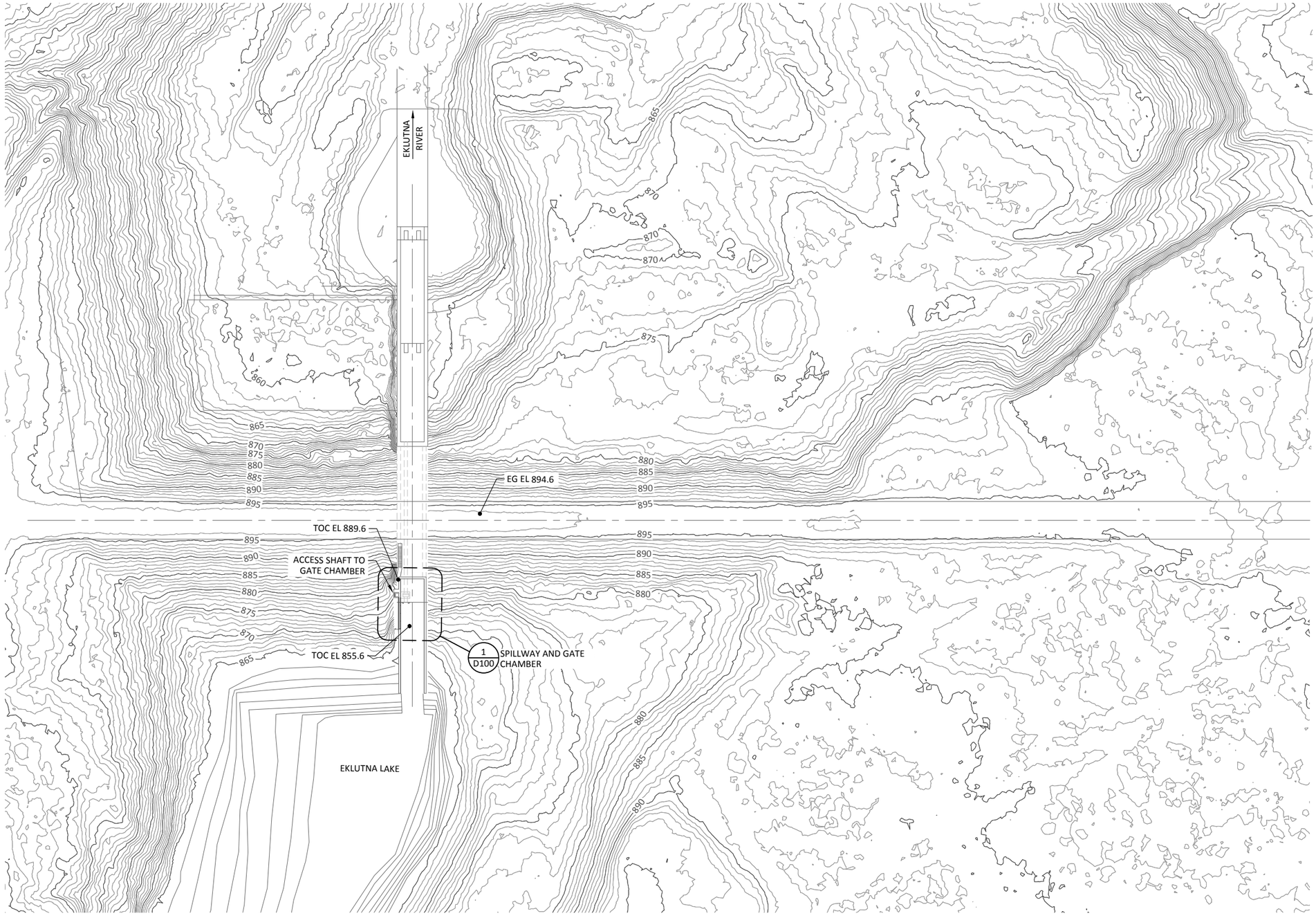
DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

G006

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\G006.dwg Plot date: Sep 28, 2023 09:26am, CAD User: HaberFlavia



SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

DEMOLITION KEY PLAN
SCALE: 1"= 40'

PRELIMINARY
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WARNING
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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

DEMOLITION KEY PLAN

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
D001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\D001.dwg Plot date: Sep 28, 2023 09:29am, CAD User: HaberFlavia

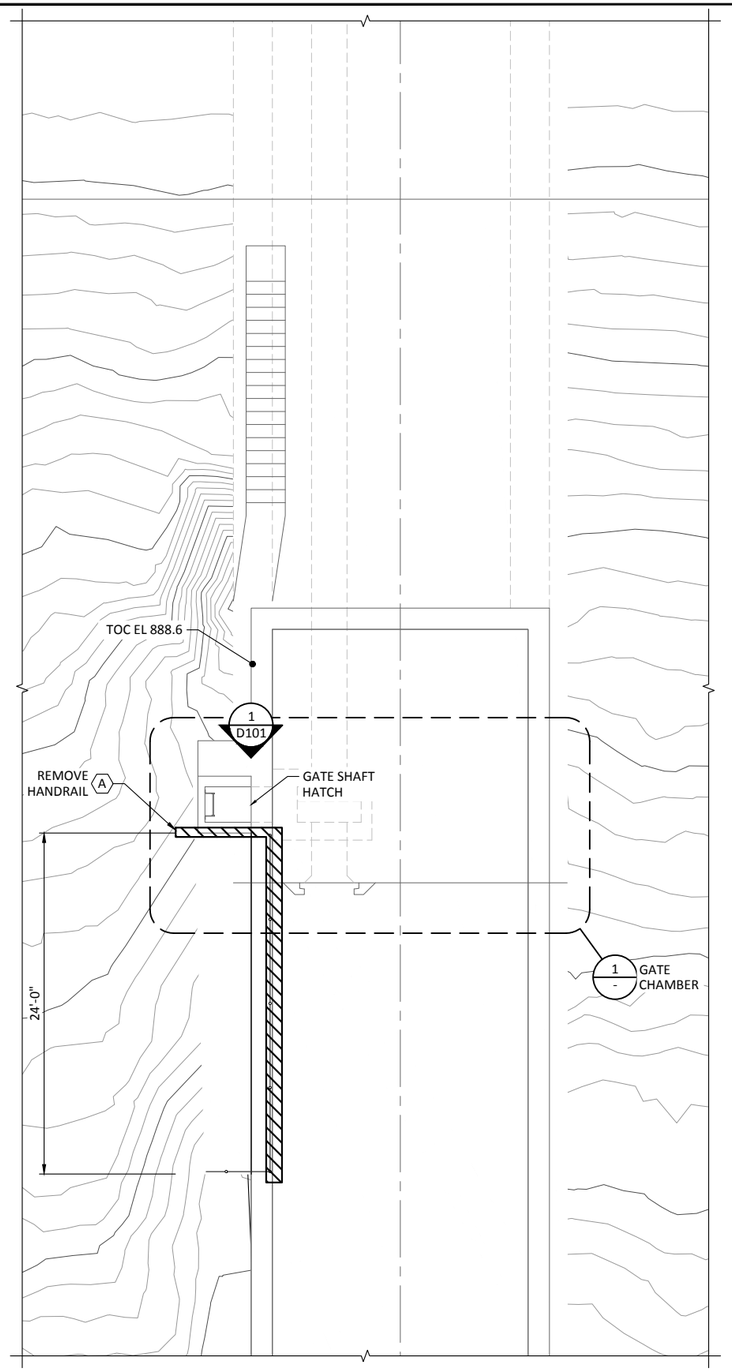
SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

SHEET KEY NOTES:

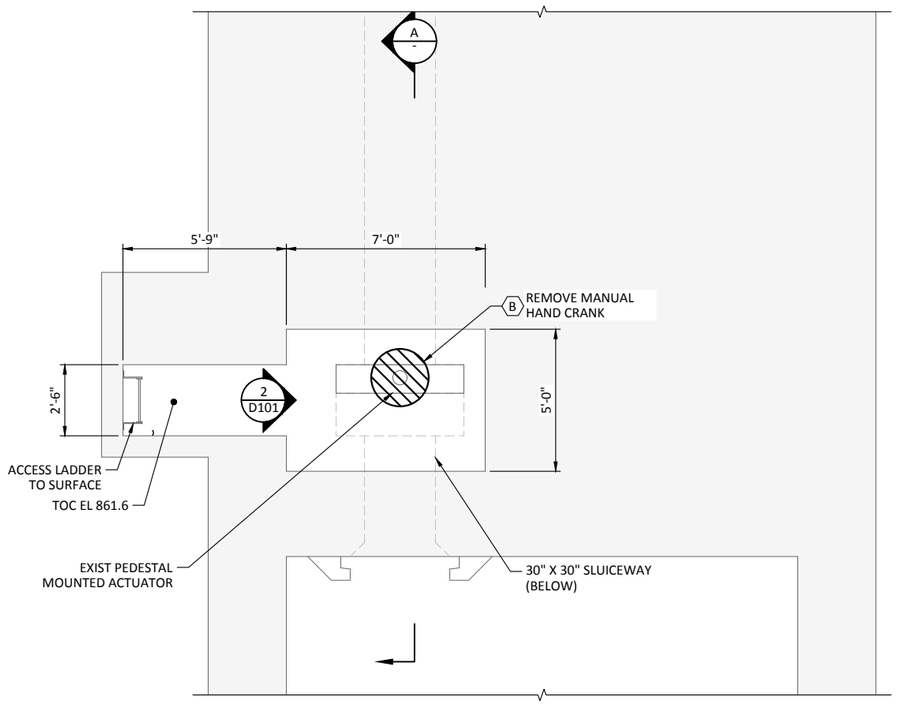
A. REMOVE HANDRAIL ALONG SPILLWAY TRAINING WALL AND EAST SIDE OF GATE SHAFT HATCH.

B. REMOVE MANUAL HAND CRANK OPERATOR FROM OUTLET GATE ACTUATOR FOR REPLACEMENT WITH ELECTRIC MOTOR OPERATOR.



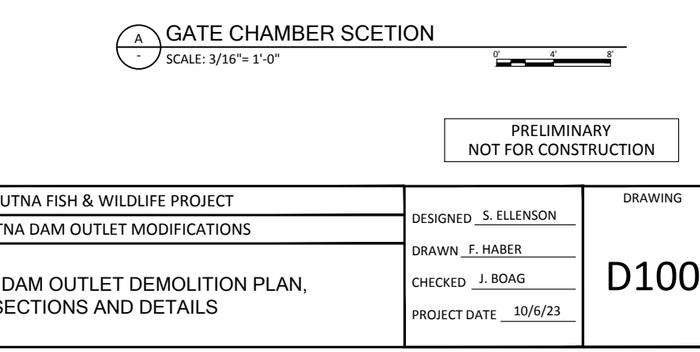
SPILLWAY DETAIL

SCALE: 3/16"= 1'-0"



1 - GATE CHAMBER PLAN

SCALE: 3/8"= 1'-0"



A - GATE CHAMBER SCETION

SCALE: 3/16"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

EKLUTNA DAM OUTLET DEMOLITION PLAN, SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING

D100

JOB NO: 000000

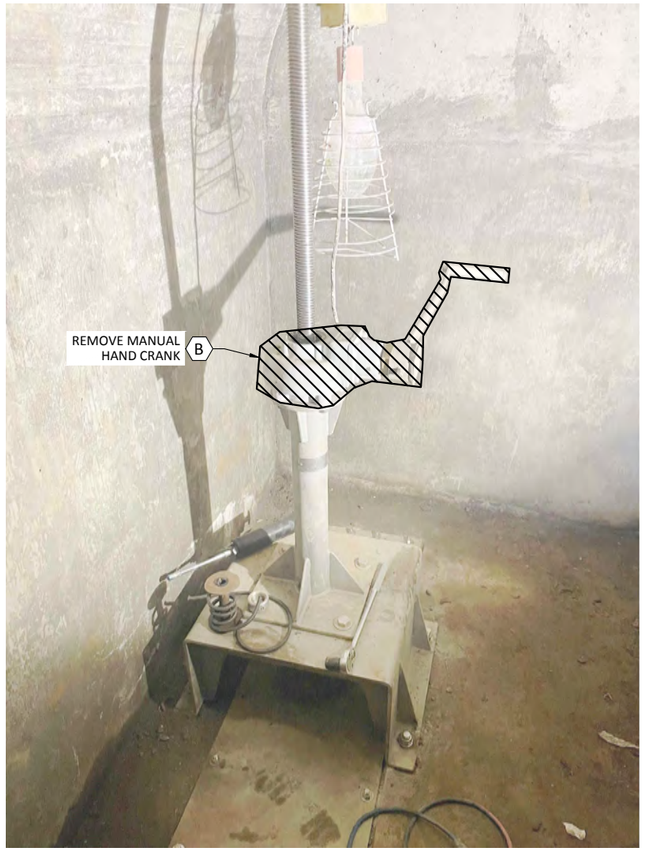
Path: C:\Vault\Chugach Electric\Dam Outlet Modification\D100.dwg Plot date: Sep 28, 2023 09:30am, CAD User: HaberFlavia

SHEET KEY NOTES:

A. REMOVE HANDRAIL ALONG SPILLWAY TRAINING WALL AND EAST SIDE OF GATE SHAFT HATCH.

B. REMOVE MANUAL HAND CRANK OPERATOR FROM OUTLET GATE ACTUATOR FOR REPLACEMENT WITH ELECTRIC MOTOR OPERATOR.

1 D100 PHOTO



2 D100 PHOTO

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

EKLUTNA DAM OUTLET
DEMOLITION PHOTOS

DESIGNED S. ELLENSON

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

D101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\D101.dwg Plot date: Sep 28, 2023 09:30am, CAD User: HaberFlavia

GENERAL STRUCTURAL NOTES:
THE FOLLOWING NOTES ARE GENERAL AND APPLY TO THE ENTIRE PROJECT, UNLESS SPECIFICALLY NOTED OTHERWISE (UNO)

1) GENERAL:

A. CONSTRUCTION DOCUMENTS:
   1. THE CONTRACTOR SHALL REVIEW THE APPROVED CONTRACT DOCUMENTS AND NOTIFY THE ENGINEER OF ANY ERRORS OR DISCREPANCIES PRIOR TO THE START OF CONSTRUCTION.
   2. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF ANY UNIDENTIFIED EXISTING UNDERGROUND UTILITIES ARE DISCOVERED.
   3. THE STRUCTURAL CONTRACT DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, BRACING AND/OR SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC.
   4. UNDER NO CIRCUMSTANCES CAN STRUCTURAL COMPONENTS BE SUBSTITUTED, OMITTED, OR ALTERED FROM THE APPROVED SET OF CONSTRUCTION DOCUMENTS WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.

B. DIMENSIONS AND NOTATIONS:
   1. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. DO NOT SCALE DRAWINGS.
   2. ABBREVIATIONS USED ON THE APPROVED CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED TYPICAL ABBREVIATIONS FOR THE INDUSTRY. THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE ENGINEER IMMEDIATELY OF ANY ABBREVIATIONS THAT ARE UNKNOWN TO THE CONTRACTOR.

C. TYPICAL NOTES AND DETAILS:
   1. SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER STANDARD TYPICAL NOTES AND DETAILS.
   2. STANDARD TYPICAL NOTES AND DETAILS ARE TO BE USED WHEN REFERRED TO OR WHEN NO OTHER MORE RESTRICTIVE OR DIFFERENT DETAILS ARE SHOWN ON THE DRAWINGS.
   3. WORK NOT PARTICULARLY SHOWN OR SPECIFIED SHALL BE THE SAME AS SIMILAR PARTS THAT ARE SHOWN OR SPECIFIED.

D. CODE REQUIREMENTS:
   1. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF REGULATING AGENCIES WHICH MAY HAVE AUTHORITY OVER ANY PORTION OF THE WORK.
   2. SPECIFICATIONS, CODES AND STANDARDS NOTED SHALL BE OF THE LATEST APPROVED ISSUE, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE.
   3. MINIMUM UNIFORM (BLANKET) ROOF SNOW LOAD, AS DEFINED BY LOCAL BUILDING OFFICIAL OR STATE, SHALL BE DESIGNED FOR, AND IT IS THE RESPONSIBILITY OF THE MBSS ENGINEER TO CONFIRM IF ONE EXISTS BY CONTACTING THE LOCAL BUILDING OFFICIAL.

E. DEFERRED SUBMITTALS:
   1. DEFERRED STRUCTURE SUBMITTAL ITEMS HAVE NOT BEEN PERMITTED UNDER THE BASE BUILDING APPLICATION.
   2. THE CONTRACTOR SHALL SUBMIT COMPONENT SYSTEM DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS, STAMPED BY A PROFESSIONAL ENGINEER LICENSED IN THE JURISDICTION HAVING AUTHORITY, TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE FOR REVIEW AND FORWARD THE REVIEWED DOCUMENTS TO THE BUILDING OFFICIAL IN COMPLIANCE WITH SECTION 107.3.4.1 OF THE CBC.
   3. DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THE COMPONENT SYSTEM DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.
   4. THE FOLLOWING CONTRACTOR-DESIGNED PROJECT ELEMENTS ARE DEFINED AS DEFERRED STRUCTURAL SUBMITTAL ITEMS:

      PRE-ENGINEERED METAL BUILDINGS

2) CODES, STANDARDS, AND REFERENCES:

A. ASCE 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES.
B. ACI 318-14: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE.ACI 350-06: CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES.
C. AISC 360-16 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.

3) GRATING:

A. UNLESS INDICATED OTHERWISE, ALL GRATING SHALL BE FAS INDICATED IN THE DRAWINGS, OR APPROVED EQUAL.
B. WEIGHT OF GRATING SECTION SHALL NOT EXCEED 80 LBS.
C. PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL, APPROX 4" FROM PANEL CORNERS.
D. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
E. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
F. PROVIDE GRATING FASTENERS AS REQUIRED.
G. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN ¼" NOR GREATER THAN ½"
H. ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS.
I. PROVIDE MINIMUM BEARING PER MANUFACTURERS RECOMMENDATIONS FOR ALL FRP GRATING.

4) NON-SHRINK GROUT:

1. ALL GROUT WORK SHALL CONFORM TO THE LATEST EDITION OF ACI 301.
2. FORMWORK: DESIGN, ERECT, SUPPORT, BRACE AND MAINTAIN FORMWORK TO SUPPORT VERTICAL, LATERAL, STATIC AND DYNAMIC LOADS THAT MIGHT BE APPLIED UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

5) STRUCTURAL AND MISCELLANEOUS STEEL:

A. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM STANDARDS:
   a) WIDE FLANGE SHAPES — A992, GR 50 GALV
   b) OTHER SHAPES, PLATES, ANGLES AND BARS — A36 GALV
   c) STEEL PIPE — A53, GRADE B GALV
   d) HOLLOW STRUCTURAL SECTIONS — A500, GRADE B GALV
B. WELDS: PROVIDE 70KSI LOW HYDROGEN ELECTRODE OR PROCESS IN ACCORDANCE WITH AWS A5.1.
C. BOLTS, U.N.O.:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316
D. DRILL AND EPOXY ANCHOR BOLTS:
   1. STAINLESS STEEL ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316 OR EQUAL APPROVED BY ENGINEER
E. EPOXY BOLT OR EXPANSION BOLT SUBSTITUTIONS FOR EMBEDDED BOLTS IS PROHIBITED WITHOUT WRITTEN CONSENT FROM THE ENGINEER.
F. UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL EPOXY BOLTS SHALL BE AS SPECIFIED.
G. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE AISC CODE OF STANDARD PRACTICE, EXCEPT AS MODIFIED IN THESE NOTES AND THE PROJECT SPECIFICATIONS.
H. ALL STAINLESS STEEL SHALL BE TYPE 316.
I. SPLICING OF STEEL MEMBERS, UNLESS SHOWN ON THE DRAWINGS, IS PROHIBITED WITHOUT WRITTEN APPROVAL OF THE PROJECT ENGINEER.
J. GALVANIC PROTECTION SHALL BE PROVIDED BETWEEN DISSIMILAR METALS.
K. WELDING SHOWN FOR STAINLESS STEEL ELEMENTS SHALL COMPLY WITH AWS D1.6/D1.6M.

DESIGN LOADS - GENERAL	
FLOOR LOADS - ELEVATED PLATFORMS	
DEAD LOAD	VARIES
LIVE LOAD	100 PSF

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

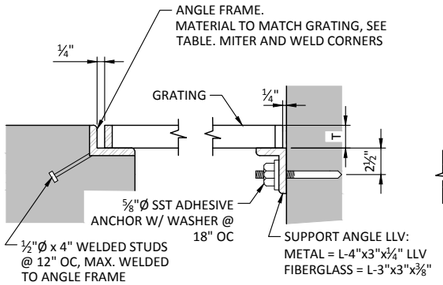
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
STRUCTURAL GENERAL NOTES

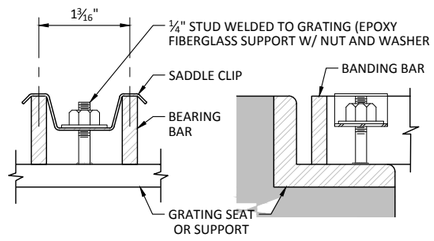
DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
GS001

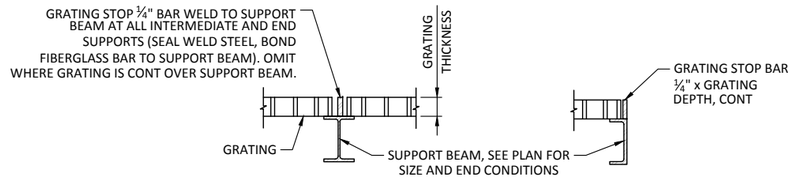
JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GS001.dwg Plot date: Sep 28, 2023 09:35am, CAD User: HaberFlavia





GRATING CLIP DETAIL



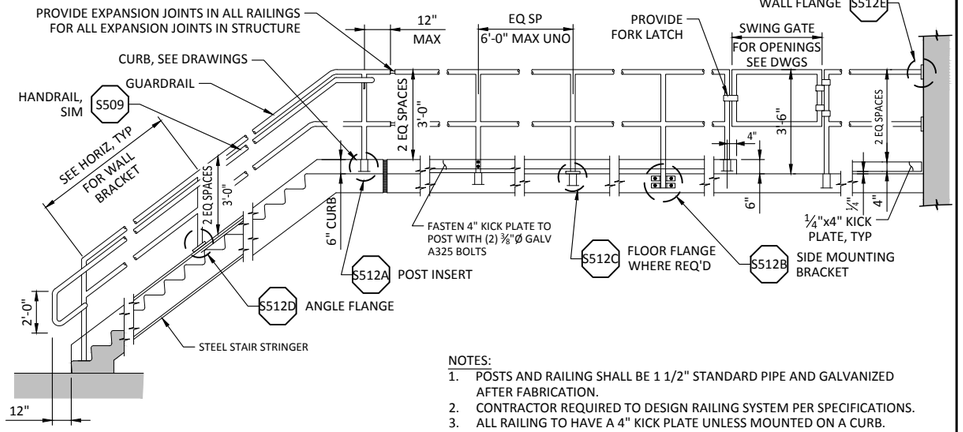
GRATING STOP DETAIL

NOTES:
1. UNLESS INDICATED OTHERWISE, ALL GRATING SHALL BE ALUM.
2. GRATING DEPTH TO BE DETERMINED BY MANUFACTURER AND APPROVED BY ENGINEER, UNO.
3. ALL ENDS AND OPENINGS SHALL BE BANDED.
4. WEIGHT OF GRATING SECTION SHALL NOT EXCEED 80 LBS.
5. METAL BEARING BARS SHALL BE DEPTH T x 3/16" @ 1 3/16" OC.. CROSS BARS SHALL BE @ 4" OC.
6. PROVIDE A MINIMUM OF 4 CLIPS PER GRATING PANEL, APPROX 4" FROM PANEL CORNERS. MAXIMUM CLIP SPACING AT 36" OC.
7. MATERIALS:
   - A. ALUM GRATING - USE ALUM ANGLE SUPPORTS AND SST BOLTS AND CLIPS. IF SUPPORTED BY STEEL BEAMS, USE STEEL STOP BARS. ALUM IN CONTACT WITH CONC OR STEEL SHALL BE COATED PER THE PROTECTIVE COATING SPECS.
   - B. GALV STEEL GRATING - USE STEEL ANGLE SUPPORTS, BOLTS AND CLIPS. GALV AFTER FABRICATION.
   - C. SST GRATING - USE SST ANGLE SUPPORTS, BOLTS AND CLIPS
   - D. FIBERGLASS GRATING - USE FIBERGLASS FOR ALL COMPONENTS EXCEPT DRILLED ANCHORS; ALL CUT EDGES SHALL BE SEALED WITH RESIN; BONDING: USE EPOXY ADHESIVE BONDING AGENT

GRATING FRAME TABLE SIZED TO MATCH GRATING (FOR FIBERGLASS USE CONTINUOUS PROTRUDED FIBERGLASS SEAT & ANCHOR)			
GRATING DEPTH (T)	STEEL ANGLE (STEEL)	GRATING DEPTH (T)	STEEL ANGLE (STEEL)
1"	1¾ x 1¼ x ¼ (1¼ x 1¼ x ¼)	2"	*2½ x 2½ x ½
1¼"	2 x 1½ x ¼ (1½ x 1½ x ¼)	2¼"	2½ x 2½ x ¼
1½"	1¾ x 1¾ x ¼	2½"	3 x 3 x ½
1¾"	2 x 2 x ¼		

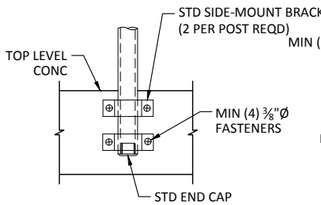
* OR USE 2½"x2½"x¼" W/ ¼" SHIM PLATE WELDED TO BOTTOM

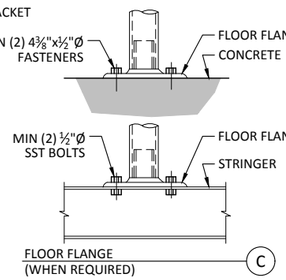
S501 GRATING
SCALE: NTS



NOTES:
1. POSTS AND RAILING SHALL BE 1 1/2" STANDARD PIPE AND GALVANIZED AFTER FABRICATION.
2. CONTRACTOR REQUIRED TO DESIGN RAILING SYSTEM PER SPECIFICATIONS.
3. ALL RAILING TO HAVE A 4" KICK PLATE UNLESS MOUNTED ON A CURB.

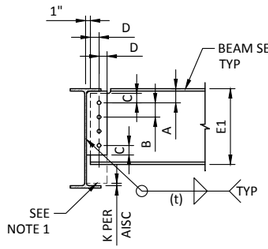
S510 TWO-RAIL RAILING GUARDRAIL DETAIL
SCALE: NTS



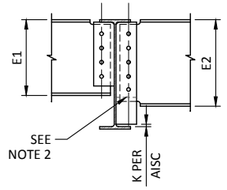


NOTES:
1. IF FASTENING TO CONCRETE, FASTENERS SHALL BE ADHESIVE ANCHORS.
2. CONTRACTOR REQUIRED TO DESIGN RAILING SYSTEM PER SPECIFICATIONS.

