

Eklutna Fish & Wildlife Program

Phase 1 Engineering Feasibility and Cost Assessment

Aquatics TWG

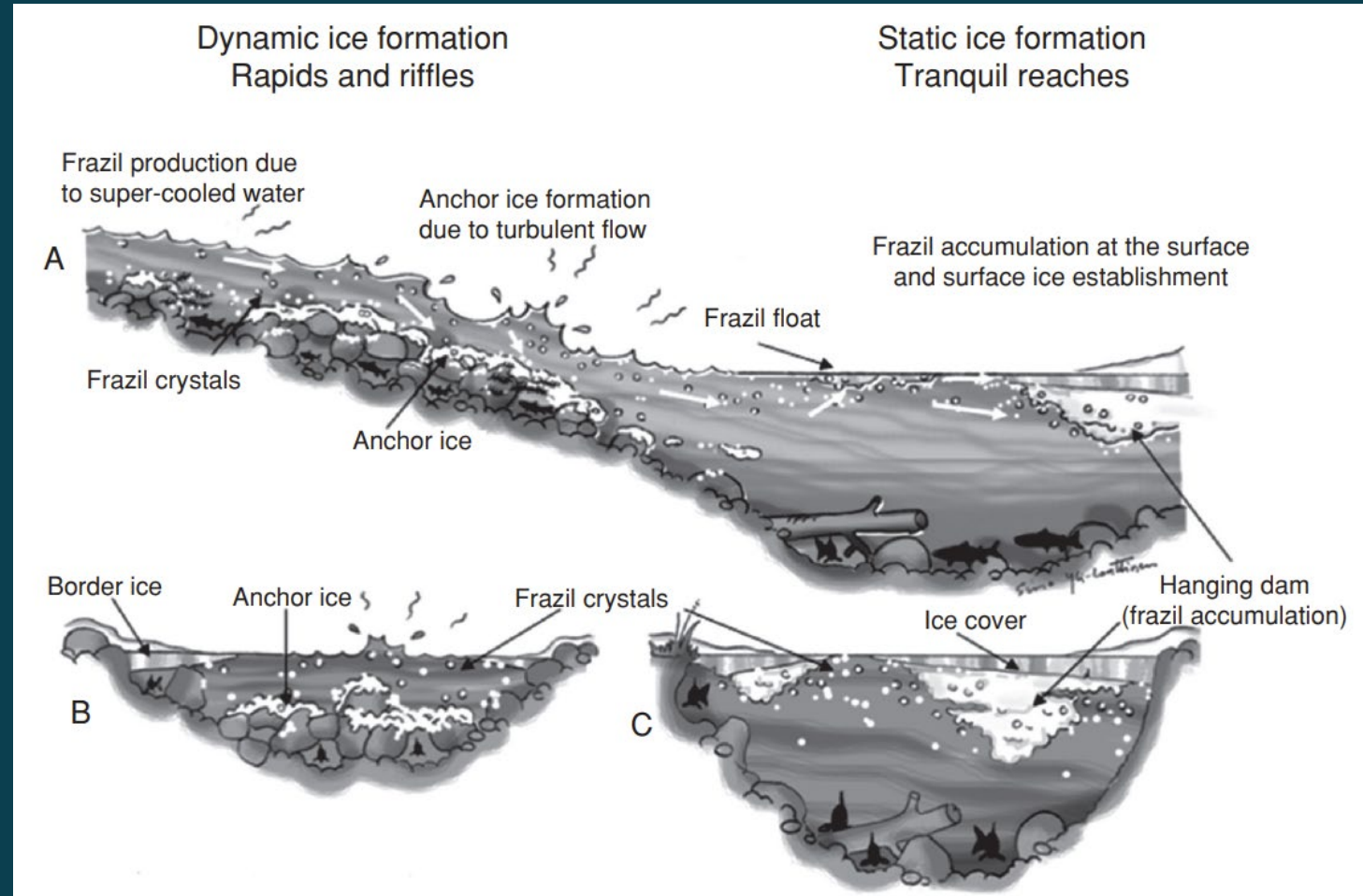
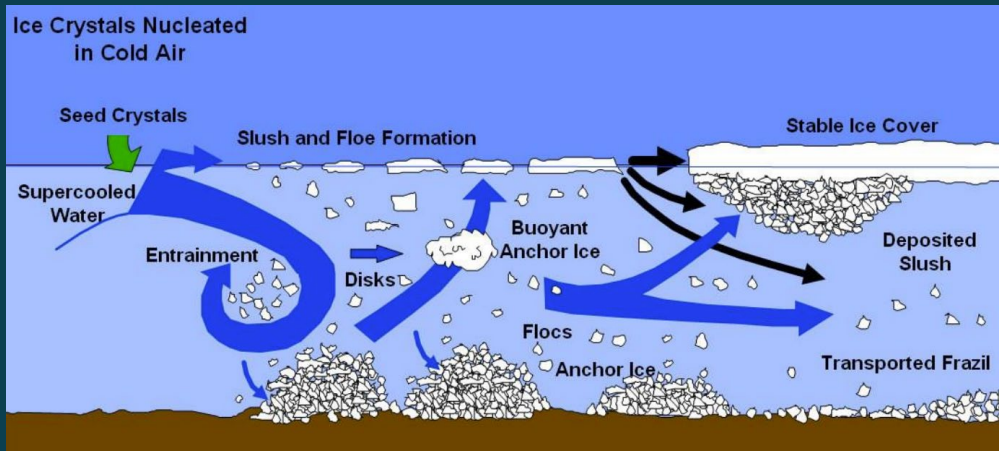
March 28, 2023