S512 RAILING, GUARDRAIL AND HANDRAIL SUPPORT DETAIL
SCALE: NTS



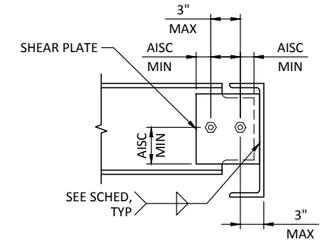
BEAM: ONE SIDE ONLY



BEAM: BOTH SIDES

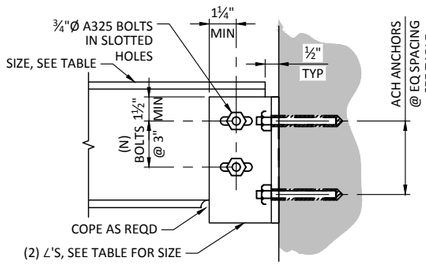
BEAM TO BEAM CONNECTION SCHEDULE								
BEAM SIZE	NO OF A325N BOLTS REQ'D ¾" Ø	NO OF A325N BOLTS REQ'D 1" Ø	CONN PLATE THICKNESS (IN)	WELD SIZE (t)	A (IN)	B (IN)	C (IN)	D (IN)
W8	2		5/16	3/16	2½"	2½"	1½"	1½"
W10	2		5/16	3/16	3	3	1½"	1½"

S562 BEAM TO BEAM CONNECTION - PLATE CONNECTION
SCALE: NTS



6" OR LESS CONNECTION

NOTES:
1. EXTEND CONN PLATE WHEN E1 IS GREATER THAN OR EQUAL TO W12 BM.
2. LIMIT OF CONN PLATE WHEN E2-E1 IS LESS THAN OR EQUAL TO 6 INCHES.



BEAM TO CONC CONNECTION SCHEDULE			
BEAM SIZE	DOUBLE ANGLE SIZE	# OF BOLTS (N)	ADHESIVE ANCHORS NUMBER AND SIZE

S563 BEAM TO CONC CONNECTION
SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

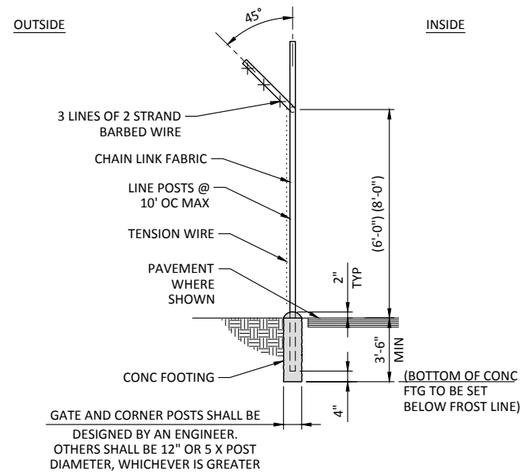
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
STRUCTURAL STANDARD DETAILS 1

DESIGNED K. HEINDEL
DRAWN J. HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
GS002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GS002.dwg Plot date: Sep 28, 2023 09:35am, CAD User: HaberFlavia



NOTES:
1. SEE SPECIFICATIONS FOR FENCE MATERIAL, COATINGS, AND INSTALLATION REQUIREMENTS.
2. EXTENSION ARM MAY BE TURNED IN AT OPTION OF OWNER.

S900 CHAIN LINK FENCE
SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

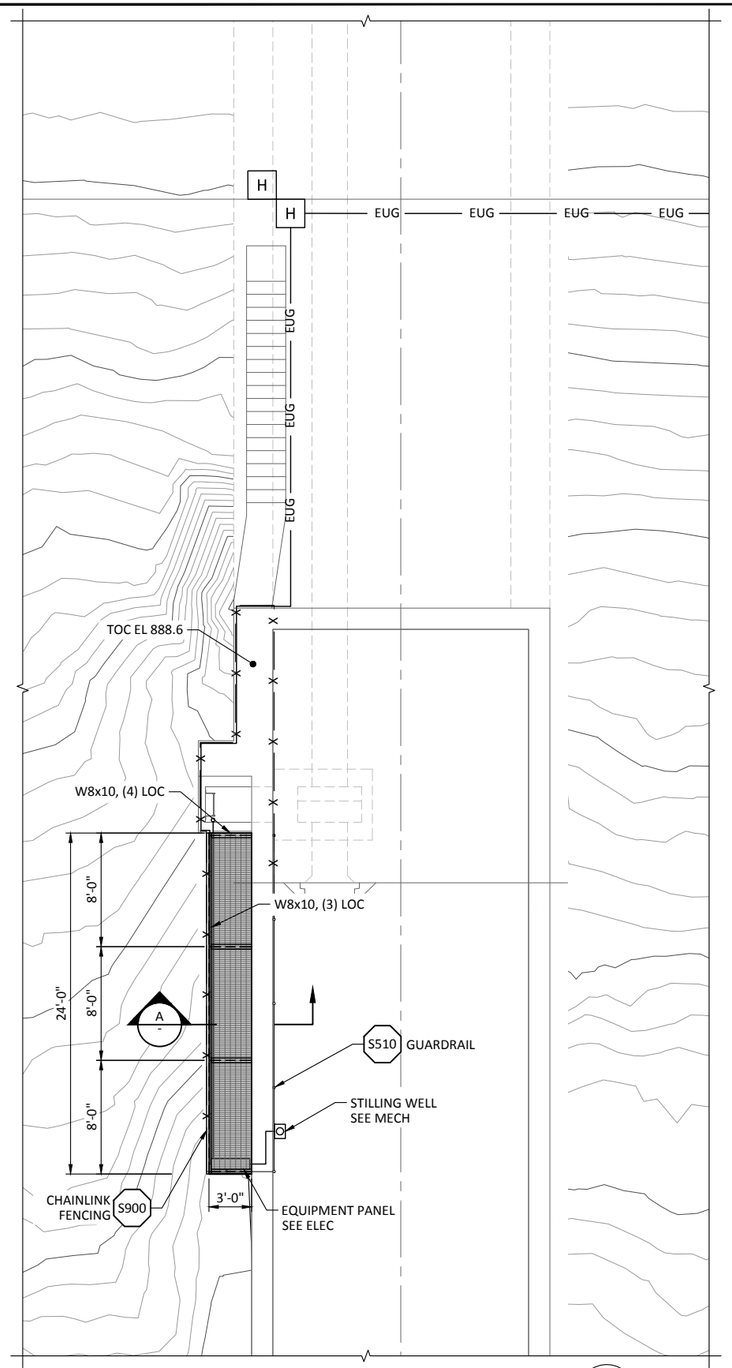
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
STRUCTURAL STANDARD DETAILS 2

DESIGNED K. HEINDEL
DRAWN J.HOLT
CHECKED M. MERKLEIN
PROJECT DATE 10/6/23

DRAWING
GS003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GS003.dwg Plot date: Sep 28, 2023 09:35am, CAD User: HaberFlavia



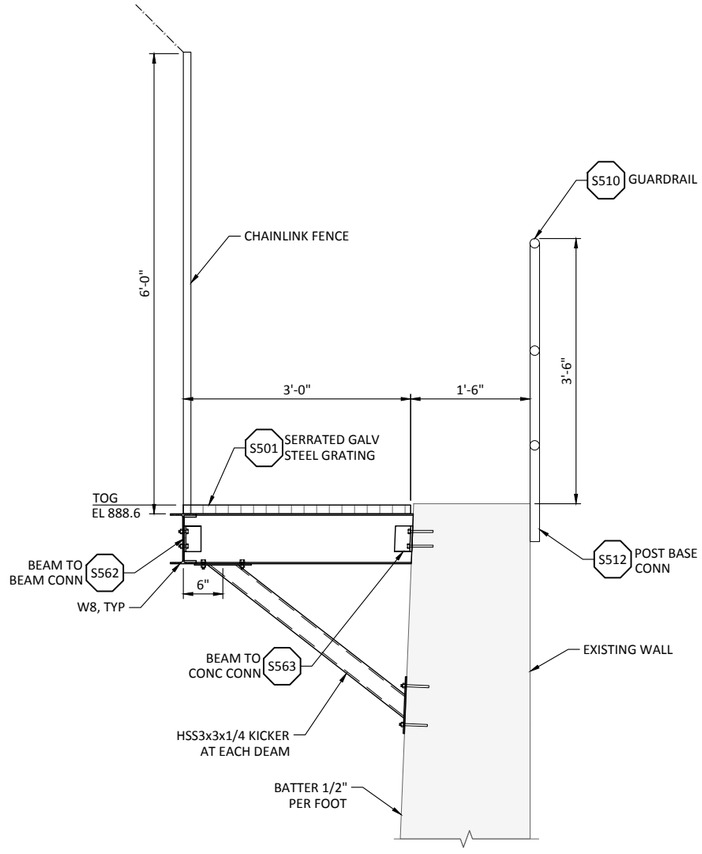
SPILLWAY DETAIL

SCALE: 3/16"= 1'-0"

0' 4' 8'

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



A SECTION

SCALE: 1"= 1'-0"

0' 1' 2'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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McMillen

CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

EKLUTNA DAM OUTLET STRUCTURAL PLAN, SECTION AND DETAIL

DESIGNED K. HEINDEL

DRAWN J. HOLT

CHECKED M. MERKLEIN

PROJECT DATE 10/6/23

DRAWING

S100

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\S100.dwg Plot date: Sep 28, 2023 09:35am, CAD User: HaberFlavia

ACTUATOR SCHEDULE

EQUIPMENT NUMBER	LOCATION	SERVICE	ACTUATOR TYPE (NORMAL POSITION)	RATING (HP)	ELECTRICAL SERVICE (V/PH/CY)	SPEC SECTION	COMMENTS
ACT-100	GATE CHAMBER	OUTLET GATE	ELECTRIC (CLOSED)	2	240 / 1 / 60		INCLUDES 4-20 mA POSITION SENSING

INSTRUMENTATION SCHEDULE

EQUIPMENT NUMBER	LOCATION	SERVICE	EQUIPMENT DESCRIPTION	FLUID	SIGNAL OUTPUT	ELECTRICAL SERVICE	MEASUREMENT RANGE	SPEC SECTION	COMMENTS
LE-100	EKLUTNA DAM	LEVEL MEASUREMENT	PRESSURE TRANSDUCER	RAW WATER	ANALOG; 4-20 mA	24 VDC	0 - 30 FT H20		

PRELIMINARY
NOT FOR CONSTRUCTION

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WARNING
0 1/2 1
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

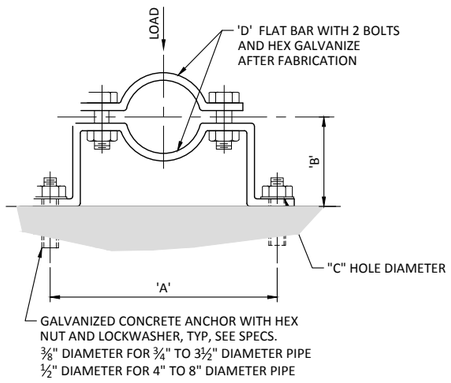
EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
MECHANICAL EQUIPMENT SCHEDULE

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
GM001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GM001.dwg Plot date: Sep 29, 2023 02:50pm, CAD User: HaberFlavia



DIMENSIONS IN INCHES					LOAD RATING LBS
PIPE DIAMETER	"A"	"B" SEE NOTE 3 BELOW	"C" HOLE DIAMETER	"D" FLAT BAR SIZE	
¾	5 15/16	2½	7/16	3/16 x 1¼	190
1	6¼	2⅝	7/16	3/16 x 1¼	190
1¼	6 11/16	2¾	7/16	3/16 x 1¼	190
1½	6 15/16	3	7/16	3/16 x 1¼	190
2	8 5/16	3 3/16	7/16	¼ x 1¼	420
2½	8⅞	3 7/16	7/16	¼ x 1¼	420
3	9⅛	3¾	7/16	¼ x 1¼	420
3½	10 1/16	4	7/16	¼ x 1¼	420
4	10 9/16	4¼	9/16	¼ x 1½	610
5	11¾	4¾	9/16	¼ x 1½	610
6	14⅜	5 5/16	9/16	⅜ x 1½	870
8	16⅝	6 5/16	9/16	⅜ x 1½	870

NOTE:
1. WHERE SUBMERGED, PIPE CLAMP, ANCHORS, SHIELD, NUTS AND LOCKWASHER TO BE TYPE 316 STAINLESS STEEL.
2. WHEN USED WITH PVC OR FIBERGLASS PIPE, PROVIDE STEEL SHIELD WITH LOOSE FIT AROUND PIPE AT CLAMP. WRAP COPPER TUBING WITH 2" WIDE STRIP OF RUBBER AT CLAMP.
3. FOR FLANGED PIPING, INCREASE 'B' DIMENSION AS REQUIRED.
4. FOR PIPES SMALLER THAN ¾" SEE STANDARD DETAIL M142.

M117 PIPE CLAMP FOR INDIVIDUAL PIPES

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS
MECHANICAL STANDARD DETAILS

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

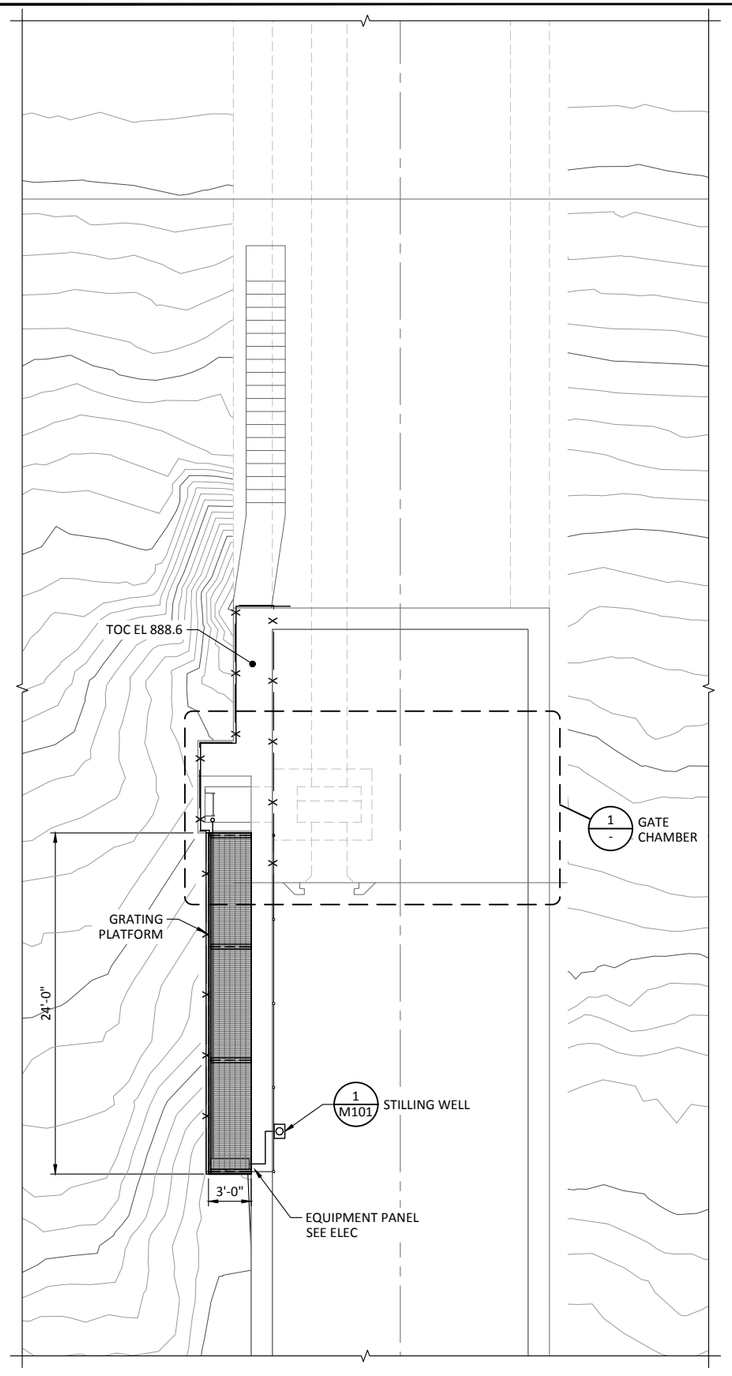
DRAWING
GM002

JOB NO: 000000

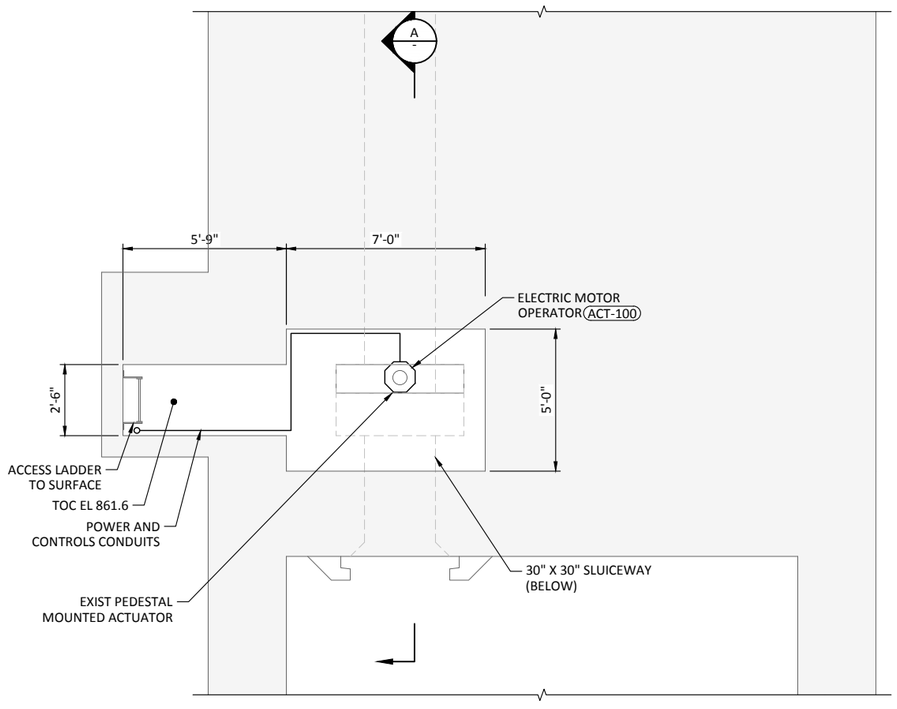
Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GM002.dwg Plot date: Sep 28, 2023 09:44am, CAD User: HaberFlavia

SHEET NOTES:

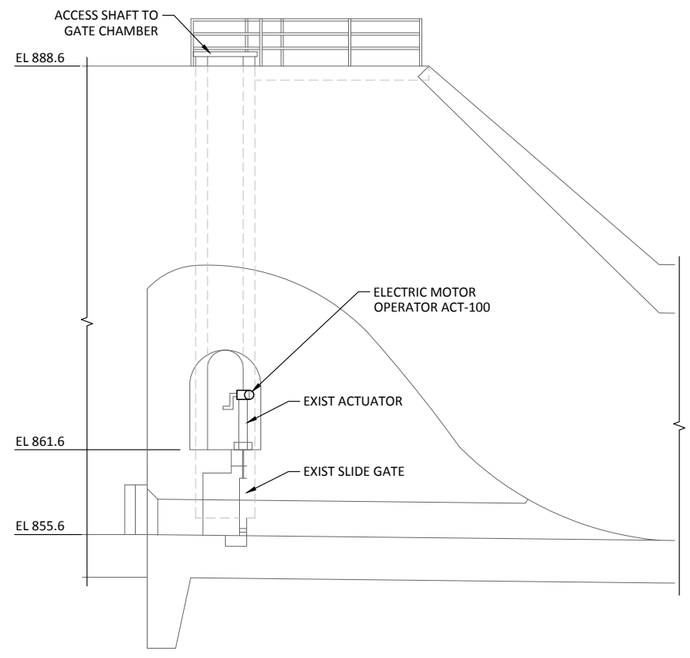
1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



SPILLWAY DETAIL
SCALE: 3/16"= 1'-0"



1 - GATE CHAMBER PLAN
SCALE: 3/8"= 1'-0"



A - GATE CHAMBER SECTION
SCALE: 3/16"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

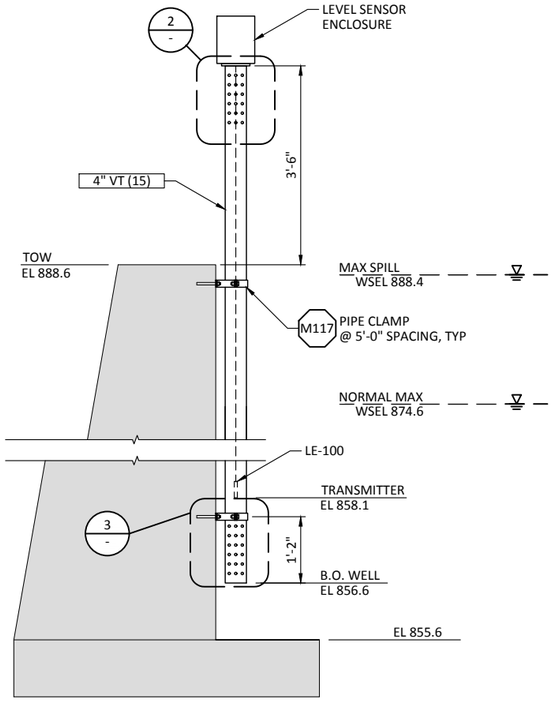
EKLUTNA DAM OUTLET MECHANICAL PLAN, SECTION AND DETAILS 1

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

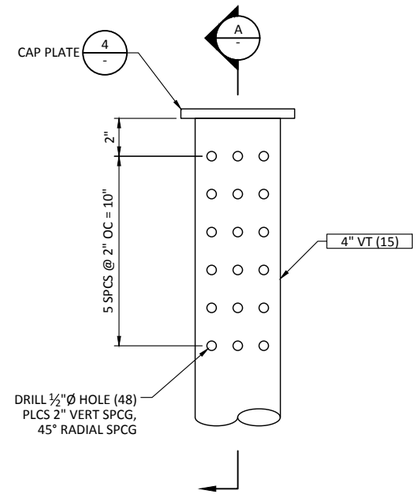
DRAWING
M100

JOB NO: 000000

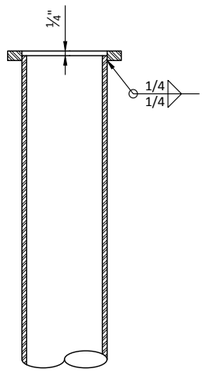
Path: C:\Vault\Chugach Electric\Dam Outlet Modification\M100.dwg Plot date: Sep 29, 2023 02:40pm, CAD User: HaberFlavia



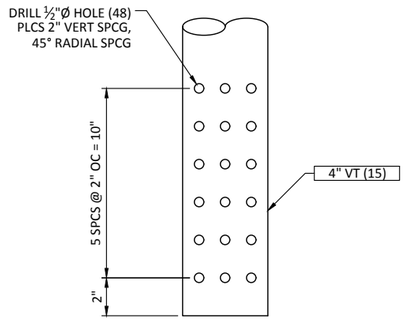
1 M100 STILLING WELL DETAIL
SCALE: 3/4"= 1'-0"



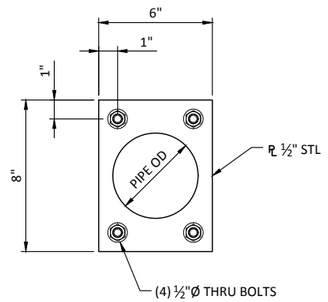
2 - TOP OF STILLING WELL DETAIL
SCALE: 3"= 1'-0"



A - TOP OF STILLING WELL DETAIL
SCALE: 3"= 1'-0"



3 - BOTTOM OF STILLING WELL DETAIL
SCALE: 3"= 1'-0"



4 - BOTTOM OF STILLING WELL DETAIL
SCALE: 3"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

EKLUTNA DAM OUTLET MECHANICAL
PLAN, SECTION AND DETAILS 2

DESIGNED S. ELLENSON
DRAWN J. HOLT
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
M101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\M101.dwg Plot date: Sep 28, 2023 09:44am, CAD User: HaberFlavia

IEEE STANDARD CONTROL AND PROTECTION DEVICES FUNCTION NUMBERS

01	MASTER ELEMENT
02	TIME-DELAY STARTING OR CLOSING RELAY (TDPU)
03	CHECKING OR INTERLOCKING RELAY
04	MASTER CONTACTOR
05	STOPPING DEVICE
06	STARTING CIRCUIT BREAKER
07	RATE-OF-CHANGE RELAY
08	CONTROL POWER DISCONNECTING DEVICE
09	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRONICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM - CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OF SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY OR POLARIZING VOLTAGE DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD (OVER/UNDER EXCITATION) RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR PHASE-BALANCE CURRENT RELAY
47	PHASE-SEQUENCE OR PHASE-BALANCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE-OF-RISE RELAY
51	AC INVERSE TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	EXCITER OR DC GENERATOR RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY (TDDO)
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	PULSE TRANSMITTER
78	PHASE-ANGLE MEASURING OR OUT-OF-STEP PROTECTIVE RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	CARRIER OR PILOT-WIRE RECEIVER RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY
95	RESERVED FOR FUTURE APPLICATION
96	RESERVED FOR FUTURE APPLICATION
97	RESERVED FOR FUTURE APPLICATION
98	CREEP DETECTOR DEVICE
99	RESERVED FOR FUTURE APPLICATION

METERING SYSTEMS AND DEVICES INDEX

A	AMMETER	PB	PUSHBUTTON
AH	AMPERE HOUR METER	PF	POWER FACTOR METER
AS	AMMETER SELECTOR SWITCH	PH	PHASE METER
C	COUNTER	PI	POSITION INDICATOR
CMA	CONTACT MAKING AMMETER	REC	RECORDER
CMC	CONTACT MAKING CLOCK	RF	REACTIVE FACTOR METER
CMV	CONTACT MAKING VOLTMETER	RPM	SPEED INDICATOR
CS	CONTROL STATION	SW	TRANSFER SWITCH
DM	DEMAND METER	SY	SYNCHROSCOPE
ETM	ELAPSE TIME METER	T	TEMPERATURE METER
F	FREQUENCY METER	TLM	TELEMETER
G	GALVANOMETER	TOC	TRUCK-OPERATED CONTACT
GD	GROUND FAULT DETECTOR	TS	TIME SWITCH
KV	KILO-VOLTMETER	V	VOLTMETER
KW	KILO-WATTMETER	VAR	VARMETER
KWH	KILO-WATT HOUR METER	VH	VAR HOUR METER
mA	MILLI-AMMETER (TRANSDUCER)	VS	VOLTMETER SELECTOR SWITCH
MOC	MECHANISM-OPERATED CONTACT	W	WATTMETER
OHM	OHMMETER	WH	WATT HOUR METER
OSC	OSCILLOGRAPH	WHDM	WATT HOUR DEMAND METER

NOTE: "R" IN FRONT OF LETTERS INDICATES A RECORDING TYPE METER.

PILOT - INDICATOR LIGHT INDEX

A	AMBER
B	BLUE
C	CLEAR
G	GREEN
NE	NEON
O	ORANGE
OP	OPALESCENT
P	PURPLE
R	RED
W	WHITE
Y	YELLOW

FIRST LETTER SUFFIX OF IEEE DEVICE DESIGNATION

A	GOVERNOR SYSTEM (OR ACTUATOR SYSTEMS - GATES)
B	BATTERY CHARGING AND MONITORING SYSTEM OR BUS
C	HIGH-VOLTAGE CABLE SYSTEM OR CLOSING RELAY/CONTACTOR
D	DATA ACQUISITION SYSTEM
E	EXCITATION SYSTEM INCLUDING TRANSFORMER AND REGULATOR BUT NOT MAIN FIELD
F	FIRE AND CO2 SYSTEM
G	MAIN GENERATOR INCLUDING AUXILIARY SYSTEMS OR GROUND
G/M	GENERATOR MOTOR INCLUDING AUXILIARY SYSTEMS IN PUMPED STORAGE APPLICATIONS
H	TURBINE OR MAIN PUMP INCLUDING AUXILIARY SYSTEMS
I	ISOLATED AND OTHER POWER BUS SYSTEMS (NOT HIGH VOLTAGE CABLE)
J	POWER CIRCUIT BREAKER INCLUDING AUXILIARY SYSTEMS
K	POWER TRANSFORMER INCLUDING AUXILIARY SYSTEMS
L	ANNUNCIATOR SYSTEM, SECURITY SYSTEM, LINE, OR LOWERING RELAY/CONTACTOR
M	MAIN PUMP MOTOR INCLUDING AUXILIARY SYSTEMS AND VARIABLE SPEED DRIVE
N	AIR (PNEUMATIC) SYSTEM OR NEUTRAL
O	OPENING RELAY/CONTACTOR
P	PENSTOCK OR DISCHARGE LINE SYSTEM
Q	OIL STORAGE, HANDLING, PURIFICATION SYSTEM
R	FIELD FLASHING SYSTEM, PHASE REVERSAL SWITCH INCLUDING AUXILIARY SYSTEM, OR RAISING RELAY/CONTACTOR
S	STATION SERVICE SUBSTATION SYSTEM INCLUDING ENGINE/GENERATOR SYSTEM
T	TONE AND TRANSFER TRIP SYSTEM OR TRANSFORMER
U	UNIT CONTROL CIRCUIT SYSTEM OR UNINTERRUPTIBLE POWER SUPPLY SYSTEM
V	INTAKE AND/OR DISCHARGE VALVE SYSTEM
W	WATER SYSTEMS INCLUDING INTAKE/OUTLET WORKS AND PLANT WATER AND SUMP SYSTEMS
X	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY
Y	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY
Z	DEFINED FOR SYSTEMS UNIQUE TO A FACILITY

SECOND AND SUBSEQUENT LETTER SUFFIXES OF THE IEEE DEVICE DESIGNATION

A	ABNORMAL, A.C., ACCELERATION, ADMISSION, ALARM, AMPERES, AUTOMATIC, AUXILIARIES, PHASE A, ECT.
B	BACKUP, BEARING, BLOCK, BLOWER, BOOSTER, BRAKES, BUS, BUTTON, BYPASS, PHASE B, ETC.
C	CABLE, CARRIER, CHARGER, CHECK, CHLORINATION, CLOSE, COLLECTOR, COMMON, COMPENSATOR, COMPRESSOR, CONTROL, COOLING, CURRENT, CYCLE, CYLINDER, PHASE C, CONVEYOR, ECT.
D	D.C, DECELERATION, DELAY, DEPRESS, DETECTOR, DIELECTRIC, DIFFERENTIAL, DISCHARGE, DISCONNECT, DISCORDANCE, DOMESTIC, DOWN, DOWNSTREAM, DRAFT TUBE, DRAIN, ETC.
E	EJECTOR, ELEVATOR, EMERGENCY, EXPLOSIVE, ETC.
F	FAILURE, FAN, FAULT, FEEDER, FIELD, FILTER, FIRE, FLAME, FLOW, FOLLOWER, FORWARD, FREQUENCY, FULL, FUMES, FUSE, ETC.
G	GAS, GATE, GATING (SCR), GENERATE, GROUND, GUIDE BEARING, ETC.
H	HALON, HAND, HEAT, HEATER, HIGH, HOIST, HORN, HOT, HOUSING, HYDROPNEUMATIC TANK, ETC.
I	INDICATION, INITIAL, INLET, INOUT, INSTANTANEOUS, INTAKE, INTERFACE, INTERLOCK, INTERRUPT, INVERTER, IONIZATION, ETC.
J	JACKING, JET, ETC.
K	KEY, TRANSFORMER
L	LAMPS, LEFT, LEVEL, LIGHTS, LIMITS, LINE, LIQUID, LOCAL, LOGIC, LOSS, LOUVERS, LOW, LOWER, LUBRICATION, ETC.
M	MAIN, MALFUNCTION, MANUAL, METER, METERING, MOTOR, ETC.
N	NEGATIVE, NETWORK, NEUTRAL, NORMAL, ETC.
O	OPEN, OUTLET, OUTPUT, ETC.
P	PACKING BOX, PARALLEL, PARAMETER, PENSTOCK, PHASE, PHASEBACK, PILOT, PIT, POSITION, POTENTIAL, POTHEAD, POWER, PRESSURE, PRIMARY, PROTECTION, PULSE, PUMP, PURIFICATION, PUSH, ETC.
Q	OIL, ETC.
R	RAISE, REACTOR, RECLOSE, RECORD, RECTIFIER, REED, REFRIGERATION, REGULATE, RELAY, RELEASE, RELIEF, REMOTE, RESERVOIR, RESET, RESISTOR, RIGHT, ROTATION, ROTOR, RUNNER, ETC.
S	SEALS, SECONDARY, SELECTOR, SEWAGE, SHORTING, SHUTDOWN, SIGNAL, SKIMMER, SLUDGE, SMOKE, SOLENOID, SPEED, SPIRAL OR SCROLL CASE, SPLICE, STABILIZER, STANDBY, STARTING, STATOR, STEPPING, STORAGE, STRAINER, SUCTION, SUMP, SUPPLY, SWITCH, SYNCHRONIZING, ETC.
T	TANK, TEMPERATURE, TEST, THERMAL, THRUST BEARING, THYRATRON, TIE, TIME, TRANSDUCER, TRANSER, TRANSMITTER, TRIP, TROUBLE, TRASHRAKE, ETC.
U	UNIT, UNLOADER, UNWATERING, UP, UPPER, UPSTREAM, ETC.
V	VALVE, VARS, VIBRATION. VOLTAGE, ETC.
W	WATER, WATTS, WINDINGS, ETC.
X	AUXILIARY DEVICE, ETC.
Y	AUXILIARY TO DEVICE X, ANTIPUMP RELAY, ETC.
Z	AUXILIARY TO DEVICE Y

ABBREVIATIONS

A, AMP	AMP, AMPERE
AAAC	ALL ALUMINUM ALLOY CONDUCTOR
AC	ALTERNATING CURRENT
AF	AMPERE FRAME SIZE
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AH	AMPERE HOURS
AHJ	AUTHORITY HAVING JURISDICTION
AHU	AIR HANDLING UNIT
AL	ALUMINUM
A/R	AS REQUIRED
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AVR	AUTOMATIC VOLTAGE REGULATOR
BAT	BATTERY
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CLF	CURRENT LIMITING FUSE
CO	CONDUIT ONLY
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DISC	DISCONNECT
DP	DISTRIBUTION PANEL
DPDT	DOUBLE-POLE, DOUBLE-THROW
DPST	DOUBLE-POLE, SINGLE-THROW
EDH	ELECTRIC DUCT HEATER
EG	ENGINE GENERATOR
EPT	EXCITATION POWER TRANSFORMER
EUH	ELECTRIC UNIT HEATER
EV	ELECTRICAL VAULT
F, FU	FUSE
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FAS	FIRE ALARM SYSTEM
FREQ	FREQUENCY
FS	FLOAT SWITCH
FT	FLOW TRANSMITTER
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
GEN	GENERATOR
GFI	GROUND-FAULT INTERRUPTION
GFP	GROUND-FAULT PROTECTION
GND	GROUND
GPR	GENERATOR PROTECTION RELAY
GSU	GENERATOR STEP-UP TRANSFORMER
HMI	HUMAN-MACHINE INTERFACE
HOA	HAND-OFF-AUTO
HOR	HAND-OFF-REMOTE
HPU	HYDRAULIC POWER UNIT
HTR	HEATER
HZ	HERTZ (CYCLES PER SECOND)
IC	INTERRUPTING CAPACITY
I & C	INSTRUMENTATION AND CONTROL
I/O	INPUT/OUTPUT
INST	INSTANTANEOUS
INTLK	INTERLOCK
IP	INTERNET PROTOCOL
K	KEY INTERLOCK
kV	KILOVOLTS
kVA	KILOVOLT AMPERES (APPARENT POWER)
kVAR	KILOVARS (REACTIVE POWER)
kW	KILOWATTS (REAL POWER)
kWH	KILOWATT HOUR
LC	LIGHTING CONTROLLER
LCP	LOCAL CONTROL PANEL
LE	LEVEL ELEMENT
LIT	LEVEL INDICATING TRANSMITTER
LOR	LOCAL-OFF-REMOTE
LP	LIGHTING PANEL
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
mA	MILLIAMPERES
M	MOTOR, MAN, MANUAL
MAG	MAGNETIC
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MFM	MULTIFUNCTIONAL METER
MPR	MOTOR PROTECTION RELAY
MTS	MANUAL TRANSFER SWITCH
mV	MILLIVOLTS
MVA	MEGAVOLT AMPERES (APPARENT POWER)
MVAR	MEGAVARS (REACTIVE POWER)
MW	MEGAWATTS (REAL POWER)
MWH	MEGAWATT HOUR
NEUT	NEUTRAL
NGR	NEUTRAL GROUNDING RESISTOR
OHM	OHMMETER
OL	OVERLOAD
OPER	OPERATOR, OPERATED
PB	PANELBOARD, PULLBOX, PUSH BUTTON
PC	PHOTOCELL
PCB	POWER CIRCUIT BREAKER
PCC	POINT OF COMMON CONNECTION
PF	POWER FACTOR
PH, Ø	PHASE
PMP	PUMP
PNL	PANEL
PLC	PROGRAMMABLE LOGIC CONTROLLER
POI	POINT OF INTER-CONNECTION
PS	PRESSURE SWITCH
PTT	PUSH-TO-TEST
PWR	POWER
R	RELAY, REVERSE, RUN
RCP	RECEPTACLE
RIO	REMOTE I/O
RTD	RESISTANCE TEMPERATURE DETECTOR
RVNR	REDUCED VOLTAGE NON-REVERSING
RVR	REDUCED VOLTAGE REVERSING
S	SYNC SCOPE
SA	SURGE ARRESTER
SC	SURGE CAPACITOR
SDP	STANDBY DISTRIBUTION PANEL
SEL	SELECTOR, SCHWEITZER ENGINEERING LABORATORIES
SPD	SURGE PROTECTION DEVICE
SPDT	SINGLE-POLE, DOUBLE-THROW
SPST	SINGLE-POLE, SINGLE-THROW
S/S	STATION SERVICE
SV	SOLENOID VALVE
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
T	THERMOSTAT
TB	TERMINAL BLOCK, TERMINAL BOX
TD	TEMPERATURE DETECTOR, TIME DELAY
TEL	TELEPHONE
TS	THERMOSTAT
TSP	TWISTED SHIELDED PAIR
TST	TWISTED SHIELDED TRIAD
TX	TRANSMITTER
UH	UNIT HEATER
UP	UTILITY POWER
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VC	VIDEO CAMERA
VCB	VACUUM CIRCUIT BREAKER
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE
W	WIRE, WATTS
WP	WEATHER PROOF
XD	TRANSDUCER
XFMR	TRANSFORMER
XLP	CROSS LINKED POLYETHYLENE
XP	EXPLOSION PROOF

PRELIMINARY
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REV	DATE	BY	DESCRIPTION
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WARNING
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McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

ELECTRICAL ABBREVIATIONS AND DEVICE INDEXES

DESIGNED C. CURTIS
DRAWN F. HABER
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GE001.dwg Plot date: Sep 28, 2023 09:48am, CAD User: HaberFlavia

DIAGRAMS

HIGH - MEDIUM VOLTAGE SWITCHING

- POWER CIRCUIT BRK, DRAWOUT
- POWER CIRCUIT BRK, NON-DRAWOUT
- HV ISOLATING SW MOTOR OPERATED
- HV INTERRUPTER SW FUSED
- CENTER-BREAK SW MOTOR OPERATED
- DUAL-BREAK SW MOTOR OPERATED
- LOAD-BREAK SW MOTOR OPERATED
- HORN GAP SW

TRANSFORMERS:

- POWER XFMR
- MAG CORE XFMR
- LOAD TAP CHANGING XFMR
- SPLIT SECONDARY XFMR
- AUTO-XFMR

INSTRUMENT TRANSFORMERS:

- POTENTIAL XFMR
- POTENTIAL XFMR DUAL SECONDARY
- (3) 800:5 — CURRENT XFMR, QTY & RATIO AS INDICATED
- (1) 50:5 — CORE BALANCE CURRENT XFMR RATIO AS INDICATED
- (3) 800:5 — BUSHING CURRENT XFMR, QTY & RATIO AS INDICATED
- kWH — KILOWATT-HOUR METER

MACHINES:

- M / XXHP — MOTOR-DC
- M / XXHP — MOTOR-AC
- G / XXKW XXPF — AC GENERATOR

TRANSFORMERS WINDING CONNECTIONS:

- DELTA 3PH3W
- DELTA CENTER TAP GND 3PH4W
- DELTA CORNER GRD 3PH3W
- BROKEN DELTA 3PH2W
- OPEN DELTA 2PH2W
- WYE 3PH3W
- WYE GRD 3PH4W
- ZIG-ZAG 3PH3W
- ZIG-ZAG GRD 3PH4W

HIGH - MEDIUM VOLTAGE DEVICES

- L/A OR — LIGHTNING ARRESTER
- WT — WAVE TRAP
- M / 57 — GROUND SW MOTOR OPER
- MV CABLE TERMINATION
- CABLE POTHEAD OIL-FILLED

MISC DEVICES & CONNECTIONS:

- IN/OUT LINE
- 01 02 — PROTECTIVE DEVICE ELEMENT, SEE DEVICE FUNCTION INDEX
- TEST SWITCH
- TEST SWITCH, CURRENT SHORTING
- BATTERY
- GROUND
- DISCONNECTING DEVICE
- NEUTRAL CONNECTION
- ISOL PH BUS FLEX CONN
- ISOL PH BUS REMOVEABLE LINK

MISC DEVICES & CONNECTIONS:

- DEVICE TERMINAL POINT
- TERMINAL BLOCK
- EXTERNAL EQUIPMENT INTERCONNECTION
- XX XX — RELAY, SOLENOID, OR CONTACTOR COIL
- TD XX — TRANSDUCER
- I XX — INDICATING METER
- TLM XX — TELEMETRY
- X — PUSH-TO-TEST LIGHT
- X — PILOT/INDIC LIGHT
- XA — FUSE, SIZE AS INDICATED
- FUSE DUMMY
- XA — DISC SW FUSED
- FUSIBLE LINK
- CAPACITOR
- 3% — REACTOR
- RES — RESISTOR
- RES — RESISTOR VARIABLE
- OR — HEATER ELEMENT
- RECTIFIER SOLID STATE
- AC / DC+ / DC- / AC — RECTIFIER FULLWAVE
- DC BRAKE
- GROUND
- CHASSIS GROUND
- CURRENT SHUNT

LOW VOLTAGE SWITCHING:

- DISCONNECTING SWITCH, MANUALLY GANG-OPERATED
- MOLDED CASE OR AIR CIRCUIT BREAKER
- CONTACTOR WITH THERMAL OL TRIP
- CONTACTOR WITH MAGNETIC OL TRIP
- CONTACTOR WITH THERMAL AND MAGNETIC OL TRIP
- E — CIR BKR DRAWOUT ELEC OPER
- E — CIR BKR THERMO O/L DRAWOUT ELEC OPER
- E — CIR BKR MAG O/L DRAWOUT ELEC OPER
- E — CIR BKR THERMO/MAG O/L DRAWOUT ELEC OPER

SELECTOR:

J K / A1 / A2 — TWO-POSITION X-CONTACT CLOSED

	J	K
A1	X	
A2		X

J K L / A1 / A2 — THREE-POSITION X-CONTACT CLOSED

	J	K	L
A1	X		
A2			X

A B / 1 2 3 4 — TWO-POSITION SELECTOR PUSHBUTTON X-CONTACT CLOSED

CONTACTS	SELECTOR POSITION			
	A		B	
	BUTTON		BUTTON	
	FREE	CONTACTS	FREE	CONTACTS
1-2	X			
3-4		X	X	X

CONTROL SWITCHING:

- XX — PB SWITCH NORM OPEN
- XX — PB SWITCH NORM CLOSED
- XX OFF MAN AUTO — SELECTOR SWITCH
- XX — LIMIT SW NORM OPEN
- XX — LIMIT SW NORM CLOSED
- XX — LIMIT SW NORM OPEN HELD CLOSED
- XX — LIMIT SW NORM CLOSED HELD OPEN
- SOLENOID
- XX — CONTACT NORM OPEN
- XX — CONTACT NORM CLOSED
- XX — FLOW OPER NORM OPEN
- XX — FLOW OPER NORM CLOSED
- XX — LEVEL OPER NORM OPEN
- XX — LEVEL OPER NORM CLOSED
- XX — SWITCH NORM OPEN
- XX — SWITCH NORM CLOSED
- XX — TEMP ACT SW NORM OPEN
- XX — TEMP ACT SW NORM CLOSED
- XX — FOOT OPER NORM OPEN
- XX — FOOT OPER NORM CLOSED
- XX — PRESS OPER NORM OPEN
- XX — PRESS OPER NORM CLOSED

PRELIMINARY
NOT FOR CONSTRUCTION

MOMENTARY CONTACTS:

- NO / NC — SINGLE CIRCUIT
- NO & NC — DOUBLE CIRCUIT

MAINTAINED CONTACTS:

- TWO SINGLE CIRCUIT
- ONE DOUBLE CIRCUIT
- ESS — E-STOP, 2NC

INSTANT OPERATION
CONTACTS WITH BLOWOUT

- XA — NO
- XA — NC

INSTANT OPERATION
CONTACTS WITHOUT BLOWOUT

- XA — NO
- XA — NC

TIMED CONTACTS - CONTACT ACTION
DELAYED AFTER COIL IS ENERGIZED

- NOTC — XX SEC
- NCTC — XX SEC

TIMED CONTACTS - CONTACT ACTION
DELAYED AFTER COIL IS DE-ENERGIZED

- NOTC — XX SEC
- NCTC — XX SEC

SUPPLEMENTARY CONTACTS SYMBOLS:

- SPST, NO SINGLE-BREAK
- SPST, NO DOUBLE-BREAK
- SPST, NC SINGLE-BREAK
- SPST, NC DOUBLE-BREAK
- SPDT, SINGLE-BREAK
- SPDT, DOUBLE-BREAK
- DPST, NO, SINGLE-BREAK
- DPST, NO, DOUBLE-BREAK
- DPST, NC, SINGLE-BREAK
- DPST, NC, DOUBLE-BREAK
- DPDT, SINGLE-BREAK
- DPDT, DOUBLE-BREAK

NOTE:

1. "X" OR "XX" SHOWN ON SYMBOLS WILL BE SUBSTITUTED WITH DEVICE FUNCTION NUMBERS, LETTER SUFFIXES, PILOT LIGHT COLORS, OR OTHER DESCRIPTIVE TEXT, WHICH ARE DEFINED ELSEWHERE IN THESE LEGEND DRAWINGS.

REV	DATE	BY	DESCRIPTION
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WARNING
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McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

ELECTRICAL STANDARD SYMBOLS 1

DESIGNED C. CURTIS
DRAWN F. HABER
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\GE002.dwg Plot date: Sep 29, 2023 02:42pm, CAD User: HaberFlavia

PRIVATE TELEPHONE SYSTEM

- SB — SWITCHBOARD
- TC — TERMINAL CABINET
- D — DESK PHONE
- W — WALL PHONE

PRIVATE ETHERNET NETWORK SYSTEM

- DATA JACK
- VOICE/DATA JACK

PAGE/SOUND SYSTEM

- A — AMPLIFIER
- S — SPEAKER, WALL MTD
- S — SPEAKER, CEIL MTD
- H — HORN, WALL MTD
- H — HORN, CEIL MTD
- MIC — MICROPHONE
- P — HANDSET

INTRUSION ALARM/ACCESS SYSTEM

S_A — SECURITY ALARM
- A POINT OF CONTACT
- C SECURITY PROXIMITY CARD READER (+48" AFF)
- E SECURITY ELEVATOR LOCKOUT CONTROL
- K SECURITY KEYPAD
- P SECURITY PANIC BUTTON (MOUNT UNDER CABINET)

SC_D — SECURITY DOOR CONTACT
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- S SURFACE MOUNTED CONTACT/MAGNET COMBO WITH TAMPER RESISTANT METAL-CLAD PIGTAIL.
- M FULLY RECESSED CONTACT/MAGNET COMBO INSTALLED IN DOOR FRAME HEADER/TOP OF DOOR.

SL_D — SECURITY DOOR LOCK CONNECTION (LOCK BY OTHERS)
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- S ELECTRICAL STRIKE IN DOOR FRAME LATCH.
- M MAGNETIC LOCK ON DOOR FRAME HEADER.

S_M — SECURITY MOTION SENSOR - ARROW INDICATES DIRECTION OF SENSING; 360° INDICATES SENSING IN ALL DIRECTIONS

SM — SECURITY MONITOR AND MULTIPLEXOR/DVM

REX_D — REQUEST TO EXIT SIGNAL DEVICE
- D INTEGRAL TO DOOR HARDWARE OR HINGE. SEE ARCHITECTURAL DOOR HARDWARE SCHEDULE
- P PASSIVE INFRARED DETECTOR MOUNTED ABOVE DOOR FRAME. PROVIDE J-BOX TYPE 'B' HORIZONTALLY MOUNTED 6" ABOVE DOOR.

P — POWERED DOOR OPERATOR ACTUATOR

CCTV SYSTEM

- CCTV — CAMERA FIXED POSITION
- CCTV — CAMERA, PAN-TILT-ZOOM
- CCTV — CCTV MONITOR
- CCTV — CCTV MONITOR

LOW VOLTAGE ELECTRICAL MATERIALS

- CB — CIRCUIT BREAKER SWITCH
- UF — UNFUSED DISCONNECT SWITCH
- F — FUSED DISCONNECT SWITCH
- MOTOR STARTER MANUAL
- MOTOR STARTER MAGNETIC
- CB — MOTOR STARTER MAG. COMBINATION C.B. SW.
- F — MOTOR STARTER MAG. COMBINATION FUSED D.S.
- VFD — VARIABLE FREQUENCY DRIVE
- PUSHBUTTON SW. EMERG. STOP
- PUSHBUTTON SW. STOP/START
- PUSHBUTTON STATION
- SELECTOR SWITCH
- CS — CONTROL STATION
- FS — FLOAT SWITCH
- LI — LEVEL SWITCH
- BI — BIN LEVEL SWITCH
- LS — LIMIT SWITCH
- PS — PRESSURE SWITCH
- PE — ELECTRICAL/PNEUMATIC SWITCH
- PT — PRESSURE TRANSMITTER
- SV — SOLENOID VALVE
- T — THERMOSTAT
- TS — TEMPERATURE SWITCH

- 2 — MOTOR
- POINT OF CONNECTION
- J — JUNCTION BOX OR CONDUIT FITTING

$ — WALL SWITCH
- (1a) NUMBER & LETTER IN PARENTHESES INDICATES PANELBOARD CIRCUIT & SWITCHING ZONE
- 3 THREE WAY
- 4 FOUR WAY
- D DIMMER
- OS OCC SENSOR
- T TIMER
- XP EXPLOSIVE PROOF
- WP WATERPROOF

$_M — MOTOR SWITCH
- M MOTOR RATED TOGGLE SWITCH WITHOUT OVERLOADS
- MS MANUAL MOTOR STARTER WITH OVERLOADS

- DS — DAYLIGHT SENSOR
- OS — WALL MOUNTED OCCUPANCY SENSOR
- OS — CEILING MOUNTED OCCUPANCY SENSOR
- PC — PHOTOCELL, SUBSCRIPT INDICATES CIRCUIT

CONVENIENCE RECEPTACLE - DUPLEX
- C CLOCK
- CR CORROSION RESISTANT
- GFI GROUND FAULT INTERRUPTER
- TL TWIST LOCK, NEMA CONFIGURATION AS INDICATED
- U UPS FED
- WP WEATHERPROOF

SUBSCRIPT NUMBER AT RECEPTACLE INDICATES CIRCUIT

- QUADRUPLEX RECEPTACLE
- SINGLE RECEPTACLE
- FLOOR RECEPTACLE
- SPECIAL PURPOSE RECEPTACLE, NEMA CONFIGURATION AS INDICATED

SITE ELECTRICAL

- POLE CONCRETE
- POLE WOOD
- POLE MOUNTED TRANSFORMER
- DOWN GUY
- SIDEWALK GUY
- M — MANHOLE
- H — HANDHOLE
- V — VAULT
- S — PAD MOUNTED SWITCH
- T — TRANSFORMER VAULT
- PAD MOUNTED TRANSFORMER

GROUNDING

- GROUND ROD
- GROUND ROD WITH ACCESS BOX
- GROUND CONNECTION EXOTHERMIC
- GROUND CONNECTION MECHANICAL BOLTED
- GROUND CONNECTION COMPRESSION
- GROUND COIL (PIGTAIL) 5'0" (1.5M)
- GROUND GRADIENT MAT (SAFETY MAT) 4'X 4'
- GROUND GRADIENT MAT (SAFETY MAT) 4'X 6'

ELECTRICAL LIGHTING FIXTURES

- SURFACE/PENDANT LINEAR FIXTURE
- SURFACE/PENDANT LINEAR FIXTURE WITH BATTERY BACKUP
- RECESSED LINEAR FIXTURE
- RECESSED LINEAR FIXTURE WITH BATTERY BACKUP
- DOWNLIGHT FIXTURE SURFACE/PENDANT CEILING MOUNT
- DOWNLIGHT OR SCONCE FIXTURE SURFACE WALL MOUNT
- R — DOWNLIGHT FIXTURE RECESSED CEILING MOUNT
- R — DOWNLIGHT OR SCONCE FIXTURE RECESSED WALL MOUNT
- H — HAZARDOUS AREA LIGHT FIXTURE CEILING MOUNT
- EXIT SIGN, ARROW INDICATES DIRECTION SURFACE/PENDANT CEILING MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE
- EXIT SIGN, ARROW INDICATES DIRECTION SURFACE WALL MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE
- R — EXIT SIGN, ARROW INDICATES DIRECTION RECESSED WALL MOUNT, FILLED QUARTER INDICATES NON-INDICATING FACE

- EMERGENCY DOWNLIGHT FIXTURE SURFACE/PENDANT CEILING MOUNT
- EMERGENCY DOWNLIGHT OR SCONCE FIXTURE SURFACE WALL MOUNT
- R — EMERGENCY DOWNLIGHT FIXTURE RECESSED CEILING MOUNT
- R — EMERGENCY DOWNLIGHT OR SCONCE FIXTURE RECESSED WALL MOUNT
- EMERGENCY LIGHTING UNIT, 1 HEAD
- EMERGENCY LIGHTING UNIT, 2 HEAD
- EMERGENCY LIGHTING UNIT, 3 HEAD
- SURFACE MTD. DISTR. PANELBOARD
- FLUSH MTD. DISTR. PANELBOARD
- LF-1 — LF-1 — POLE-MOUNTED AREA LIGHT, NUMBER OF FIXTURES AND CONFIGURATION AS SHOWN AND PER SCHEDULE
- A / (2a) — LETTER NEXT TO LUMINAIRE INDICATES TYPE PER SCHEDULE. NUMBER AND LOWER CASE LETTER IN PARENTHESES INDICATES CIRCUIT AND SWITCHING ZONE IN PANELBOARD.

PLAN LINETYPES AND CONVENTIONS

- EXPOSED CONDUCTOR/CONDUIT
- CONCEALED/EMBEDDED CONDUCTOR/CONDUIT
- CONDUCTOR/CONDUIT DOWN
- CONDUCTOR/CONDUIT UP
- G — GROUNDING ELECTRODE CONDUCTOR, BARE COPPER
- G — GROUND CONNECTION, EXOTHERMIC OR WELDED
- G — GROUND CONNECTION, BOLTED
- EOH — OH POWER
- EUG — UG POWER
- [3/4"C, 3#12, 1#12G] — CIRCUIT CALLOUT, CONDUIT AND CONDUCTOR SIZES AS INDICATED; "n-" IN FRONT OF CALLOUT INDICATES "n" PARALLEL SETS
- RXX — RACEWAY CALLOUT, INDEX NUMBER AS INDICATED IN RACEWAY SCHEDULE

DIAGRAM LINETYPES AND CONVENTIONS

- ENCLOSURE
- CONDUCTOR, CABLE, CIRCUIT, OR BUS
- INTERCONNECTION WITH EXTERNAL EQUIPMENT
- GANG OPERATED INTERLOCK
- OR — CONDUCTOR, CROSSING OF PATHS OR CONDUCTORS NOT CONNECTED
- CONDUCTOR, JUNCTION OF CONNECTED PATHS, CONDUCTORS OR WIRES

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McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

ELECTRICAL STANDARD SYMBOLS 2

DESIGNED C. CURTIS
DRAWN F. HABER
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
GE003

JOB NO: 000000

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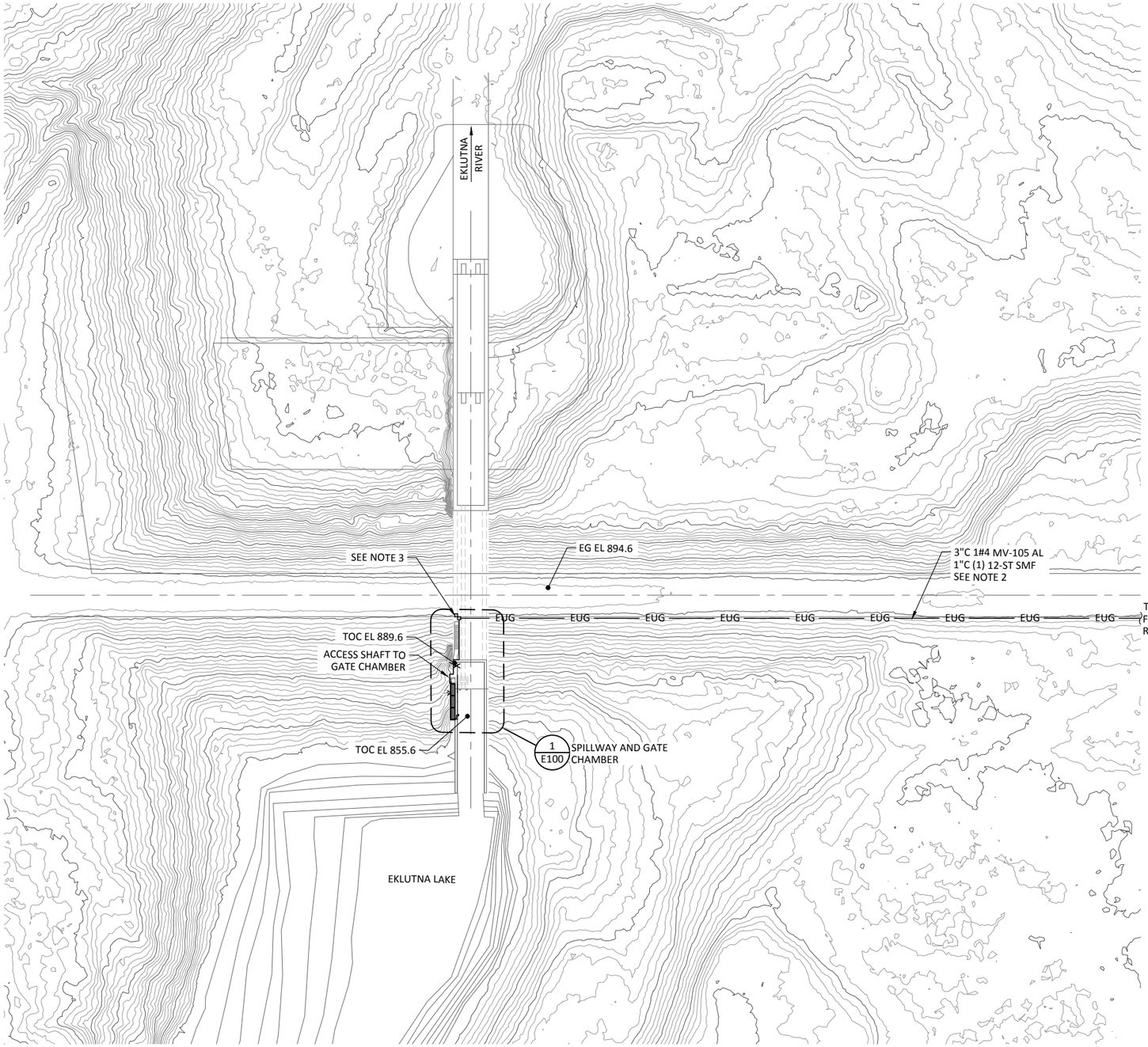

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INSTALL BURIED POWER LINE AND FIBER OPTIC COMMUNICATION LINES. PROVIDE MINIMUM 24" OF COVER.
3. INSTALL (2) 4'X4'X4'D CONCRETE HANDHOLES. ONE SHALL BE USED FOR 7.2KV POWER, THE OTHER FOR FIBER OPTIC.

INSTALLATION KEY PLAN

SCALE: 1"= 40'

0" 40' 80'

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WARNING

0 1/2 1

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McMillen

CHUGACH
POWERING ALASKA'S FUTURE

MEA
MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

EKLUTNA DAM OUTLET MODIFICATIONS

ELECTRICAL TRANSMISSION &
COMMUNICATIONS UPGRADES PLAN

DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING

E003

JOB NO: 000000

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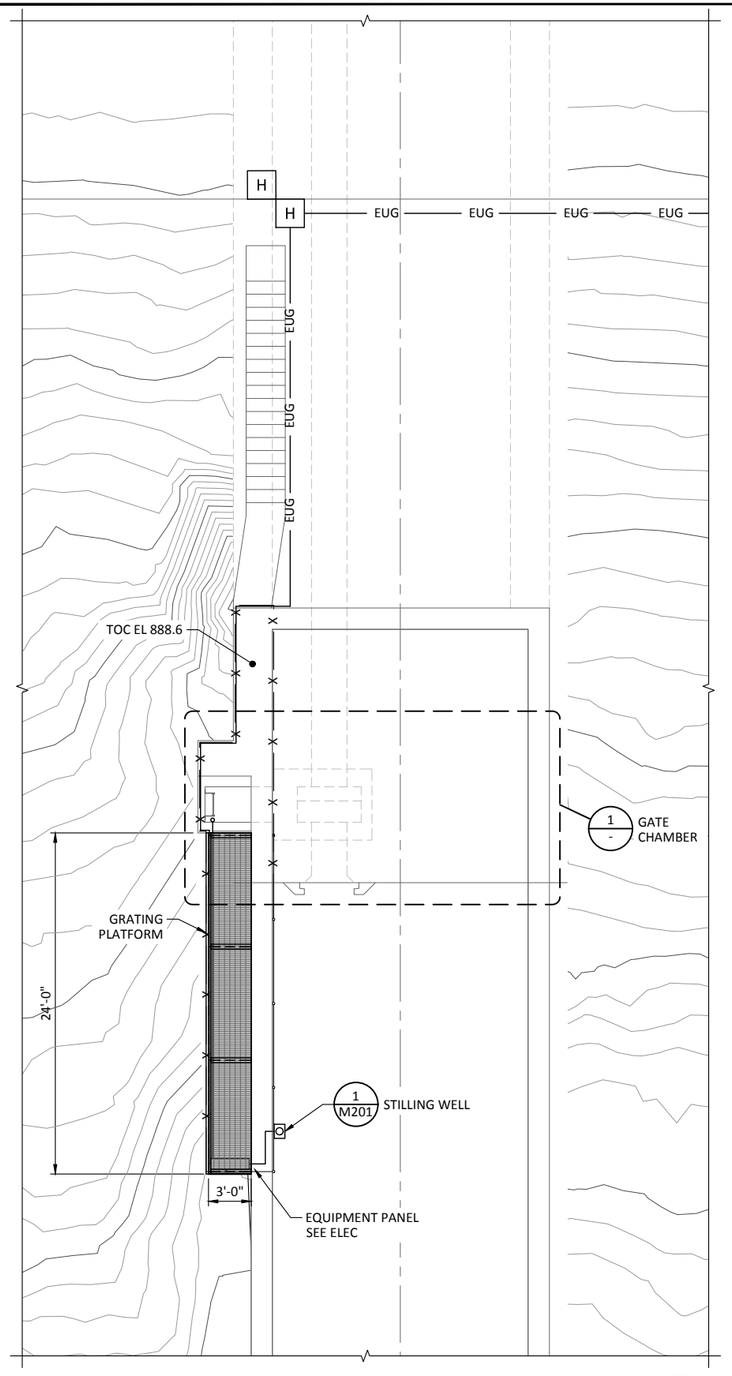
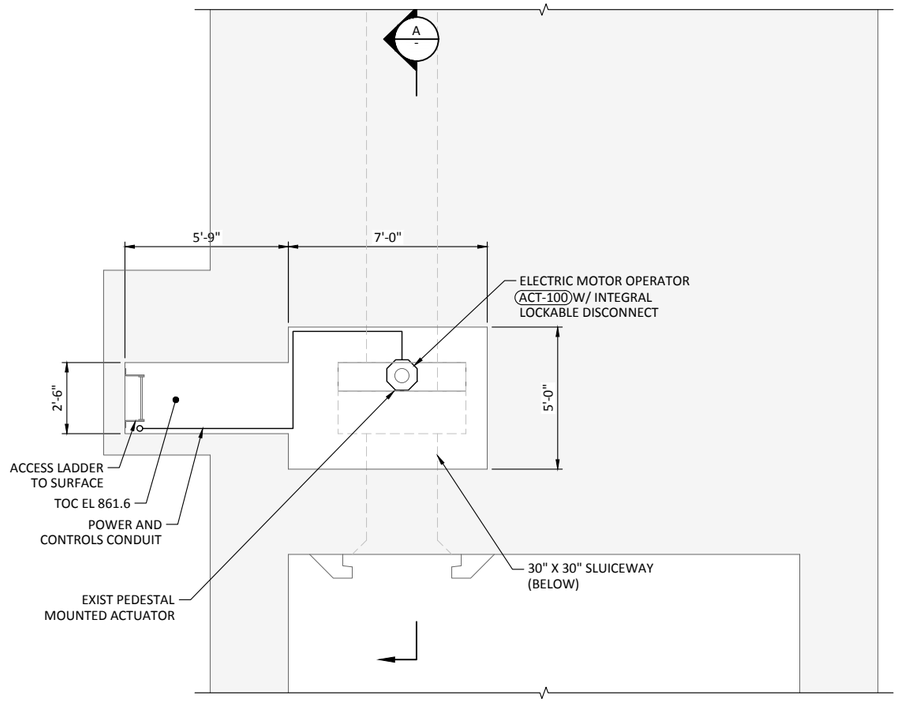
SHEET NOTES:

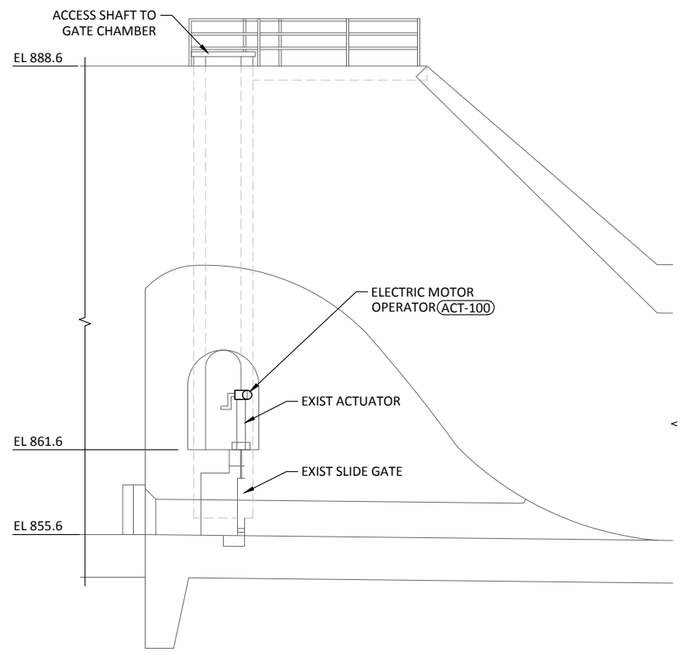
1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INSTALL NEW NEMA 250 TYPE 4X SS CABINET ON HANDRAIL OR FRAMING CHANNEL RACK. CABINET SHALL INCLUDE 240VAC SINGLE-PHASE LOADCENTER, FIBER OPTIC CLOSET CONNECTOR HOUSING, AND REMOTE I/O RACK. PROVIDE CABINET COMPLETE AND OPERABLE WITH TERMINAL BLOCKS, SURGE SUPPRESSORS, AND POWER SUPPLIES. INCLUDE LOCKABLE SERVICE ENTRANCE RATED DISCONNECT SWITCH ON EXTERIOR OF CABINET.
3. MOUNT ALL CONDUITS ALONG LOWER PORTION OF HANDRAIL.
4. INSTALL NEW PADMOUNT SINGLE-PHASE 7200V/240VAC TRANSFORMER. INCLUDE PEDESTAL MOUNTED SECONDARY-SIDE METERING SOCKET. COORDINATE SERVICE REQUIREMENTS WITH UTILITY.



SPILLWAY DETAIL
SCALE: 3/16"= 1'-0"



1 - GATE CHAMBER PLAN
SCALE: 3/8"= 1'-0"



A - GATE CHAMBER SECTION
SCALE: 3/16"= 1'-0"

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EKLUTNA FISH & WILDLIFE PROJECT
EKLUTNA DAM OUTLET MODIFICATIONS

EKLUTNA DAM OUTLET ELECTRICAL PLAN
SECTION AND DETAILS

DESIGNED C. CURTIS
DRAWN J. HOLT
CHECKED J. BAKKEN
PROJECT DATE 10/6/23

DRAWING
E100

JOB NO: 000000

Path: C:\Vault\Chugach Electric\Dam Outlet Modification\E100.dwg Plot date: Sep 29, 2023 02:47pm, CAD User: HaberFlavia

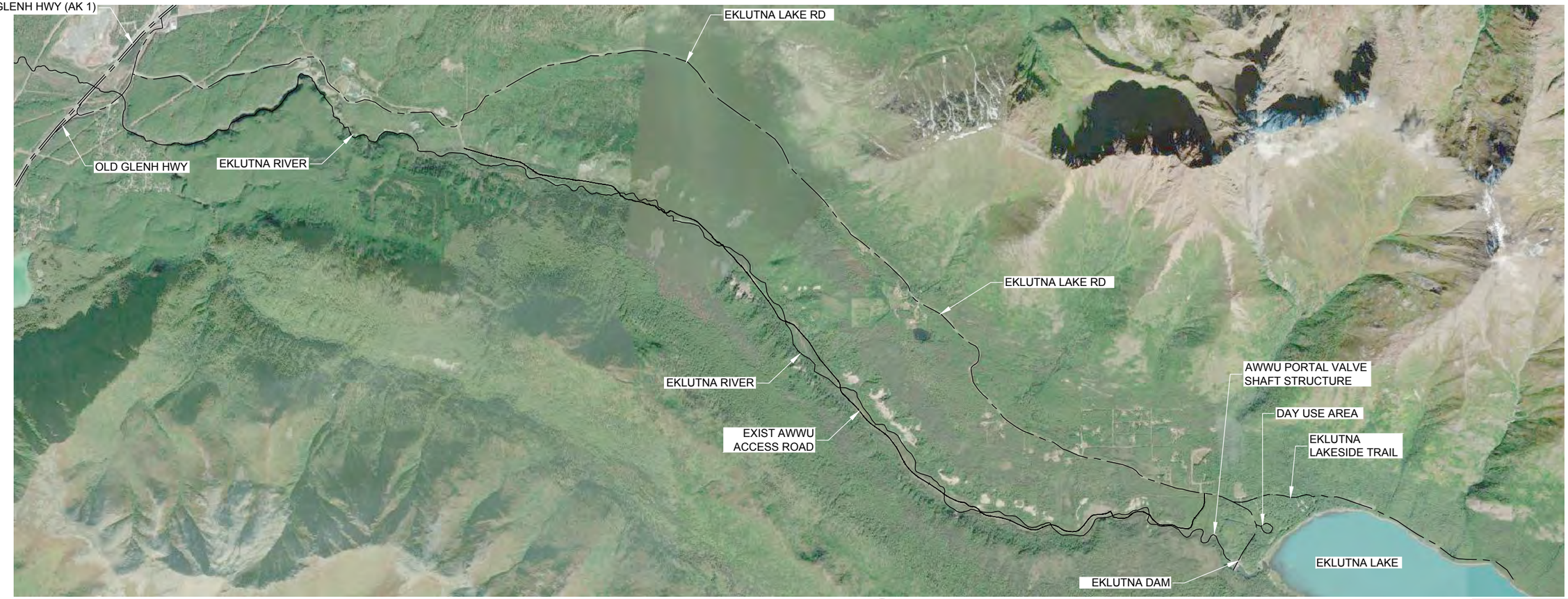
EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGE
ANCHORAGE, ALASKA

15% DESIGN
OCTOBER 2023

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES
15% DESIGN

LOCATION MAP
NTS



VICINITY MAP
NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

LOCATION MAP AND VICINITY MAP

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G001.dwg Plot date: Sep 29, 2023 12:28pm, CAD User: HaberFlavia

DRAWING INDEX

15% SUB*	SHEET NO.	DWG NO.	DESCRIPTION
			GENERAL
X			COVER SHEET
X	1	G001	LOCATION MAP AND VICINITY MAP
X	2	G002	DRAWING INDEX
X	3	G003	STANDARD ABBREVIATIONS
X	4	G004	STANDARD SYMBOLS
X	5	G005	PIPING SCHEDULE
X	6	G006	PROJECT SITE PLAN
			EROSION AND SEDIMENT CONTROL
	7	EC001	EROSION AND SEDIMENT CONTROL KEY PLAN
	8	EC002	STANDARD EROSION AND SEDIMENT CONTROL DETAILS 1
	9	EC003	STANDARD EROSION AND SEDIMENT CONTROL DETAILS 2
	10	EC004	EROSION AND SEDIMENT CONTROL DIAGRAM
			CIVIL
X	11	GC001	CIVIL GENERAL NOTES
X	12	GC002	STANDARD CIVIL DETAILS 1
	13	GC003	STANDARD CIVIL DETAILS 2
X	14	C001	OVERALL SITE KEY PLAN AND EARTHWORK QUANTITIES
X	15	C101	ROAD CROSSING NO. 1 PLAN AND PROFILE
X	16	C102	ROAD CROSSING NO. 2 PLAN AND PROFILE
X	17	C103	ROAD CROSSING NO. 3 PLAN AND PROFILE
X	18	C104	ROAD CROSSING NO. 4 PLAN AND PROFILE
X	19	C105	ROAD CROSSING NO. 5 PLAN AND PROFILE
X	20	C106	ROAD CROSSING NO. 6 PLAN AND PROFILE
X	21	C107	ROAD CROSSING NO. 7 PLAN AND PROFILE
X	22	C108	ROAD CROSSING NO. 8 PLAN AND PROFILE
			STRUCTURAL
X	23	GS001	STRUCTURAL GENERAL NOTES
X	24	S100	TYPICAL BRIDGE CROSSING PLAN
X	25	S101	TYPICAL BRIDGE SUBSTRUCTURE PLAN
X	26	S102	TYPICAL BRIDGE SUPERSTRUCTURE PLAN
X	27	S103	TYPICAL BRIDGE SECTIONS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

DRAWING INDEX

DESIGNED S. ELLENSON

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

G002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G002.dwg Plot date: Sep 26, 2023 06:20pm, CAD User: HaberFlavia

A/C	AIR CONDITIONING
A/E	ARCHITECT/ENGINEER
A	ARCHITECTURAL (DWG DISCIPLINE), AMP
AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABAN	ABANDON
AC	ALTERNATING CURRENT
ACST	ACOUSTIC
AD	ADDENDUM, AREA DRAIN
ADDL	ADDITIONAL
ADH	ADHESIVE
ADJ	ADJUSTABLE, ADJACENT
AF	AMP FRAME, AMP FUSE
AFF	ABOVE FINISH FLOOR
AFG	ABOVE FINISH GRADE
AGGR	AGGREGATE
AIC	AMPS INTERRUPTING CAPACITY
ALIG	ALIGNMENT
ALUM	ALUMINUM
ALT	ALTERNATE, ALTITUDE
AMB	AMBIENT
ANC	ANCHOR
AP	ACCESS PANEL
APRX	APPROXIMATE
APVD	APPROVED
ARCH	ARCHITECTURAL
ASSY	ASSEMBLY
AT	AMP TRIP
ATM	ATMOSPHERE
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AVG	AVERAGE
AWG	AMERICAN WIRE GAGE
AWWU	ANCHORE WATER AND WASTEWATER UTILITY
B/B	BACK TO BACK
BAL	BALANCE
BBD	BULLETIN BOARD
BC	BASE CABINET, BOTTOM CHORD, BOLT CENTER, BOLT CIRCLE
BD	BOARD
BE	BOTH ENDS, BELL END
BF	BOTH FACES, BOTTOM FACE, BLIND FLANGE, BOARD FEET
BFV	BUTTERFLY VALVE
BITUM	BITUMINOUS
BKG	BACKING
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKG	BLOCKING
BM	BENCHMARK, BEAM
BOC	BACK OF CURB
BOD	BOTTOM OF DUCT
BOG	BOTTOM OF GRILLE
BOL	BOTTOM OF LOUVER
BOP	BOTTOM OF PIPE
BOR	BOTTOM OF REGISTER
BOT	BOTTOM
BOU	BOTTOM OF UNIT
BP	BASE PLATE
BRG	BEARING
BRGP	BEARING PLATE
BRKT	BRACKET
BS	BOTH SIDES
BTU	BRITISH THERMAL UNIT
BTW	BETWEEN
BTWLD	BUTT WELD
BV	BALL VALVE
BW	BOTH WAYS
BYP	BYPASS
C TO C	CENTER TO CENTER
C&G	CURB & GUTTER
C	CHANNEL SHAPE, CENTIGRADE, CONDUIT, CIVIL (DRAWING DISCIPLINE)
CAB	CABINET
CAP	CAPACITY
CAT	CATALOG
CAV	CAVITY
CB	CATCH BASIN
CCB	CONCRETE BLOCK
CCW	COUNTER CLOCKWISE
CF	CUBIC FEET (FOOT)
CHFR	CHAMFER
CHD	CHORD
CHH	COMMUNICATION HANDHOLE
CI	CURB INLET
CIP	CAST-IN-PLACE
CIPB	CONCRETE INTERLOCKING PAVER BALLAST
CIRC	CIRCULATION, CIRCULAR
CJ	CONSTRUCTION JOINT, CONTROL JOINT
CKT	CIRCUIT
CL	CENTERLINE, CLASS, CLOSE
CLR	CLEAR
CMH	COMMUNICATION MANHOLE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT, CONCRETE OPENING
COL	COLUMN
COM	COMMON
COMB	COMBINATION
COMM	COMMUNICATION
COMP	COMPOSITION, COMPRESSIBLE, COMPOSITE
CONC	CONCENTRIC, CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS, CONTINUED
COORD	COORDINATE
CORR	CORROSIVE, CORRUGATED
CP	CHECKER PLATE, CONTROL POINT
CPLG	COUPLING
CSK	COUNTERSINK
CTR	CENTER
CTRL	CONTROL
CU	COPPER, CUBIC
CW	CLOCKWISE
CY	CUBIC YARD
d	PENNY (NAIL MEASURE)
D	DEEP, DIFFUSER
DB	DUCT BANK, DECIBEL, DRY BULB
DBA	DEFORMED BAR ANCHOR
DBL	DOUBLE
DC	DIRECT CURRENT
DEG	DEGREE
DEG C	DEGREE CENTIGRADE
DEG F	DEGREE FAHRENHEIT
DEMO	DEMOLITION
DEP	DEPRESSED
DEPT	DEPARTMENT
DET	DETAIL
DI	DROP INLET, DUCTILE IRON
DIA	DIAMETER
DIAG	DIAGONAL, DIAGRAM
DIFF	DIFFERENTIAL, DIFFERENCE
DIM	DIMENSION
DISCH	DISCHARGE
DIST	DISTANCE, DISTRIBUTION
DIV	DIVISION
DL	DEAD LOAD
DN	DOWN
DP	DEPTH
DS	DOWN SPOUT
DT	DOUBLE TEE, DRIP TRAP ASSEMBLY
DUP	DUPLICATE
DWG	DRAWING
DWL	DOWEL
E	EAST, ELECTRICAL (DWG DISCIPLINE)
EA	EACH, EXHAUST AIR
EC	ELECTRICAL CONTRACTOR
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EE	EACH END
EF	EACH FACE
EG	EXISTING GRADE
EGL	ENERGY GRADE LINE
EFF	EFFLUENT, EFFICIENCY
EHH	ELECTRICAL HANDHOLE
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
EL	ELBOW, ELEVATION
ELEC	ELECTRICAL
EMBD	EMBEDDED
EMER	EMERGENCY
EMH	ELECTRICAL MANHOLE
ENCL	ENCLOSURE
ENGR	ENGINEER
ENTR	ENTRANCE
EOP	EDGE OF PAVEMENT
EOW	EDGE OF WATER
EQ	EQUAL
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EACH SIDE, EQUAL SPACE, EMERGENCY SHOWER
ESEW	EMERGENCY SHOWER AND EYE WASH
EST	ESTIMATE
EW	EACH WAY, EMERGENCY EYE/FACE WASH
EWC	ELECTRIC WATER COOLER
EWEF	EACH WAY, EACH FACE
EWTB	EACH WAY, TOP AND BOTTOM
EXC	EXCAVATION
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION, EXPOSED
EXT	EXTERIOR, EXTERNAL, EXTENSION
F TO F	FACE TO FACE
FAB	FABRICATE
FBO	FURNISHED BY OWNER
FC	FLUSHING CONNECTION
FCA	FLANGED COUPLING ADAPTER
FCV	FIXED CONE VALVE
FD	FLOOR DRAIN
FDC	FLEXIBLE DUCT CONNECTION
FDR	FEEDER
FE	FLANGED END
FEC	FIRE EXTINGUISHER CABINET
FEXT	FIRE EXTINGUISHER
FF	FAR FACE, FACTORY FINISH, FLAT FACE
FG	FINISHED GRADE
FIG	FIGURE
FH	FIRE HYDRANT
FIN	FINISH
FL	FLOW, FLOW LINE
FLEX	FLEXIBLE
FLG	FLANGE
FLOR	FLUORESCENT
FLR	FLOOR
FLS	FLASHING, FLUSH
FND	FOUNDATION
FNC	FENCE
FO	FINISHED OPENING
FOB	FLAT ON BOTTOM
FOC	FACE OF CONCRETE, FACE OF CURB, FIBER OPTIC CABLE
FOF	FACE OF FINISH
FOM	FACE OF MASONRY
FOS	FACE OF STUDS
FOT	FLAT ON TOP
FPT	FEMALE PIPE THREAD
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FS	FLOOR SINK, FAR SIDE
FT	FEET, FOOT
FTG	FOOTING, FITTING FUR FURRED, FURRING
FURN	FURNITURE, FURNISH
FUT	FUTURE
FV	FACE VELOCITY
FW	FIELD WELD, FIRE WALL
FWD	FORWARD
FWE	FURNISHED WITH EQUIPMENT
FXTR	FIXTURE
G	GRILLE, GROUND, GENERAL (DWG DISCIPLINE)
GA	GAGE (METAL THICKNESS)
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GD	GUARD
GEN	GENERAL
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GL	GLASS
GP	GUY POLE
GR	GRADE
GRND	GROUND
GRTG	GRATING
GT	GREASE TRAP
GWB	GYPSUM WALLBOARD
GYP	GYPSUM HARDBOARD
H	HIGH
HB	HOSE BIB
HBD	HARDBOARD
HC	HANDICAPPED, HOLLOW CORE, HORIZONTAL CURVE
HC	HORIZONTAL CENTERLINE
HDR	HEADER
HDW	HARDWARE
HEX	HEXAGONAL
HH	HANDHOLE
HM	HOLLOW METAL
HORIZ	HORIZONTAL
HP	HIGH POINT, HORSEPOWER
HPC	HORIZONTAL POINT OF CURVATURE
HPS	HIGH PRESSURE SODIUM
HPT	HORIZONTAL POINT OF TANGENCY
HR	HOUR
HS	HEADED STUD, HIGH STRENGTH
HSS	HOLLOW STRUCTURAL SHAPE
HT	HEIGHT
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATION & AIR CONDITIONING
HWD	HARDWOOD
HWL	HIGH WATER LEVEL
HYD	HYDRAULIC HZ HERTZ, CYCLES PER SECOND
I	INSTRUMENTATION (DWG DISCIPLINE)
ID	INSIDE DIAMETER, INTERIOR DIMENSION
IE	INVERT ELEVATION
IF	INSIDE FACE
IH	INTAKE HOOD
IMP	IMPACT
IN	INCH
INC	INCLUDE, INCANDESCENT
INF	INFLUENT
INSTR	INSTRUMENTATION
INSUL	INSULATION
INT	INTERIOR, INTERSECTION
INTR	INTERMEDIATE, INTERIOR
INV	INVERT
IPS	IRON PIPE SIZE
IPT	INTERNAL PIPE THREAD
IRR	IRRIGATION
ISO	ISOMETRIC
JB	JUNCTION BOX
JCT	JUNCTION
JF	JOINT FILLER
JT	JOINT
K	KIP
KB	KNEE BRACE
KCMIL	THOUSAND CIRCULAR MILS
KD	KNOCK DOWN
KIUC	KAUAI ISLAND UTILITY COOPERATIVE
KO	KNOCK OUT
KSI	KIPS PER SQUARE INCH
L	ANGLE, LENGTH, LAVATORY
LAM	LAMINATE
LATL	LATERAL
LB	LAG BOLT, POUND
LDR	LEADER
LF	LINEAR FOOT
LG	LONG
LH	LEFT HAND
LIN	LINEAR
LIQ	LIQUID
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LMLU	LIQUID MARKER LECTURE UNIT
LNG	LONGITUDINAL
LOC	LOCATION
LP	LOW POINT
LPS	LOW PRESSURE SODIUM
LR	LONG RADIUS
LT	LEFT
LTD	LIMITED
LTG	LIGHTING
LTL	LINTEL
LTNG	LIGHTNING
LV	LOW VOLTAGE
LVR	LOUVER
LW	LIGHTWEIGHT
LWC	LIGHTWEIGHT CONCRETE
LWL	LOW WATER LEVEL
M	MECHANICAL (DWG DISCIPLINE)
MA	MIXED AIR
MAINT	MAINTENANCE
MAN	MANUAL
MAOP	MAXIMUM ALLOWABLE OPERATING PRESSURE
MATL	MATERIAL
MAX	MAXIMUM
MB	MACHINE BOLT
MBR	MEMBER
MCJ	MASONRY CONTROL JOINT
MECH	MECHANICAL
MED	MEDIUM
MFR	MANUFACTURER
MH	MANHOLE, METAL HALIDE
MIN	MINIMUM
MIR	MIRROR
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MMB	MEMBRANE
MO	MASONRY OPENING
MOD	MODULAR, MODIFY
MON	MONUMENT
MPT	MALE PIPE THREAD
MSL	MEAN SEA LEVEL
MT	MOUNT
MU	MASONRY UNIT
MULL	MULLION
MV	MEDIUM VOLTAGE
MW	MONITORING WELL
N	NORTH, NEUTRAL
NA	NOT APPLICABLE
NAT	NATURAL
NC	NORMALLY CLOSED
NEG	NEGATIVE
NF	NEAR FACE, NON-FUSED
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN, NUMBER
NOM	NOMINAL
NPS	NOMINAL PIPE SIZE
NPT	NATIONAL PIPE THREAD
NS	NEAR SIDE
NTS	NOT TO SCALE
NWL	NORMAL WATER LEVEL
O TO O	OUT-TO-OUT
OA	OUTSIDE AIR, OVERALL
OC	ON CENTER
OCPD	OVER CURRENT PROTECTION DEVICE
OD	OUTSIDE DIAMETER
OH	OVERHEAD
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
ORD	OVERFLOW ROOF DRAIN
ORIG	ORIGINAL
OVFL	OVERFLOW
OVHG	OVERHANG
OZ	OUNCE
P	PAINT, PROCESS (DWG DISCIPLINE)
PAR	PARALLEL, PARAPET
PB	PANIC BAR, PULL BOX
PBD	PARTICLE BOARD
PC	POINT OF CURVE, PIECE, PRECAST
PCC	POINT OF COMPOUND CURVATURE
PCF	POUNDS PER CUBIC FOOT
PCT	PERCENT
PE	PLAIN END
PED	PEDESTAL
PEN	PENETRATION
PERF	PERFORATED
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PI	POINT OF INTERSECTION
PKG	PACKAGE
PL	PLATE, PROPERTY LINE
PLBG	PLUMBING
PLF	POUNDS PER LINEAR FOOT
PNEU	PNEUMATIC
POL	POLISH
POS	POSITIVE, POSITION
PP	POLYPROPYLENE, POWER POLE
PRC	POINT OF REVERSE CURVATURE
PREF	PREFINISHED
PREFAB	PREFABRICATED
PRELIM	PRELIMINARY
PREP	PREPARE
PRES	PRESSURE
PROP	PROPERTY
PROT	PROTECTION
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PT	POINT, POINT OF TANGENCY
PTN	PARTITION
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWD	PLYWOOD
PZ	PIEZOMETER
Q	RATE OF FLOW
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R&R	REMOVE AND REPLACE
R&S	REMOVE AND SALVAGE
R	RADIUS, REGISTER, RISER
RA	RETURN AIR
RB	RESILIENT BASE, ROCK BERM
RCPT	RECEPTACLE
RD	ROOF DRAIN
REC	RECESS
RECD	RECEIVED
RECT	RECTANGULAR
RED	REDUCER
REF	REFERENCE
REINF	REINFORCING
REQD	REQUIRED
RESIL	RESILIENT
RET	RETAINING, RETURN
REV	REVISION, REVERSE
RFL	REFLECTED, REFLECTOR
RGS	RIGID GALVANIZED STEEL
RH	RELIEF HOOD, RIGHT HAND, RELATIVE HUMIDITY
RL	REQUIRED LAP
RND	ROUND
RNG	RENEWABLE NATURAL GAS
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RR	RAILROAD
RT	RIGHT
S	SOUTH, SINK, STRUCTURAL (DWG DISCIPLINE)
SA	SUPPLY AIR
SAN	SANITARY
SC	SOLID CORE
SCH	SCHEDULE
SCHEM	SCHEMATIC
SCRN	SCREEN
SE	STEEL/ALUMINUM EDGE
SEC	SECONDARY, SECONDS
SECT	SECTION
SEP	SEPARATE
SF	SQUARE FOOT
SH	SHOWER
SHT	SHEET
SHTG	SHEATHING
SIM	SIMILAR
SL	SLOPE
SLTD	SLOTTED
SLV	SLEEVE
SMLS	SEAMLESS
SOG	SLAB ON GRADE
SP	SOUNDPROOF, STANDPIPE
SPC	SPACING
SPEC	SPECIFICATION
SPLY	SUPPLY
SPT	SET POINT
SQ	SQUARE
SR	SHORT RADIUS
SS	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STL	STEEL
STOR	STORAGE
STR	STRUCTURAL, STRAIGHT
SUB	SUBSTITUTE
SUC	SUCTION
SUSP	SUSPENDED
SY	SQUARE YARD
SYM	SYMBOL
SYMM	SYMMETRICAL
SYN	SYNTHETIC
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T	TILE, TREAD
TA	TEMPERED AIR
TAN	TANGENT
TBM	TEMPORARY BENCHMARK
TEMP	TEMPORARY, TEMPERATURE
THK	THICK
THRD	THREAD
THRU	THROUGH
TOB	TOP OF BOLT, TOP OF BANK, TOP OF BEAM
TOC	TOP OF CURB, TOP OF CONCRETE
TOD	TOP OF DUCT
TOF	TOP OF FOOTING
TOG	TOP OF GRATING
TOL	TOLERANCE, TOP OF LEDGER
TOM	TOP OF MASONRY
TOP	TOP OF PLATE
TOPO	TOPOGRAPHY
TOS	TOP OF SLAB, TOP OF STEEL
TOW	TOP OF WALL
TP	TELEPHONE POLE, TOE PLATE, TRAP PRIMER
TPG	TOPPING
TRANS	TRANSITION
TRD	TRENCH DRAIN
TYP	TYPICAL
U	URINAL
UG	UNDERGROUND
ULT	ULTIMATE
UNFN	UNFINISHED
UNO	UNLESS NOTED OTHERWISE
UTIL	UTILITY
V	VENT, VELOCITY, VOLT
VA	VOLT AMPERE
VAC	VACUUM
VAR	VARNISH, VARIABLE, VOLT AMPERES REACTIVE
VB	VAPOR BARRIER, VINYL BASE, VALVE BOX
VC	VERTICAL CURVE
VCT	VINYL COMPOSITION TILE, VERTICAL CENTERLINE
VEL	VELOCITY
VENT	VENTILATION
VERT	VERTICAL
VS	VERSES, VAPOR SEAL
VOL	VOLUME
VPC	VERTICAL POINT OF CURVATURE
VPI	VERTICAL POINT OF INTERSECTION
VPT	VERTICAL POINT OF TANGENCY
VTR	VENT THROUGH ROOF
VWC	VINYL WALL COVERING
W/	WITH
W/O	WITHOUT
W	WATT, WEST, WIDE, WINDOW, WIRE, WIDE FLANGE BEAM
WC	WATER CLOSET, WATER COLUMN
WD	WIDTH
WF	WIDE FLANGE, WASH FOUNTAIN
WG	WIRE GLASS, WATER GAGE
WH	WALL HYDRANT, WEEP HOLE
WL	WATER LEVEL
WLD	WELDED
WM	WIRE MESH
WP	WATERPROOF, WORKING POINT
WTHP	WEATHERPROOF
WS	WATERSTOP, WATER SURFACE
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT, WATER TIGHT
WWF	WELDED WIRE FABRIC
XS	EXTRA STRONG
XXS	DOUBLE EXTRA STRONG
XSECT	CROSS SECTION
YH	YARD HYDRANT
YS	YIELD STRENGTH

GENERAL NOTES:

1. THESE ABBREVIATIONS APPLY TO THE ENTIRE SET OF CONTRACT DRAWINGS.
2. LISTING OF ABBREVIATIONS DOES NOT IMPLY ALL ABBREVIATIONS ARE USED IN THE CONTRACT DRAWINGS.
3. ABBREVIATIONS SHOWN ON THIS SHEET INCLUDE VARIATIONS OF THE WORD. FOR EXAMPLE, "MOD" MAY MEAN MODIFY OR MODIFICATION; "INC" MAY MEAN INCLUDED OR INCLUDING; "REINF" MAY MEAN EITHER REINFORCE OR REINFORCING.
4. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH SHEET FOR USAGE.

PRELIMINARY
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REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

STANDARD ABBREVIATIONS

DESIGNED L.VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G003

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G003.dwg Plot date: Sep 29, 2023 01:03pm, CAD User: HaberFlavia

SHEET SYMBOLS

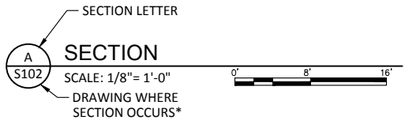
PLAN
SCALE: 1/2"= 1'-0"
0' 2' 4'

N

SECTION IDENTIFICATION

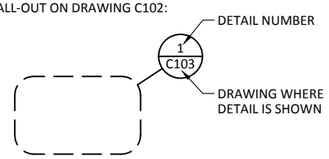
(1) SECTION CUT ON DRAWING C102:

(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

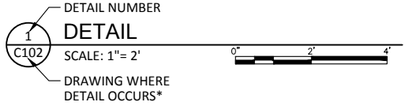


DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON DRAWING C102:



(2) ON DRAWING C103 THIS SECTION IS IDENTIFIED AS:

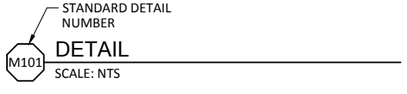


*NOTE: IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON SAME DRAWING. DRAWING NUMBER IS REPLACED BY A LINE.

STANDARD DETAIL IDENTIFICATION

(1) DETAIL CALL-OUT ON PLAN OR SECTION:

(2) ON DETAIL DRAWINGS, IDENTIFIED AS:



ELEVATION/IMAGE IDENTIFICATION

SITE PLAN LINE TYPES

- FENCE LINE
- OVERHEAD POWER
- MAJOR CONTOUR
- MINOR CONTOUR
- EXIST MAJOR CONTOUR
- EXIST MINOR CONTOUR
- EDGE OF WATERLINE
- TOE OF SLOPE
- TOP OF BANK
- SANITARY SEWER
- STORM DRAIN
- EDGE OF PAVEMENT
- EDGE OF GRAVEL
- WATTLE
- SILT FENCE
- CONSTRUCTION FENCE
- GAS LINE
- TURBIDITY CURTAIN
- IRRIGATION LINE
- WATER LINE
- TELEPHONE LINE
- COMMUNICATION LINE
- OVERHEAD ELECTRICAL/POWER
- UNDERGROUND ELECTRICAL
- PROPERTY LINE
- EXISTING OVERHEAD POWER LINE
- EXISTING OVERHEAD POWER & TELEPHONE LINE
- EXISTING OVERHEAD TELEPHONE LINE
- EXISTING BURIED TELEPHONE LINE EVIDENCED BY PEDESTALS & WARNING PADDLES
- EXISTING FENCE LINE
- PROJECT BOUNDARY
- TREE PROTECTION FENCE
- LIMITS OF DISTURBANCE
- SHORING

SITE PLAN SYMBOLS

- ARROW INDICATES DIRECTION OF PLAN NORTH
- CONIFER TREE: FIR, SPRUCE, LARCH OR PINE, 8" DIAMETER OR LARGER.
- DECIDUOUS TREE: COTTONWOOD, HAWTHORN, ASPEN, 8" DIAMETER OR LARGER.
- MH — MANHOLE
- EB — ELECTRIC BOX
- STORM DRAIN MANHOLE
- FH — FIRE HYDRANT
- YH-X — YARD HYDRANT
- SURVEY CONTROL POINT, AS NOTED.
- POLE ANCHOR
- POWER POLE
- LIGHT POLE
- SIGN
- SURVEY HUB
- SECTION CORNER
- BENCH MARK
- EXISTING HEADWALL
- EXISTING MONITORING STATION
- EXISTING FENCE
- STATE PLANE COORDINATE MARKER
- EXISTING TREE LINE
- EXISTING BUILDING, STRUCTURES
- EXISTING SECTION CORNER MONUMENT FOUND AS DESCRIBED
- EXISTING 5/8" REBAR CONTROL POINT MONUMENT, BORING LOCATION
- W — EXISTING HOSE BIB
- EXISTING PORTABLE IRRIGATION WATER PUMP
- WELL — EXISTING 6" WATER WELL
- EXISTING ELECTRICAL OUTLET
- P — EXISTING POWER POLE
- T — EXISTING TELEPHONE PEDESTAL
- CONTROL POINT
- PUMP
- PUMP
- TP — TEST PIT LOCATION

MISCELLANEOUS SYMBOLS

- CHANGE OF PIPE MTL
- OR — END OF PIPE
- ℄ — CENTERLINE
- Ø — DIAMETER
- ∠ — ANGLE
- PL — PLATE
- ± — PLUS/MINUS

GENERAL NOTES:

1. ALL SYMBOLS ARE NOT NECESSARILY USED. THIS IS A STANDARD DRAWING SHOWING COMMON SYMBOLS ON THIS PROJECT.
2. SCREENING OR SHADING OF WORK IS USED TO INDICATE EXISTING COMPONENTS OR TO DE-EMPHASIZE PROPOSED IMPROVEMENTS TO HIGHLIGHT SELECTED TRADE WORK. REFER TO CONTEXT OF EACH DRAWING FOR USAGE.

HATCH SYMBOLS

- ROCK, TYPE AS NOTED (PLAN/SECTION)
- BED ROCK
- EXISTING GRADE (SECTION)
- NEW SOIL (SECTION)
- CONCRETE EXISTING (SECTION/PLAN)
- CONCRETE 1ST STAGE (SECTION/PLAN)
- CONCRETE 2ND STAGE (SECTION/PLAN)
- SAND, GROUT (PLAN/SECTION)
- STEEL (SECTION)
- GRATING (PLAN)
- MASONRY (PLAN)
- WOOD, SIZE/TYPE AS NOTED (PLAN)
- WOOD, SIZE/TYPE AS NOTED (SECTION)
- RIP RAP (PLAN/SECTION)
- RIGID INSULATION (SECTION)
- ASPHALT CONCRETE PAVEMENT SURFACE (PLAN/SECTION)
- GRASS/VEGETATION (PLAN)
- BATT INSULATION (SECTION)
- NEW CONSTRUCTION
- EXISTING
- EXISTING TO BE REMOVED OR DEMOLISHED
- CLEARING AND GRUBBING
- ASPHALT
- GRASS/VEGETATION
- GRAVEL

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen
CHUGACH POWERING ALASKA'S FUTURE
MEA MATANUSKA ELECTRIC ASSOCIATION
MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

STANDARD SYMBOLS

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G004

JOB NO: 000000

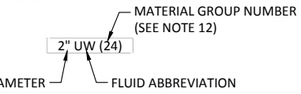
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G004.dwg Plot date: Sep 26, 2023 06:21pm, CAD User: HaberFlavia

FLUID ABBREVIATION	FUNCTION	ALLOWABLE PIPING MATERIAL GROUP NO. (SEE NOTE 1 AND 4)				FIELD TEST REQUIREMENTS (SEE NOTE 3 AND NOTE 4)		
	THIS LIST MAY INCLUDE FLUIDS NOT USED IN THIS PROJECT	EXPOSED PIPING (SEE NOTE 14)		BURIED PIPING (SEE NOTE 13)		MINIMUM TEST PRESSURE PSI	TEST MEDIUM	LEAKAGE ALLOWANCE (SEE NOTE 2)
		3" DIA AND SMALLER	4" DIA AND LARGER	3" DIA AND SMALLER	4" DIA AND LARGER			
COMMONLY USED FUNCTIONS								
SDR	STORM DRAIN	--	21	--	21	NOTE 6	WATER	(C)

PIPING MATERIAL SCHEDULE (SEE NOTE 1)

GROUP NO.	PIPE MATERIAL	FITTINGS / JOINTS	LININGS AND COATINGS (SEE NOTE 13)
21	CORRUGATED METAL PIPE, GALVANIZED, AASHTO M36 (TYP SERVICE - DRAINAGE & CULVERTS)	FOR COUPLING AND END-PROTECTORS, SEE SPEC 02567	NO APPLICABLE

TYPICAL PIPE DESIGNATION:



NOTES:

NOTE 1
ALTHOUGH SEVERAL PIPE MATERIAL GROUPS MAY BE LISTED ON THIS SHEET FOR A GIVEN FLUID SERVICE, CONTRACTOR SHALL PROVIDE ONLY THE PIPE MATERIAL GROUP SHOWN ON THE DRAWINGS AND SPECIFIED FOR THAT FLUID SERVICE.

NOTE 2
LEAKAGE ALLOWANCE IS AS FOLLOWS
A. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE.
B. PIPES SO DESIGNATED SHALL SHOW ZERO LEAKAGE FOR UNBURIED PIPE AND NOT MORE THAN 0.02 GALLON PER HOUR PER INCH DIAMETER PER 100 FEET OF BURIED PIPE.
C. PIPES SO DESIGNATED SHALL NOT SHOW A LEAKAGE OF MORE THAN 0.15 GALLON PER HOUR PER INCH OF DIAMETER PER 100 FEET OF PIPE.
D. PIPES SO DESIGNATED SHALL NOT SHOW A LOSS OF PRESSURE OF MORE THAN 5 PERCENT.
E. PIPE SO DESIGNATED SHALL NOT SHOW A LOSS OF VACUUM OF MORE THAN 4 INCHES MERCURY COLUMN.

NOTE 3
FOR FIELD TEST PROCEDURES AND ADDITIONAL TEST REQUIREMENTS, SEE PIPING SECTION OF SPECIFICATIONS.

NOTE 4
NO SUBSTITUTIONS U.N.O. IN THE SPECIFICATIONS.

NOTE 5
PIPING GROUP FUNCTION SHOWN THUS * SHALL BE INSULATED PER SPECIFICATIONS.

NOTE 6
STATIC WATER TEST WITH SURFACE 5 FEET ABOVE HIGH POINT OF PIPE.

NOTE 7
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE PLUMBING CODE.

NOTE 8
NO APPARENT LEAKS UNDER NORMAL OPERATING CONDITIONS.

NOTE 9
INSPECTION AND TESTING SHALL BE IN ACCORDANCE WITH APPLICABLE NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.

NOTE 10
PIPING MATERIALS SHALL BE IN ACCORDANCE WITH NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.

NOTE 11
FOR VALVES 4" AND LARGER SEE VALVE SCHEDULE FOR SPECIAL VALVES SEE SPECIFICATIONS.

NOTE 12
CHANGE IN PIPING MATERIAL GROUP NUMBER IS INDICATED THUS: ——◆

NOTE 13
FOR FULL PIPE LINING AND COATING REQUIREMENTS, SEE SPECIFICATIONS.

NOTE 14
EXPOSED OUTDOOR PIPING SHALL BE PAINTED IN ACCORDANCE WITH SPECIFICATIONS. COLORS TO BE SELECTED BY OWNER.

NOTE 15
NATURAL GAS BURIED PIPE SHALL BE POLYETHYLENE BASED PIPE IN ACCORDANCE W/ LOCAL GAS UTILITY PIPE REQUIREMENTS FOR PRESSURE GAS SERVICE.

NOTE 16
ALL FISH RELEASE PIPE BENDS SHALL HAVE A MINIMUM RADIUS OF 5 TIMES THE PIPE DIAMETER. FITTINGS FOR FISH RELEASE PIPE SHALL BE OF THE SAME MATERIAL AS THE PIPING. ALL FISH RELEASE PIPING SHALL BE FREE OF BURRS AND ROUGH SURFACES. ALL PIPING JOINTS SHALL BE SMOOTH AND FREE OF SURFACE BLEMISHES.

NOTE 17
FOR HDPE PIPING THE SIZE OF PIPE SHOWN ON DRAWING CALL-OUTS SHALL BE THE MINIMUM INSIDE DIAMETER. PIPE WALL THICKNESS SHALL BE PER DR RATING REQUIREMENT.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

PIPING SCHEDULE

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G005

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G005.dwg Plot date: Sep 26, 2023 06:22pm, CAD User: HaberFlavia

SHEET NOTES:

1. VERTICAL DATUM: NORTH AMERICA VERTICAL DATUM 88 (NAVD88) GEOID12B, US FEET.
2. HORIZONTAL DATUM: NAD83(2011) ALASKA STATE PLANE ZONE 4, US FEET.
3. 2020 LIDAR AND IMAGERY MAPPING WERE PERFORMED BY NV5 LLC, (FORMERLY KNOWN AS QUANTUM SPATIAL INC.) ON MAY, 2020.
4. 2022 LIDAR AND IMAGERY MAPPING WERE BY PERFORMED BY NV5 LLC. ON MAY, 2022.
5. GROUND CONTROL POINTS (GCP) WERE ESTABLISHED FOR GEOSPATIAL CORRECTION BY A. WILLIAM STOLL, PLS #12041 WITH DOWL INC. ON MAY 2020 AND JUNE 2022 RESPECTIVELY FOR BOTH LIDAR AND IMAGERY MAPPING PERIODS.
6. 2022 IMAGERY MAPPING ARE 4-BAND, 32-BIT RGB-IR GEOTIFF WITH 0.15 METER GROUND SAMPLE DISTANCE VIA VEXCEL ULTRA CAM EAGLE ON A TWIN ENGINE, FIXED WING AIRCRAFT.
7. ROAD CROSSING NO. 2 THROUGH NO. 1

   2022 LIDAR - 0.5 METER GEOTIFFS BASE EARTH DIGITAL ELEVATION MODEL (DEM)

8. ROAD CROSSING NO. 2 THROUGH NO. 8

   2022 LIDAR - 0.5 METER GEOTIFFS BASE EARTH DIGITAL ELEVATION MODEL (DEM)

EXIST RIVER CROSSING				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	2707503.60	1782922.84	759.77	ROAD CROSSING NO. 1
2	2707969.40	1780453.05	718.65	ROAD CROSSING NO. 2
3	2708552.28	1779237.95	698.21	ROAD CROSSING NO. 3
4	2712247.39	1775622.06	622.01	ROAD CROSSING NO. 4
5	2714544.84	1773722.77	576.10	ROAD CROSSING NO. 5
6	2717147.47	1771578.34	527.11	ROAD CROSSING NO. 6
7	2718313.63	1769561.00	494.88	ROAD CROSSING NO. 7
8	2718994.84	1767954.17	452.36	ROAD CROSSING NO. 8

PROJECT SITE PLAN
SCALE: 1"=750'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
PROJECT SITE PLAN

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
G006

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\G006.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia

GENERAL PROJECT NOTES:

1. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH 1991 FISH AND WILDLIFE SERVICE (1991 AGREEMENT).
2. ALL CONSTRUCTION ACTIVITIES SHALL COMPLY WITH AWWU AND ADNR STANDARDS AND REQUIREMENTS.
3. ALL CONSTRUCTION ACTIVITIES SHALL BE PERFORMED IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL STANDARDS FOR THE PROJECT.

GENERAL CIVIL NOTES:

1. EXISTING TOPOGRAPHY, STRUCTURES AND SITE FEATURES ARE SHOWN SCREENED AND/OR LIGHT-LINED. NEW FINISH GRADE, STRUCTURES, AND SITE FEATURES ARE SHOWN UNSCREENED AND HEAVY LINED.
2. VERTICAL DATUM: NAVD88, GEOID12B, US FEET.
3. HORIZONTAL DATUM: ALASKA STATE PLANE ZONE 4 NAD83(2011), US FEET.
4. ELEVATIONS GIVEN ARE TO FINISH GRADE UNLESS OTHERWISE SHOWN.
5. SLOPE UNIFORMLY BETWEEN CONTOURS AND SPOT ELEVATIONS SHOWN.

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL ATTEND A PRE-CONSTRUCTION CONFERENCE (OR AN ON-SITE MEETING) WITH THE PROJECT REPRESENTATIVE PRIOR TO THE START OF WORK.
2. THE CONTRACTOR SHALL NOTIFY THE PROJECT REPRESENTATIVE WHEN MATERIALS ARE ON SITE OR AN INSPECTION OF THE WORK IS REQUIRED. NO WORK MAY BEGIN ON ANY PROJECT WITHOUT TWENTY-FOUR (24) HOUR PRIOR NOTICE.
3. CONTRACTOR SHALL FURNISH PROOF THAT ALL MATERIALS INSTALLED ON THIS PROJECT MEET THE REQUIREMENTS OF THE CONTRACT DRAWINGS AND SPECIFICATIONS.
4. ANY DEVIATION FROM THE APPROVED PLANS AND SPECIFICATION MUST HAVE A DESIGN ENGINEER AND OWNER APPROVAL IN WRITING PRIOR TO CONSTRUCTION.
5. UNLESS OTHERWISE NOTED, ALL DISTURBED SURFACES SHALL BE RETURNED TO ORIGINAL OR BETTER CONDITIONS.
6. MAINTAIN, RELOCATE OR REPLACE EXISTING SURVEY MONUMENTS, CONTROL POINTS, AND STAKES WHICH ARE DISTURBED OR DESTROYED. PERFORM THE WORK TO PRODUCE THE SAME LEVEL OF ACCURACY AS THE ORIGINAL MONUMENT(S) IN A TIMELY MANNER, AND AT THE CONTRACTOR'S EXPENSE.
7. THE CONTRACTOR SHALL KEEP CONSTRUCTION ACTIVITIES WITHIN THE SITE BOUNDARIES FOR THIS PROJECT AS SHOWN. THIS INCLUDES, BUT IS NOT LIMITED TO, VEHICLES AND EQUIPMENT, STOCKPILED CUT MATERIAL, AND FILL MATERIAL UNLESS OTHERWISE APPROVED BY OWNER.
8. ALL CONTRACTORS, INCLUDING SUBCONTRACTOR WORKING WITHIN THE PROJECT BOUNDARIES ARE RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE SAFETY LAWS AND STANDARDS.
9. ONLY PLAN SETS STAMPED “ISSUED FOR CONSTRUCTION” SHALL BE USED BY THE PROJECT CONTRACTOR(S).
10. THE CONTRACTOR SHALL KEEP ON SITE AT ALL TIMES A COPY OF THE APPROVED CONSTRUCTION PLANS AND RECORD THE ACTUAL LOCATIONS OF THE CONSTRUCTED WORK AND ANY UTILITIES ENCOUNTERED. THE CONTRACTOR SHALL PROVIDE THESE LOCATIONS TO BE SUBMITTED TO AS PART OF THE RECORD DRAWINGS PER SPECIFICATIONS.
11. UNLESS NOTED OTHERWISE, THE CONTRACTOR(S) SHALL REMOVE ALL OBSTRUCTIONS, BOTH ABOVE AND BELOW GROUND, AS REQUIRED FOR CONSTRUCTION OF THE PROPOSED IMPROVEMENTS. THIS SHALL INCLUDE CLEARING AND GRUBBING WHICH CONSISTS OF CLEARING THE GROUND SURFACE OF ALL TREES, STUMPS, BRUSH, UNDERGROWTH, HEDGES, HEAVY GROWTH OF GRASS OR WEEDS, FENCES, STRUCTURES, DEBRIS, RUBBISH, AND SUCH MATERIAL, WHICH IN THE OPINION OF CONTRACTING OFFICER, IS UNSUITABLE FOR THE FOUNDATION OF CONSTRUCTED WORKS. ALL MATERIAL NOT SUITABLE FOR FUTURE USE ON SITE SHALL BE DISPOSED OF AT OWNER APPROVED LOCATIONS.

GENERAL EXISTING UTILITIES AND STRUCTURE NOTES:

1. EXISTING UNDERGROUND UTILITIES AND STRUCTURES WERE OBTAINED FROM AVAILABLE RECORDS. CONTRACTOR SHALL FIELD VERIFY DEPTH AND LOCATION PRIOR TO EXCAVATION. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES AND STRUCTURES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS AND ELEVATIONS AND SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT UTILITIES OR STRUCTURES SHOWN OR NOT SHOWN.
2. THE CONTRACTOR SHALL PROTECT ALL EXISTING UTILITIES AND STRUCTURES DURING CONSTRUCTION. IF EXISTING UTILITIES (GAS, ELECTRIC, POTABLE WATER, ETC.) ARE IN CONFLICT WITH THE WORK, CONTRACTOR SHALL CONTACT THE ENGINEER.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR SHALL LOCATE ALL EXIST UTILITIES AND STRUCTURES IN AND AROUND THE AREAS OF NEW CONSTRUCTION. THE CONTRACTOR SHALL POTHOLE FOR EXIST UTILITIES PRIOR TO SUBMITTAL OF SHOP DRAWINGS, FOR POINTS OF CONNECTIONS.
4. THE CONTRACTOR SHALL CONTACT THE UTILITY AGENCIES FOR THE FIELD LOCATION OF UTILITIES AT LEAST 72 HOURS PRIOR TO THE START OF CONSTRUCTION. A DIG ALERT IDENTIFICATION NUMBER MUST BE ISSUED BEFORE A PERMIT TO EXCAVATE WILL BE VALID.
5. THE CONTRACTOR SHALL REPAIR ALL EXISTING SURFACES, UTILITIES, BUILDINGS AND FOUNDATIONS IMPACTED BY CONSTRUCTION.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

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McMillen

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MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

CIVIL GENERAL NOTES

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

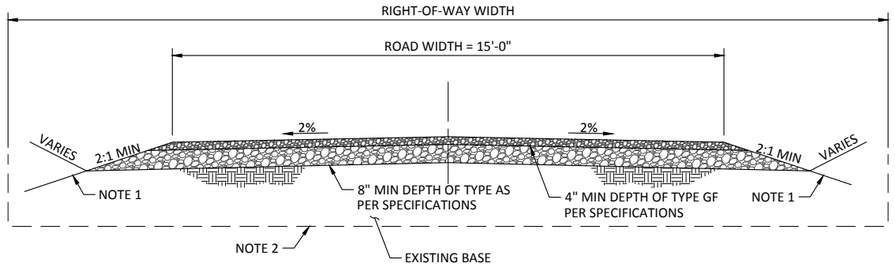
PROJECT DATE 10/6/23

DRAWING

GC001

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\GC001.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia



NOTES:
1. BORROW DITCHES SHALL HAVE A MINIMUM 2:1 SLOPE WITH 4:1 SLOPE RECOMMENDED. THE BACKSLOPE OF THE BORROW DITCH SHALL BE MINIMUM 2:1 BACKSLOPE WITH 4:1 BACKSLOPE RECOMMENDED. THE FLOW LINE IF THE DITCH SHALL BE 6" BELOW THE LOWEST AGGREGATE BASE COURSE TO ENCOURAGE DRAINAGE.
2. OVER EXCAVATE EXISTING GRADE 12" MIN. PROOF ROLL AND BACKFILL WITH TYPE EF PER SPECIFICATIONS.

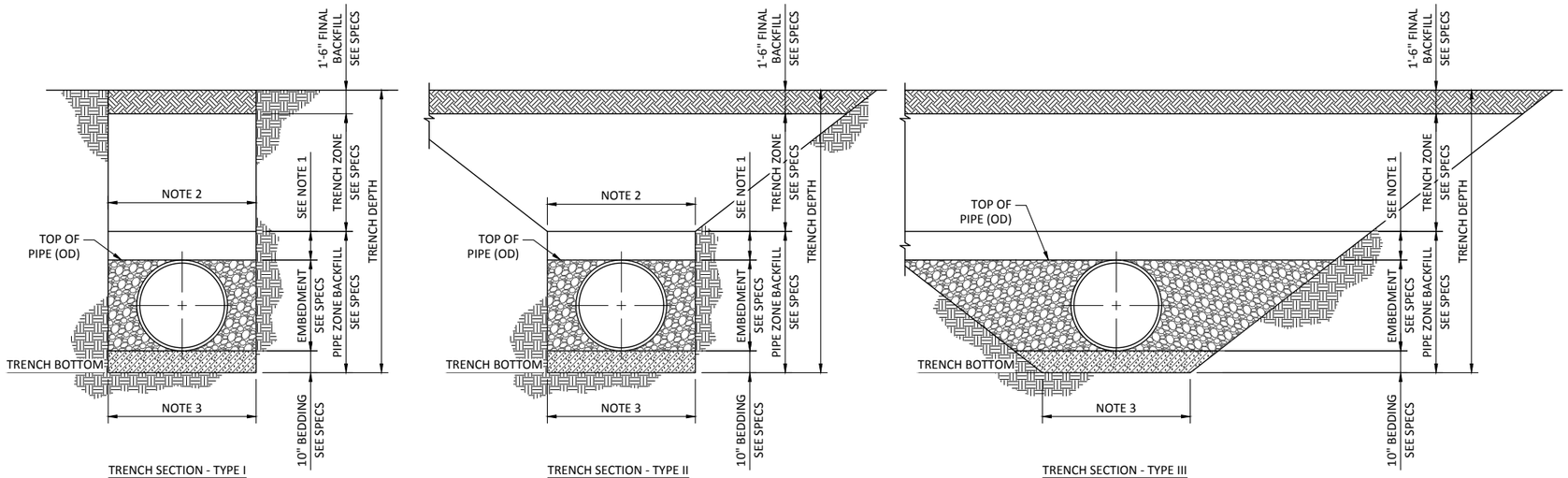
TYPICAL GRAVEL ROAD SECTION

SCALE: NTS

C137

A. FLEXIBLE PIPE REFERS TO ALL STEEL, DUCTILE-IRON, AND PLASTIC PIPES.
B. TYPICAL TRENCH SECTIONS (I, II AND III) ARE TO BE USED ONLY WHERE STABLE, COMPACT SOIL CONDITIONS EXIST. IF BOULDERS OR LARGE OBSTRUCTIONS ARE ENCOUNTERED, TRENCH SECTIONS MAY BE DEEPER OR WIDER THAN SHOWN. THE ENGINEER SHALL BE ADVISED SHOULD THIS OCCUR.
C. THE NEED FOR PROTECTIVE SYSTEMS AND EXCAVATION SLOPES SHALL BE DETERMINED CONSIDERING APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS, AND GEOTECHNICAL CONSULTANTS' RECOMMENDATIONS.
D. PROTECTIVE SYSTEMS SHALL BE DESIGNED AND BUILT IN ACCORDANCE WITH THE APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS.
E. SUPPORTING DOCUMENTATION SHALL BE SUBMITTED TO THE ENGINEER REGARDING PIPE DESIGN AND COMPLIANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS.
F. UNSUPPORTED VERTICAL AND/OR SLOPING TRENCH WALL SLOPES SHALL NOT BE STEEPER THAN ALLOWED BY APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS, UNLESS SUPPORTING DOCUMENTATION IS SUBMITTED, ACCORDING TO AFOREMENTIONED SAFETY STANDARDS.
G. TRENCH SECTIONS OTHER THAN THE TYPICAL SECTIONS SHOWN MAY BE UTILIZED PROVIDED THEY COMPLY WITH APPLICABLE LOCAL, STATE AND FEDERAL (OSHA) SAFETY STANDARDS AND REGULATIONS. DOCUMENTATION SUPPORTING THIS COMPLIANCE AND PIPE DESIGN CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEER.
H. IF OVER-EXCAVATION DUE TO POOR FOUNDATION MATERIAL IS ORDERED BY THE ENGINEER, THE BACKFILL MATERIAL SHALL BE ACCORDING TO THE EARTHWORK SECTION OF THE SPECIFICATIONS ARTICLE ENTITLED, "FILL AND BACKFILL MATERIAL REQUIREMENTS."
I. IF DURING CONSTRUCTION, THE WATER TABLE IS DISCOVERED TO BE ABOVE THE TRENCH BOTTOM, THE ENGINEER SHALL BE NOTIFIED, AND APPROPRIATE DEWATERING SHALL BE IMPLEMENTED TO LOWER THE WATER LEVEL BELOW THE TRENCH BOTTOM. THE BACKFILL MATERIAL SHALL BE ACCORDING TO THE EARTHWORK SECTIONS OF THE SPECIFICATIONS, OR AS ORDERED BY THE ENGINEER.

NOTES:
1. 6" MIN FOR PIPE DIAMETER < 24"
   12" MIN FOR PIPE DIAMETER > 24"
2. MAX TRENCH WIDTH @ TOP OF PIPE:
   O.D. + 36" FOR, 18" & LARGER PIPE O.D.
   O.D. + 24" FOR LESS THAN 18" PIPE O.D.
3. MIN TRENCH BOTTOM WIDTH =
   O.D. + 24" FOR MECHANICAL COMPACTION



TRENCH SECTION FLEXIBLE PIPE

SCALE: NTS

C601

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
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MUNICIPALITY OF ANCHORAGE

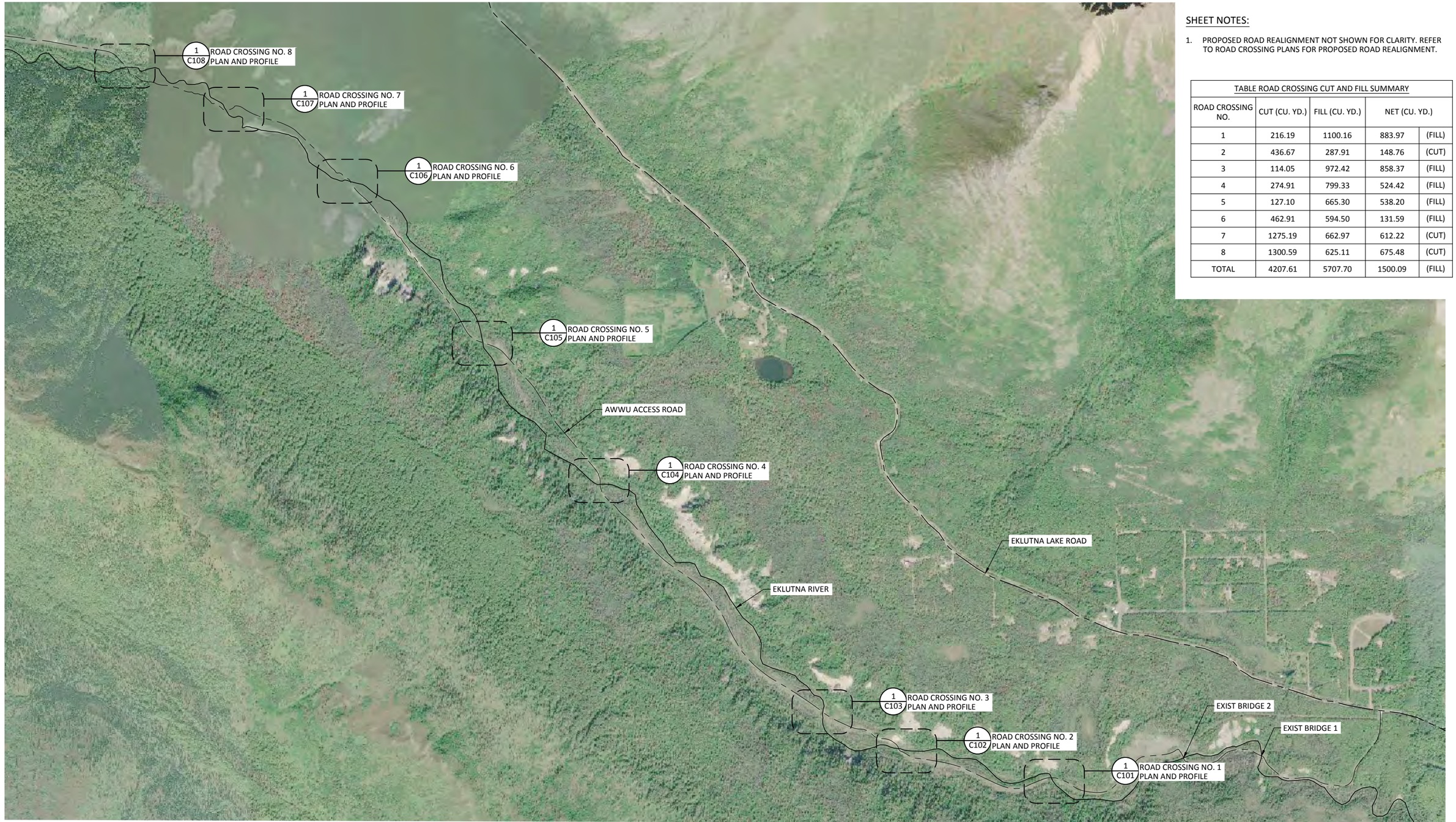
EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES
STANDARD CIVIL DETAILS 1

DESIGNED L.VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
GC002

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\GC002.dwg Plot date: Sep 26, 2023 06:36pm, CAD User: HaberFlavia



SHEET NOTES:

1. PROPOSED ROAD REALIGNMENT NOT SHOWN FOR CLARITY. REFER TO ROAD CROSSING PLANS FOR PROPOSED ROAD REALIGNMENT.

TABLE ROAD CROSSING CUT AND FILL SUMMARY

ROAD CROSSING NO.	CUT (CU. YD.)	FILL (CU. YD.)	NET (CU. YD.)	
1	216.19	1100.16	883.97	(FILL)
2	436.67	287.91	148.76	(CUT)
3	114.05	972.42	858.37	(FILL)
4	274.91	799.33	524.42	(FILL)
5	127.10	665.30	538.20	(FILL)
6	462.91	594.50	131.59	(FILL)
7	1275.19	662.97	612.22	(CUT)
8	1300.59	625.11	675.48	(CUT)
TOTAL	4207.61	5707.70	1500.09	(FILL)

OVERALL SITE KEY PLAN
SCALE: 1"=750'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

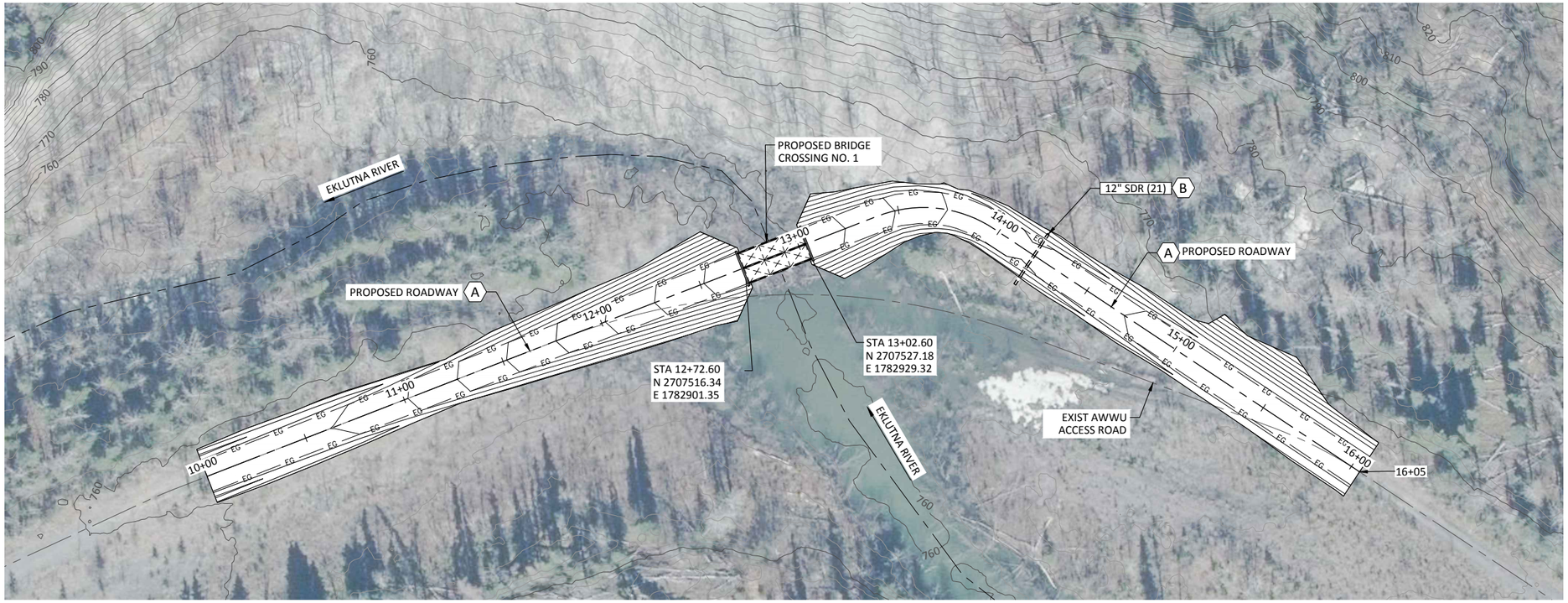
OVERALL SITE KEY PLAN AND EARTHWORK QUANTITIES

DESIGNED L. VO
DRAWN F. HABER
CHECKED J. BOAG
PROJECT DATE 10/6/23

DRAWING
C001

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C001.dwg Plot date: Sep 29, 2023 02:18pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 1 PLAN

SCALE: 1"= 30'

0" 30' 60'

N

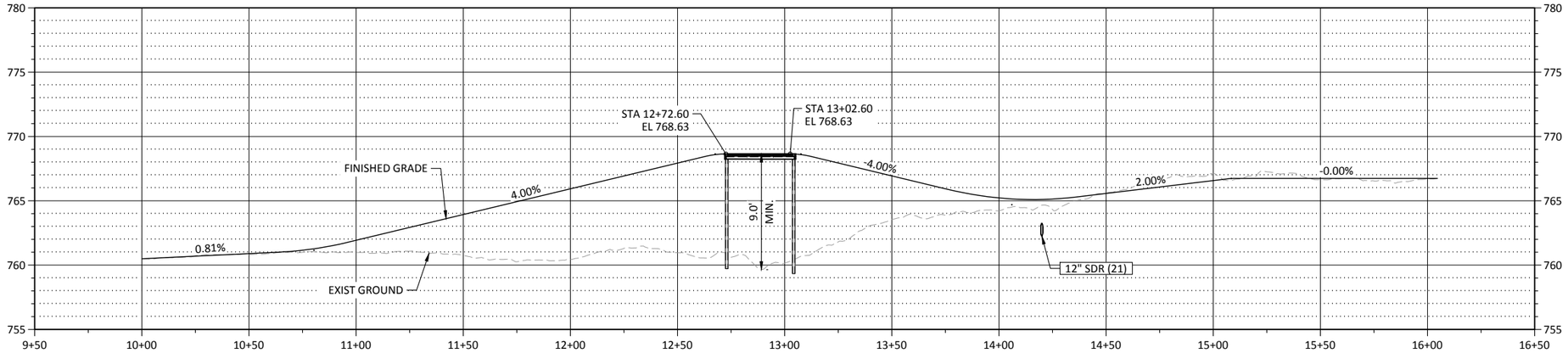
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 1
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

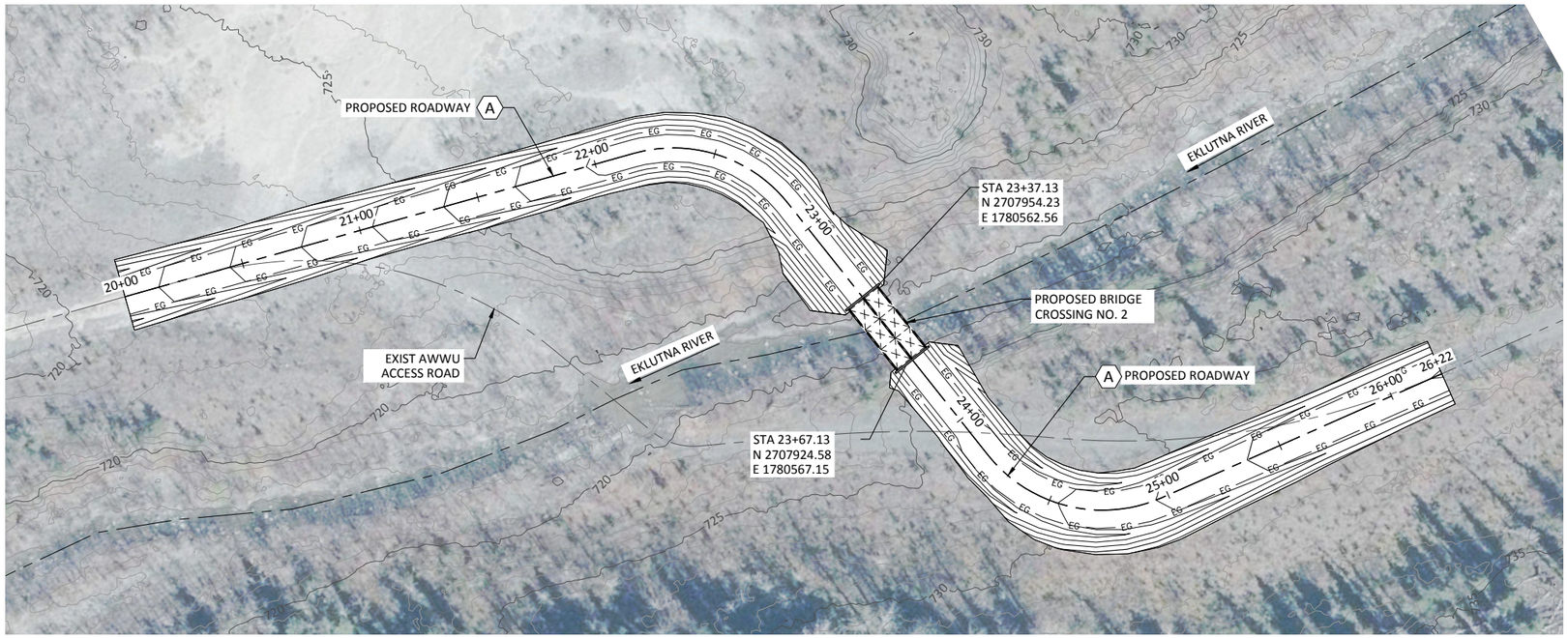
PROJECT DATE 10/6/23

DRAWING

C101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C101.dwg Plot date: Sep 29, 2023 01:50pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 2 PLAN

SCALE: 1"= 30'

0" 30' 60'

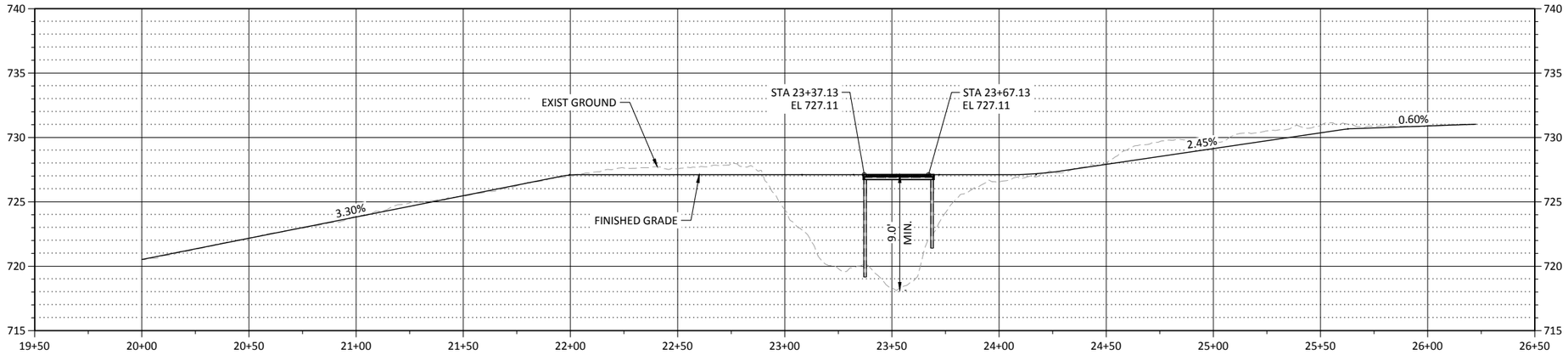
N

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 2
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

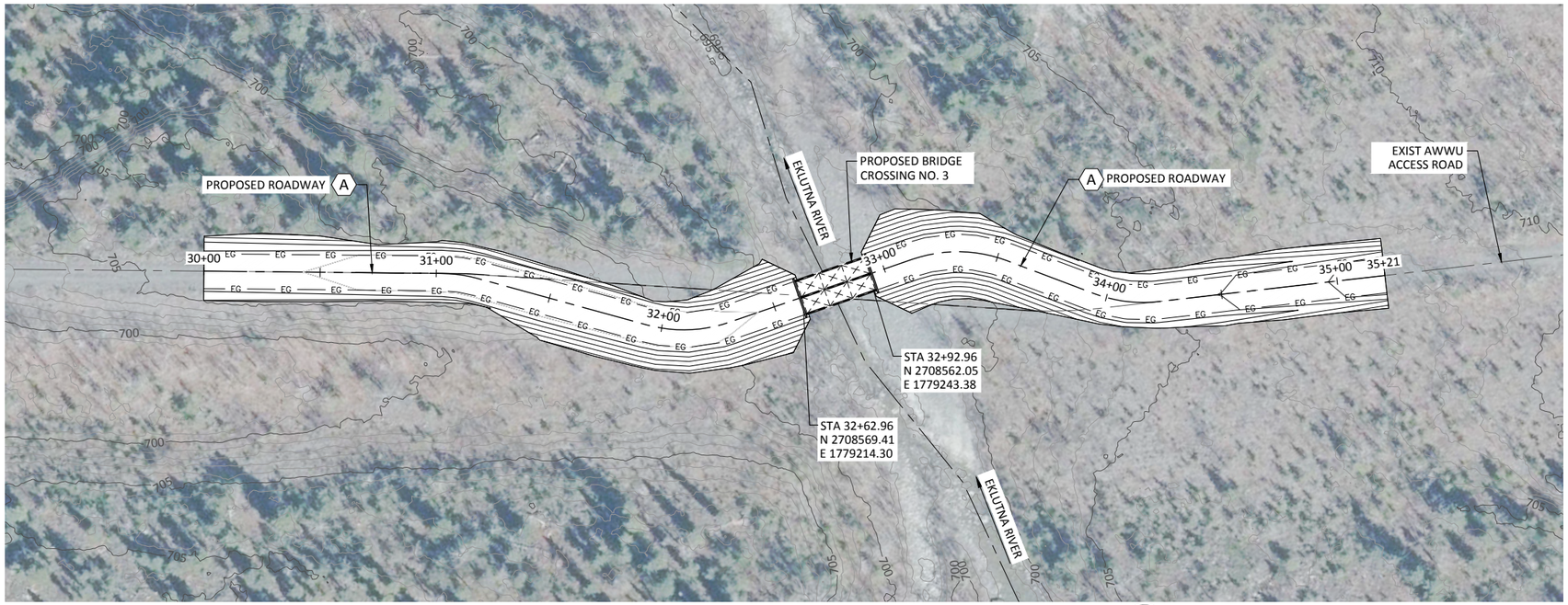
PROJECT DATE 10/6/23

DRAWING

C102

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C102.dwg Plot date: Sep 29, 2023 11:59am, CAD User: HaberFlavia

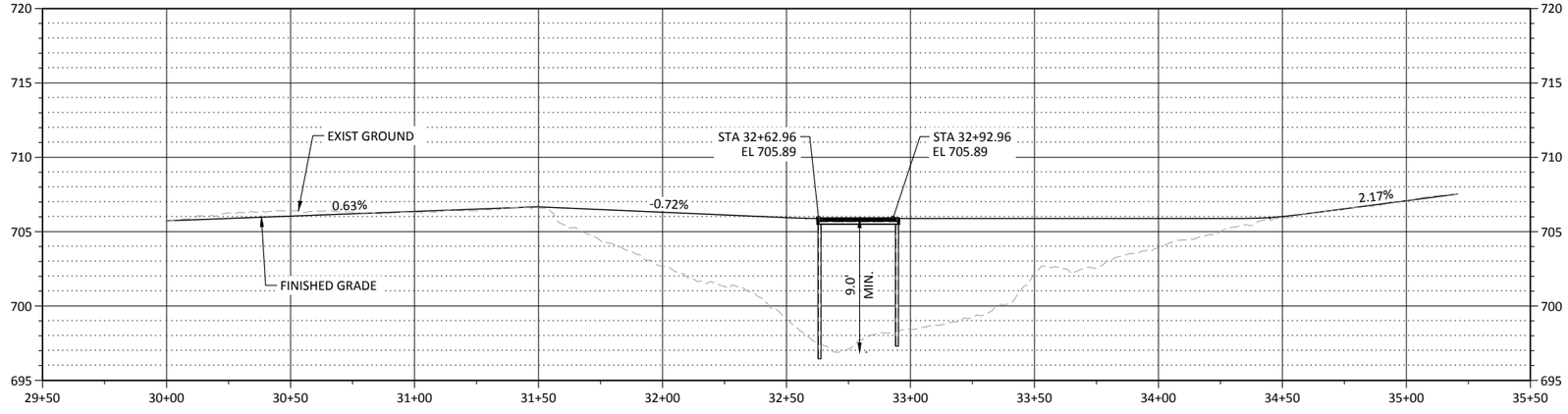


1 / C001 ROAD CROSSING NO. 3 PLAN

SCALE: 1"= 30'

0" 30' 60'

N



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 3
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C103

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C103.dwg Plot date: Sep 29, 2023 12:00pm, CAD User: HaberFlavia

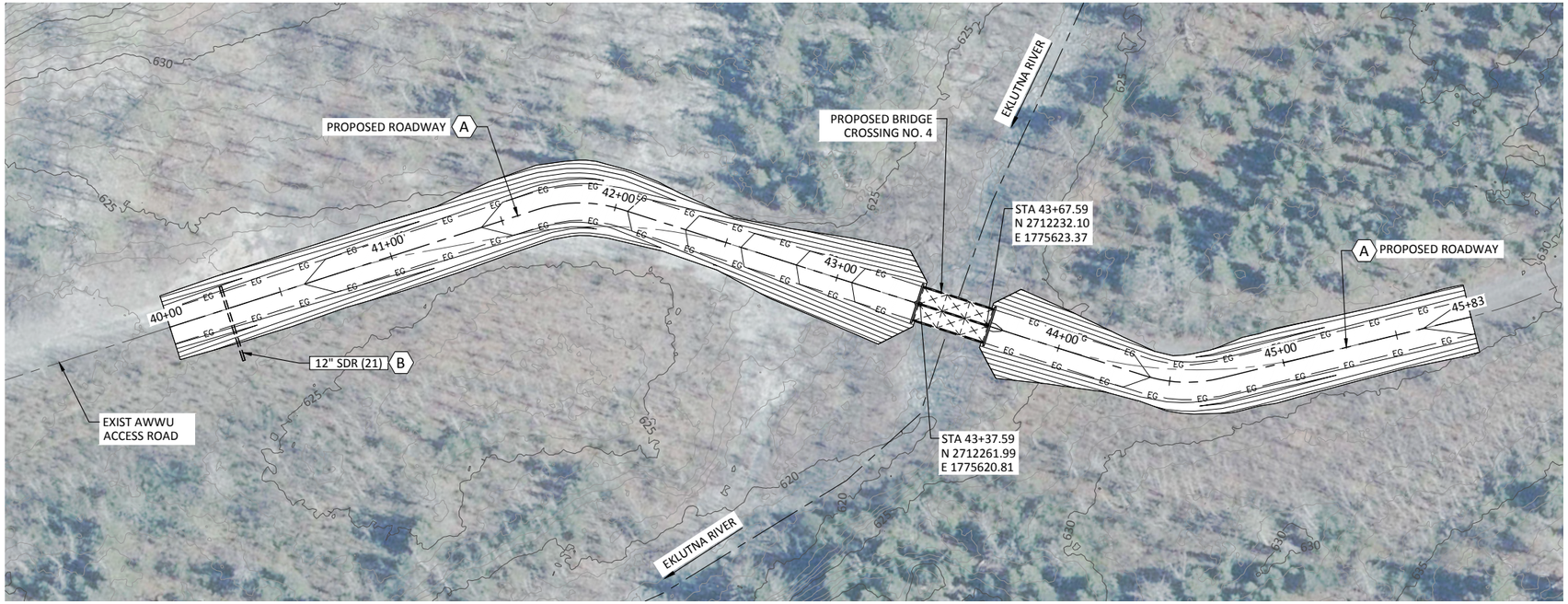
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

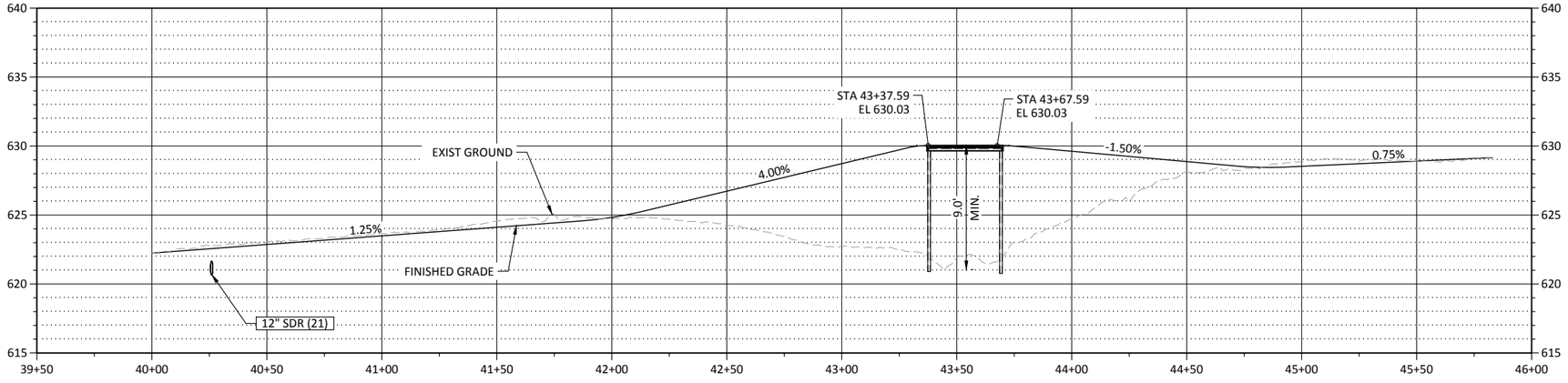
A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



1 / C001 ROAD CROSSING NO. 4 PLAN

SCALE: 1"= 30'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 4
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

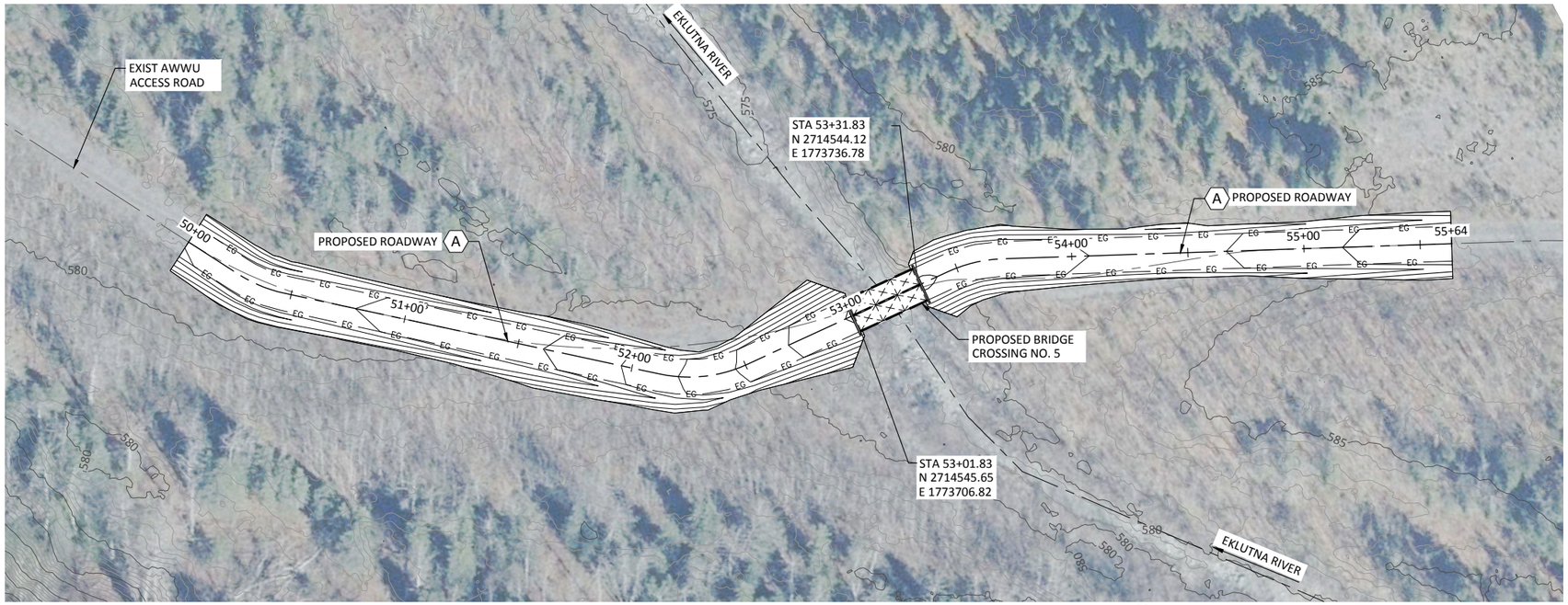
PROJECT DATE 10/6/23

DRAWING

C104

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C104.dwg Plot date: Sep 29, 2023 12:00pm, CAD User: HaberFlavia

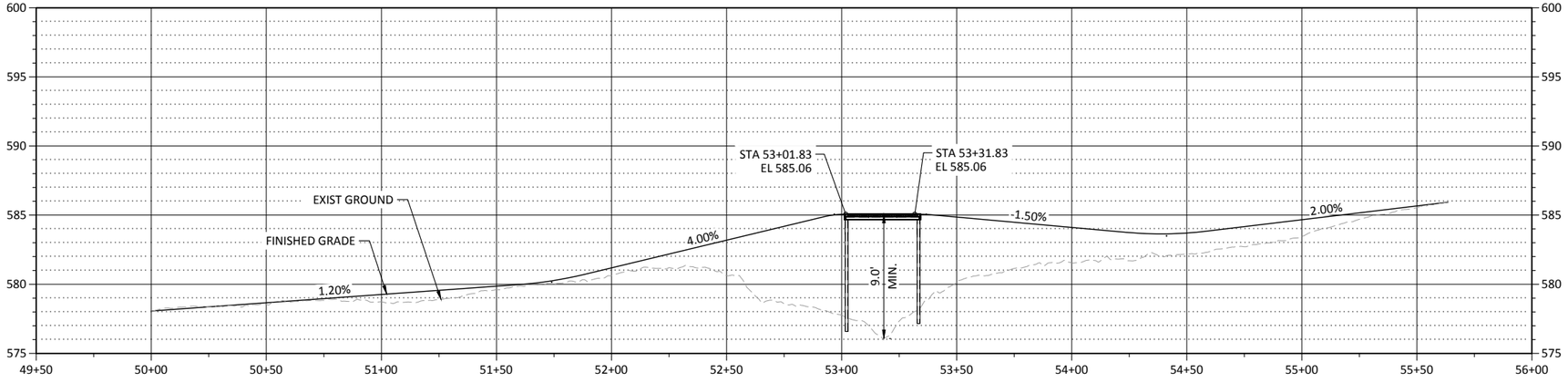


1 C001 ROAD CROSSING NO. 5 PLAN

SCALE: 1"= 30'

0" 30' 60'

N



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 5
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

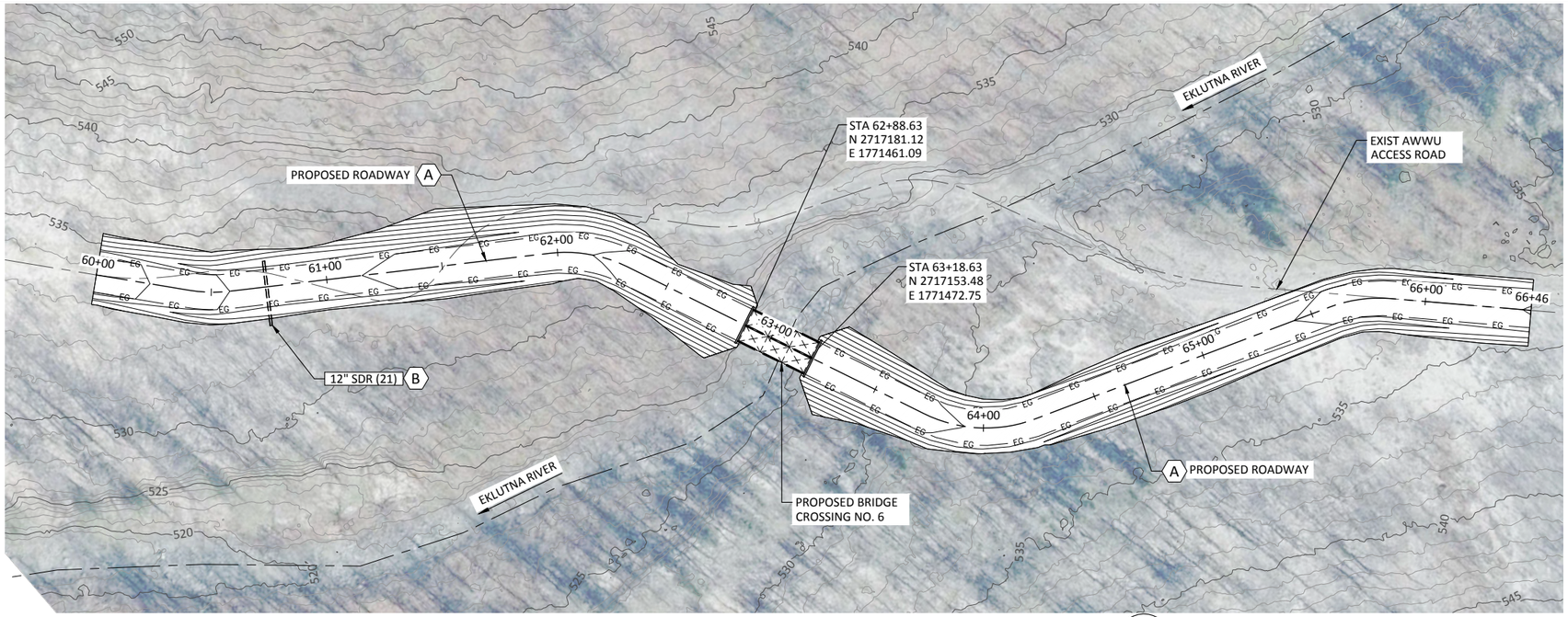
PROJECT DATE 10/6/23

DRAWING

C105

JOB NO: 000000

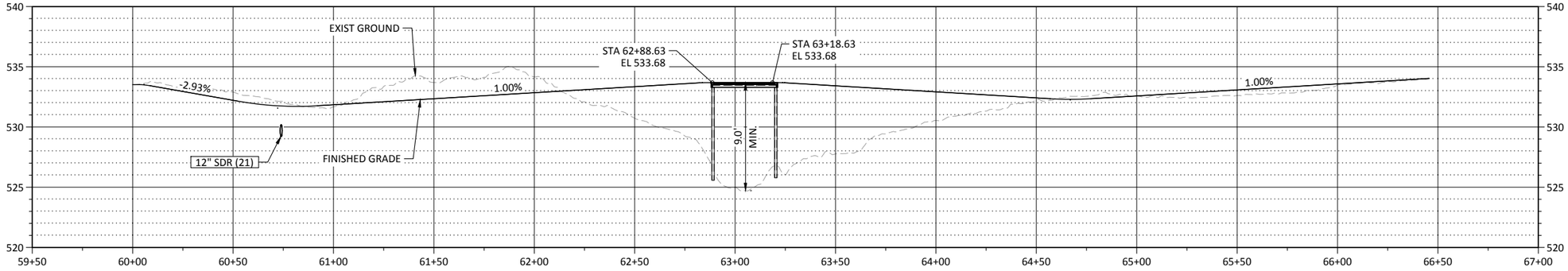
Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C105.dwg Plot date: Sep 29, 2023 12:02pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 6 PLAN

SCALE: 1"= 30'

0" 30' 60'



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 6
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

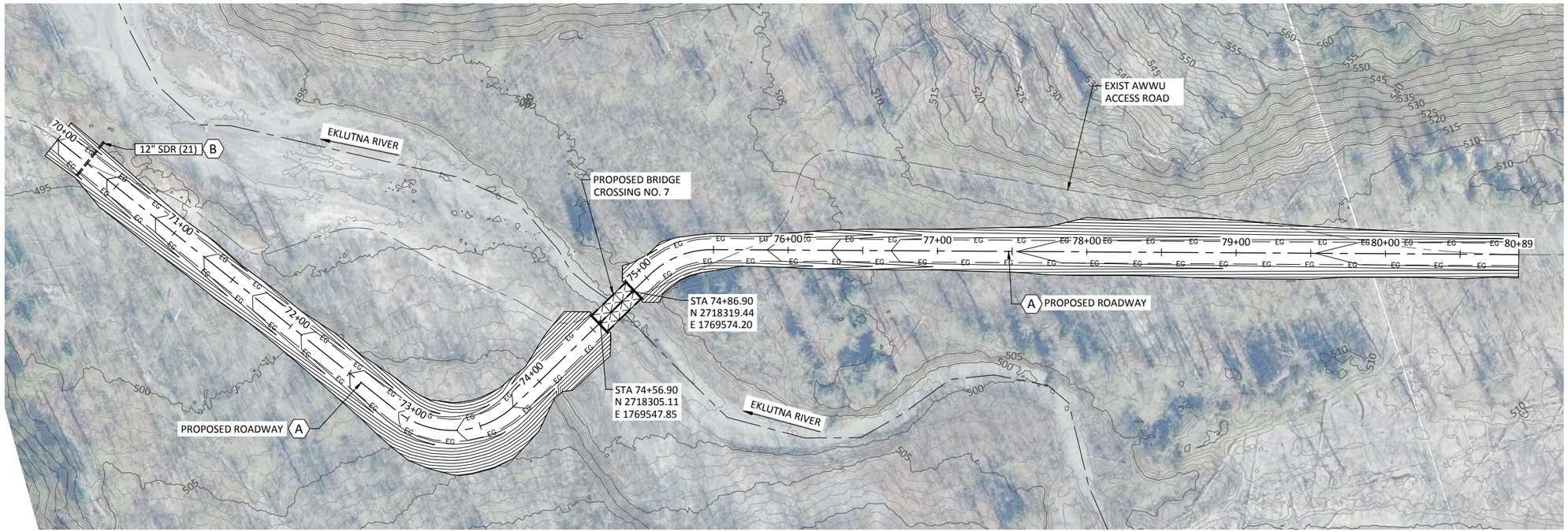
PROJECT DATE 10/6/23

DRAWING

C106

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C106.dwg Plot date: Sep 29, 2023 01:39pm, CAD User: HaberFlavia



1 / C001 ROAD CROSSING NO. 7 PLAN

SCALE: 1"= 40'

0" 40' 80'

N

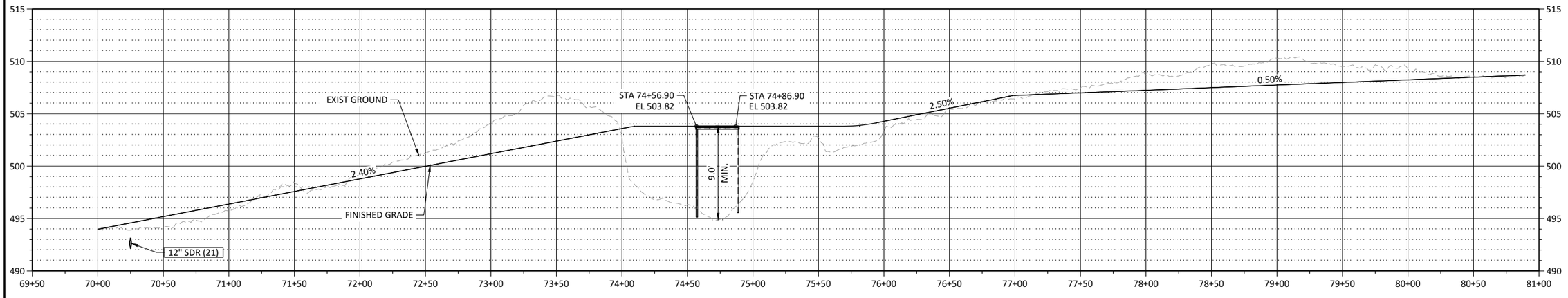
SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.

B INSTALL 12 INCH CULVERT PER STD DETAIL C601.



PROFILE

SCALE: HORIZ 1"= 40'

VERT 1"= 5'

0" 40' 80'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 7
PLAN AND PROFILE

DESIGNED L. VO

DRAWN F. HABER

CHECKED J. BOAG

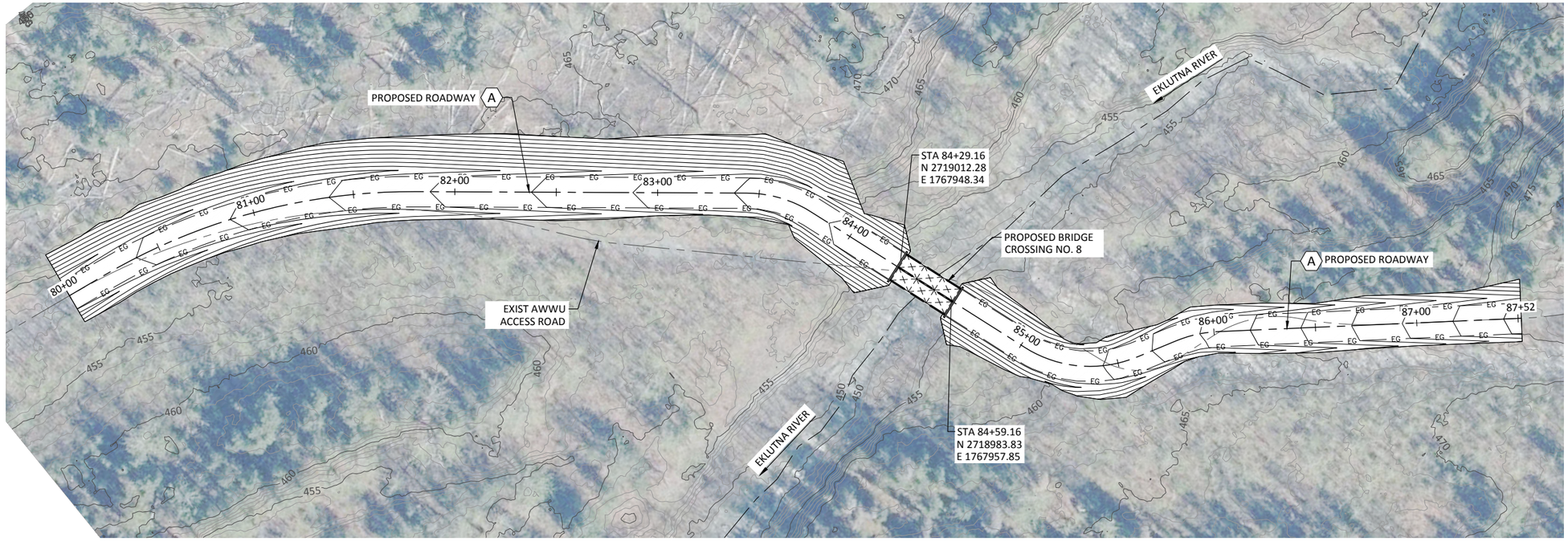
PROJECT DATE 10/6/23

DRAWING

C107

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\C107.dwg Plot date: Sep 29, 2023 01:57pm, CAD User: HaberFlavia



1 C001 ROAD CROSSING NO. 8 PLAN

SCALE: 1"= 30'

0" 30' 60'

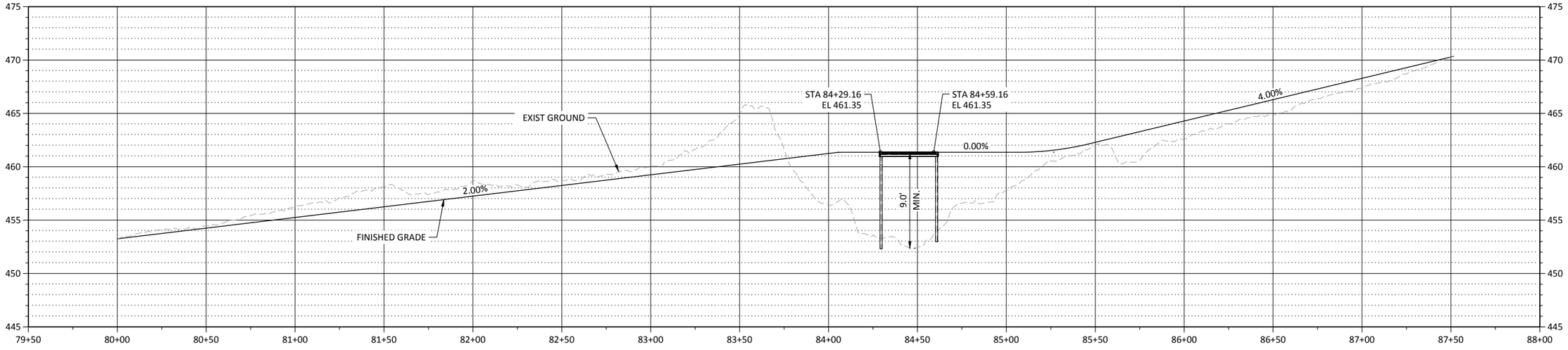
N

SHEET NOTES:

1. REFER TO STRUCTURAL DWG FOR BRIDGE DETAILS.

SHEET KEY NOTES:

A CONSTRUCT 15 FT WIDE ROAD PER STD DETAIL C137.



PROFILE

SCALE: HORIZ 1"= 30'

VERT 1"= 5'

0" 30' 60'

0" 5' 10'

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

ROAD CROSSING NO. 8
PLAN AND PROFILE

DESIGNED L.VO

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

C108

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridges\C108.dwg Plot date: Sep 29, 2023 12:07pm, CAD User: HaberFlavia

GENERAL STRUCTURAL NOTES:
THE FOLLOWING NOTES ARE GENERAL AND APPLY TO THE ENTIRE PROJECT, UNLESS SPECIFICALLY NOTED OTHERWISE (UNO)

1) GENERAL:

A. CONSTRUCTION DOCUMENTS:
   1. THE CONTRACTOR SHALL REVIEW THE APPROVED CONTRACT DOCUMENTS AND NOTIFY THE ENGINEER OF ANY ERRORS OR DISCREPANCIES PRIOR TO THE START OF CONSTRUCTION.
   2. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF ANY UNIDENTIFIED EXISTING UNDERGROUND UTILITIES ARE DISCOVERED.
   3. THE STRUCTURAL CONTRACT DRAWINGS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, BRACING AND/OR SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC.
   4. UNDER NO CIRCUMSTANCES CAN STRUCTURAL COMPONENTS BE SUBSTITUTED, OMITTED, OR ALTERED FROM THE APPROVED SET OF CONSTRUCTION DOCUMENTS WITHOUT WRITTEN APPROVAL FROM THE ENGINEER.

B. DIMENSIONS AND NOTATIONS:
   1. WRITTEN DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALED DIMENSIONS. DO NOT SCALE DRAWINGS.
   2. ABBREVIATIONS USED ON THE APPROVED CONSTRUCTION DOCUMENTS SHALL BE CONSIDERED TYPICAL ABBREVIATIONS FOR THE INDUSTRY. THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE ENGINEER IMMEDIATELY OF ANY ABBREVIATIONS THAT ARE UNKNOWN TO THE CONTRACTOR.

C. TYPICAL NOTES AND DETAILS:
   1. SPECIFIC NOTES AND DETAILS SHALL TAKE PRECEDENCE OVER STANDARD TYPICAL NOTES AND DETAILS.
   2. STANDARD TYPICAL NOTES AND DETAILS ARE TO BE USED WHEN REFERRED TO OR WHEN NO OTHER MORE RESTRICTIVE OR DIFFERENT DETAILS ARE SHOWN ON THE DRAWINGS.
   3. WORK NOT PARTICULARLY SHOWN OR SPECIFIED SHALL BE THE SAME AS SIMILAR PARTS THAT ARE SHOWN OR SPECIFIED.

D. CODE REQUIREMENTS:
   1. ALL WORK SHALL CONFORM TO THE MINIMUM STANDARDS OF REGULATING AGENCIES WHICH MAY HAVE AUTHORITY OVER ANY PORTION OF THE WORK.
   2. SPECIFICATIONS, CODES AND STANDARDS NOTED SHALL BE OF THE LATEST APPROVED ISSUE, INCLUDING SUPPLEMENTS, UNLESS NOTED OTHERWISE.
   3. MINIMUM UNIFORM (BLANKET) ROOF SNOW LOAD, AS DEFINED BY LOCAL BUILDING OFFICIAL OR STATE, SHALL BE DESIGNED FOR.

2) CODES, STANDARDS, AND REFERENCES:

A. ASCE 7-16: MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES
B. ACI 318-14: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
C. ACI 350-06: CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES
D. AISC 360-16 SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS
E. 2018 INTERNATIONAL BUILDING CODE (IBC)

3) FOUNDATIONS AND GEOTECHNICAL:

A. GEOTECHNICAL DESIGN CRITERIA IS BASED ON THE RECOMMENDATIONS DOCUMENTED IN THE DESIGN DOCUMENTATION REPORT:

4) NON-SHRINK GROUT:
A. ALL GROUT WORK SHALL CONFORM TO THE LATEST EDITION OF ACI 301.
B. FORMWORK: DESIGN, ERECT, SUPPORT, BRACE AND MAINTAIN FORMWORK TO SUPPORT VERTICAL, LATERAL, STATIC AND DYNAMIC LOADS THAT MIGHT BE APPLIED UNTIL STRUCTURE CAN SUPPORT SUCH LOADS.

5) STRUCTURAL AND MISCELLANEOUS STEEL:

A. STRUCTURAL STEEL SHALL CONFORM TO THE FOLLOWING ASTM STANDARDS:

a)	WIDE FLANGE SHAPES	A992, GR 50 GALV
b)	OTHER SHAPES, PLATES, ANGLES AND BARS	A36 GALV
c)	STEEL PIPE	A53, GRADE B GALV
d)	HOLLOW STRUCTURAL SECTIONS	A500, GRADE B GALV

B. WELDS: PROVIDE 70KSI LOW HYDROGEN ELECTRODE OR PROCESS IN ACCORDANCE WITH AWS A5.1.
C. BOLTS, U.N.O.:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI TYPE 316
D. DRILL AND EPOXY ANCHOR BOLTS:
   1. STAINLESS STEEL: ASTM A193, GRADE 8, CLASS 2, AISI, TYPE 316 OR EQUAL APPROVED BY ENGINEER
E. EPOXY BOLT OR EXPANSION BOLT SUBSTITUTIONS FOR EMBEDDED BOLTS IS PROHIBITED WITHOUT WRITTEN CONSENT FROM THE ENGINEER.
F. UNLESS NOTED OTHERWISE ON THE DRAWINGS, ALL EPOXY BOLTS SHALL BE AS SPECIFIED.
G. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED, AND ERECTED IN ACCORDANCE WITH THE AISC CODE OF STANDARD PRACTICE, EXCEPT AS MODIFIED IN THESE NOTES AND THE PROJECT SPECIFICATIONS.

6) ROUGH CARPENTRY:

A. STANDARDS AND REFERENCES

ROUGH CARPENTRY CONSTRUCTION SHALL COMPLY WITH THE FOLLOWING IN ADDITION TO THE STANDARDS AND REFERENCES LISTED IN GENERAL NOTE 2:

NDS	ANSI/AWC - NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, 2015 EDITION
SDPWS	ANSI/AWC - SPECIAL DESIGN PROVISIONS FOR WIND AND SEISMIC, 2015 EDITION

B. MATERIALS

1. LUMBER GRADE – STRUCTURAL FRAMING LUMBER SHALL BE DOUGLAS FIR -LARCH, NO. 2 OR BETTER UNLESS OTHERWISE INDICATED. REFER TO ARCH FOR TIMBER SIDING MATERIAL SPECIFICATION.

2. MOISTURE CONTENT - STRUCTURAL WOOD MEMBERS SHALL HAVE A MAXIMUM MOISTURE CONTENT OF 19 PERCENT AND NOT LESS THAN ONE PERCENT.

3. PRESERVATIVE TREATMENT – WOOD SHALL BE PRESERVATIVE TREATED IN ACCORDANCE WITH AWPA STANDARD U1 AND M4 FOR THE SPECIES, PRODUCT, PRESERVATIVE AND END USE. PRESERVATIVE TREATED WOOD SHALL BE MARKED PER IBC SECTION 2303.1.9.1.

4. CONNECTORS AND FASTENERS – WOOD CONSTRUCTION CONNECTORS AND FASTENERS SHALL BE GALVANIZED.

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING
0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen | CHUGACH POWERING ALASKA'S FUTURE | MEA MATANUSKA ELECTRIC ASSOCIATION | MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT
AWWU MAINTENANCE ROAD AND BRIDGES

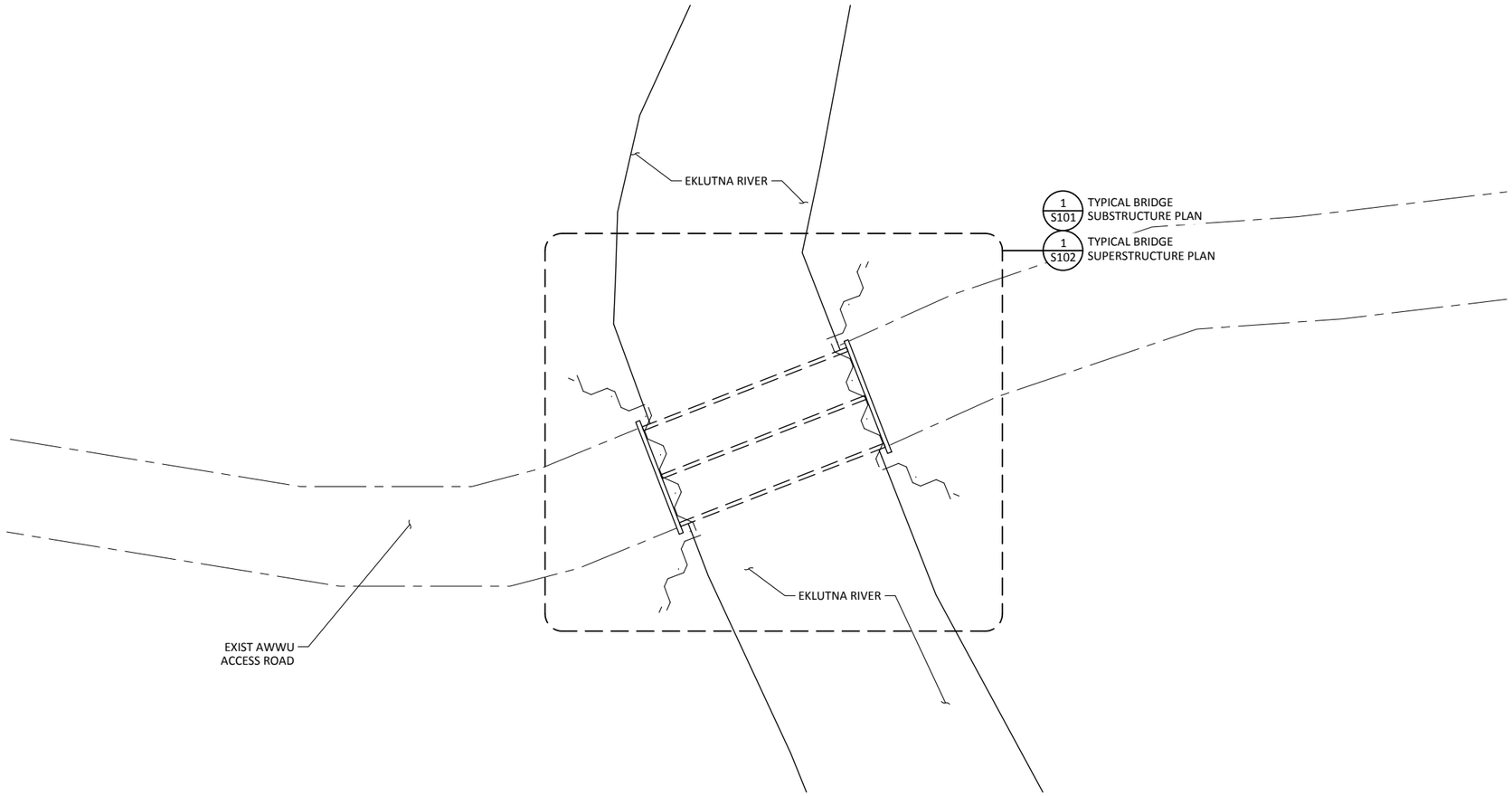
STRUCTURAL GENERAL NOTES

DESIGNED K. HEINDEL
DRAWN F. HABER
CHECKED C. BY
PROJECT DATE 10/6/23

DRAWING
GS001

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\GS001 STRUCTURAL GENERAL NOTES.dwg Plot date: Sep 27, 2023 08:13pm, CAD User: HaberFlavia



TYPICAL BRIDGE CROSSING PLAN

SCALE: NTS

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE CROSSING PLAN

DESIGNED K. HEINDEL

DRAWN F. HABER

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

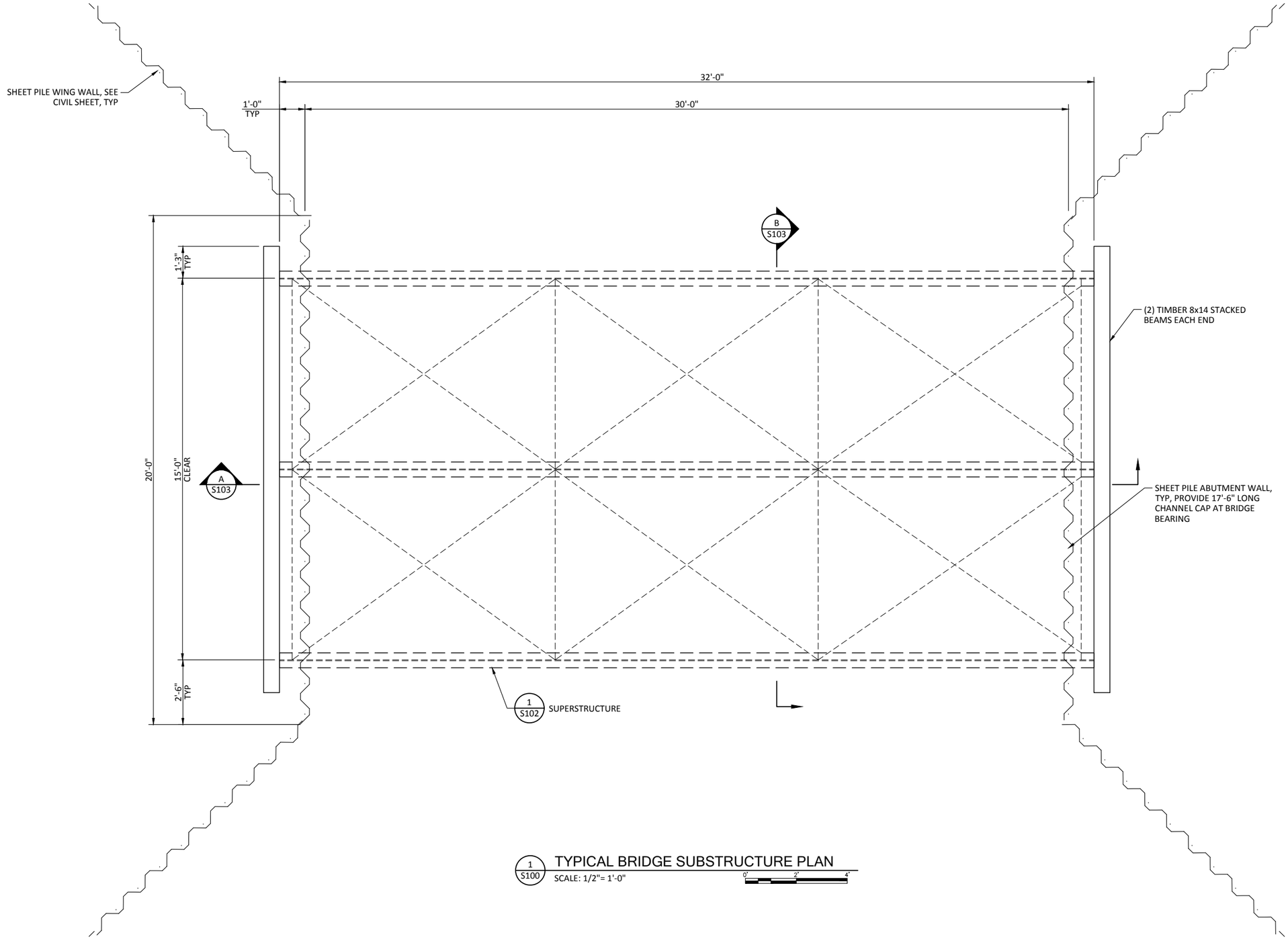
S100

JOB NO: 0000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S100.dwg Plot date: Sep 27, 2023 08:13pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).



1 S100 TYPICAL BRIDGE SUBSTRUCTURE PLAN

SCALE: 1/2"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SUBSTRUCTURE PLAN

DESIGNED K. HEINDEL

DRAWN J. HOLT

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

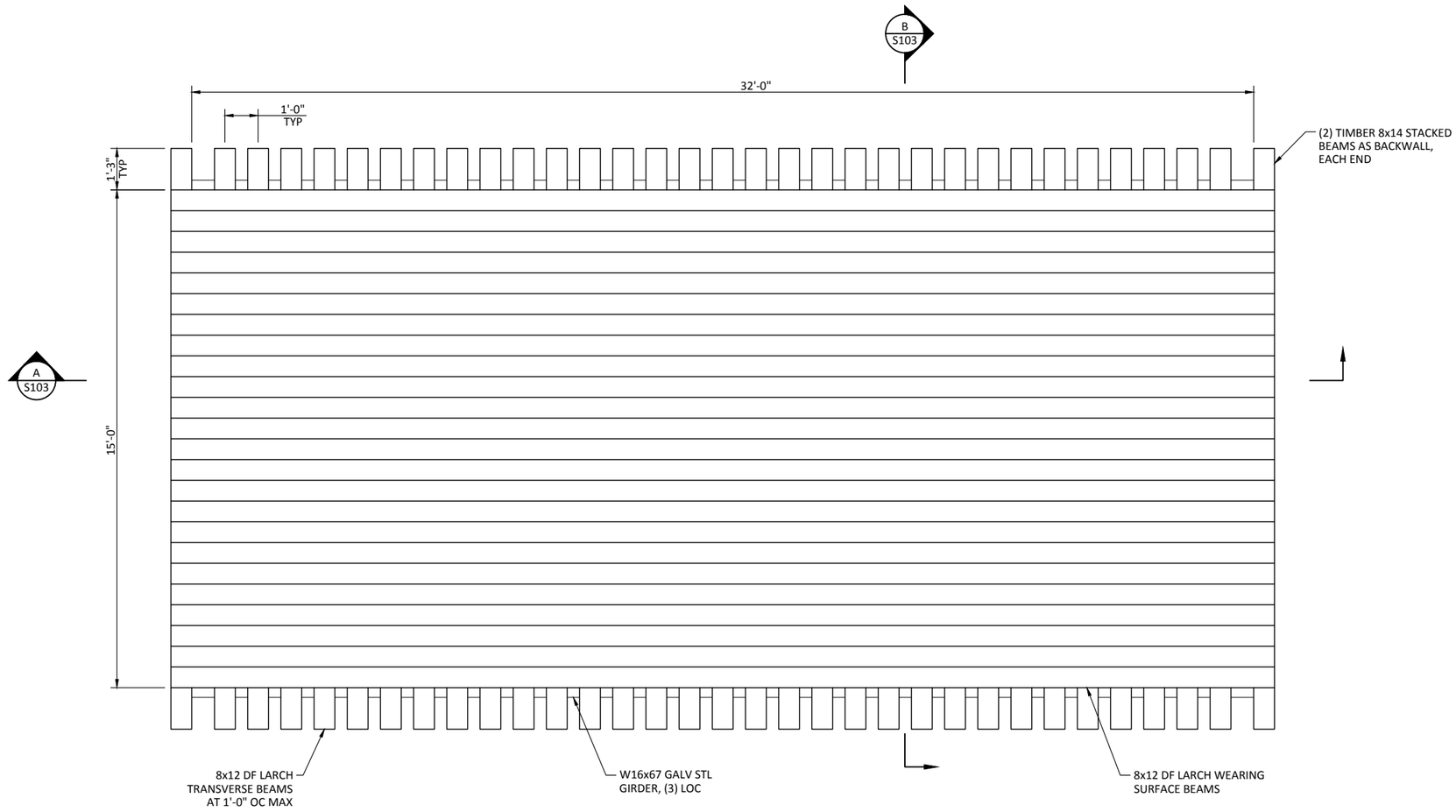
S101

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S101.dwg Plot date: Sep 27, 2023 08:17pm, CAD User: HaberFlavia

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INTERIOR W16x67 GALV STL GIRDER AND BRACING NOT SHOWN FOR CLARITY.



1 / S100 TYPICAL BRIDGE SUBSTRUCTURE PLAN

SCALE: 1/2"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SUPERSTRUCTURE PLAN

DESIGNED K. HEINDEL

DRAWN J. HOLT

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

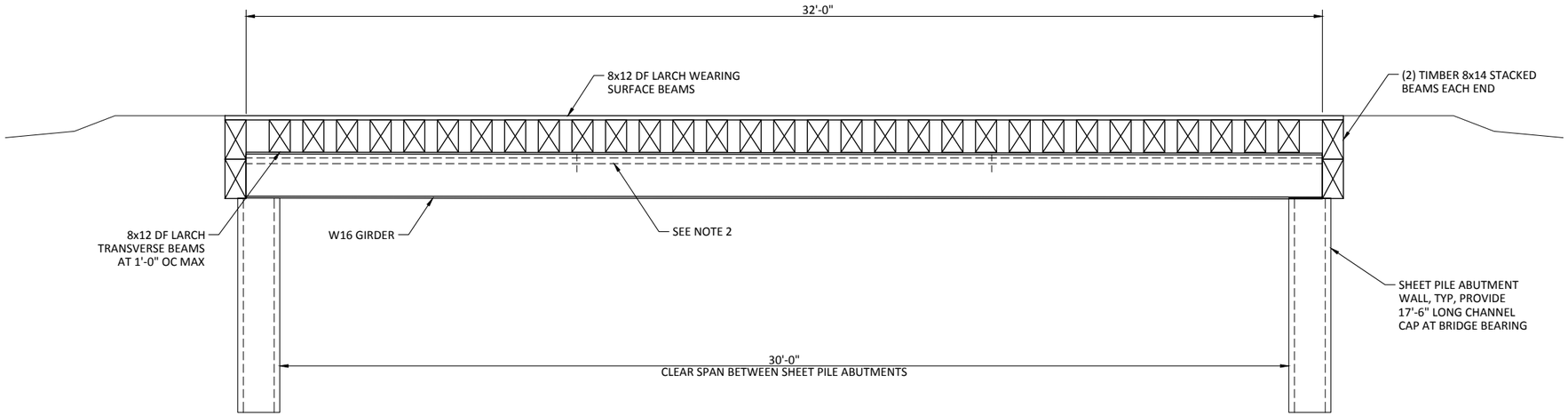
S102

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S102.dwg Plot date: Sep 27, 2023 08:18pm, CAD User: HaberFlavia

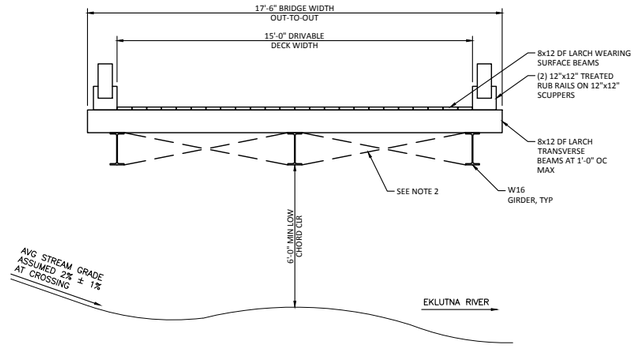
SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. INTERIOR GALV STL BRACING TO BE DETERMINED.



A S101 BRIDGE SECTION

SCALE: 1/2"= 1'-0"



B S101 BRIDGE SECTION

SCALE: 1/2"= 1'-0"

PRELIMINARY
NOT FOR CONSTRUCTION

REV	DATE	BY	DESCRIPTION
0	10/6/23	SPE	15% DESIGN

WARNING

0 1/2 1

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

McMillen

CHUGACH POWERING ALASKA'S FUTURE

MEA MATANUSKA ELECTRIC ASSOCIATION

MUNICIPALITY OF ANCHORAGE

EKLUTNA FISH & WILDLIFE PROJECT

AWWU MAINTENANCE ROAD AND BRIDGES

TYPICAL BRIDGE SECTIONS

DESIGNED K. HEINDEL

DRAWN J. HOLT

CHECKED J. BOAG

PROJECT DATE 10/6/23

DRAWING

S103

JOB NO: 000000

Path: C:\Vault\Chugach Electric\AWWU Maintenance Bridge\S103.dwg Plot date: Sep 27, 2023 08:19pm, CAD User: HaberFlavia