Winter Flow Regime

Winter Flow Regime

Goals

- Encourage deeper pools for overwintering habitat
- Minimize extent of Anchor Ice formation in Eklutna River
- Encourage surface ice formation



||| Winter Flow Regime

Anchor Ice Formation

Air Temperature:

$$T_{air} \leq -10^{\circ}C$$

$$T_{air} \leq 14^{\circ}F$$

Velocity Criterion:

$$v \geq 0.6 \text{ m/s}$$

$$v \geq 2.0 \text{ ft/s}$$



Surface Ice Formation

$$t_i = C\sqrt{AFDD} \quad (\text{USACE - Stefan Eqn})$$

Where:

t_i = Ice Thickness

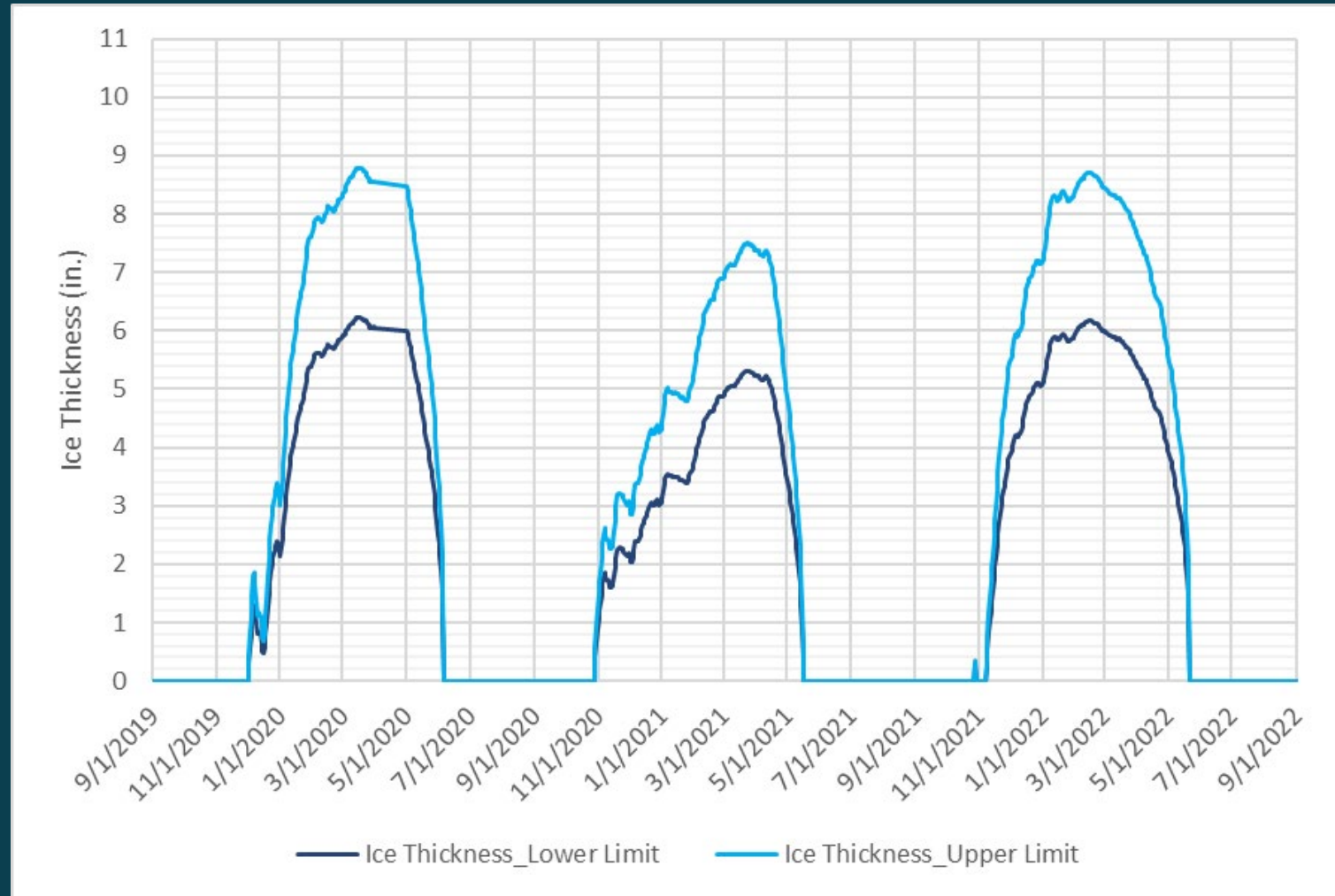
C = Stefan Coefficient (0.17 - 0.21)

AFDD = Accumulated Freezing Degree Days



Winter Flow Regime

Surface Ice Formation



Maximum Ice Thickness 2002 - 2022

7" - 10"

- Highly dependent on environmental conditions
- Winter flow regime to be monitored as part of adaptive management strategy

Winter Flow Regime

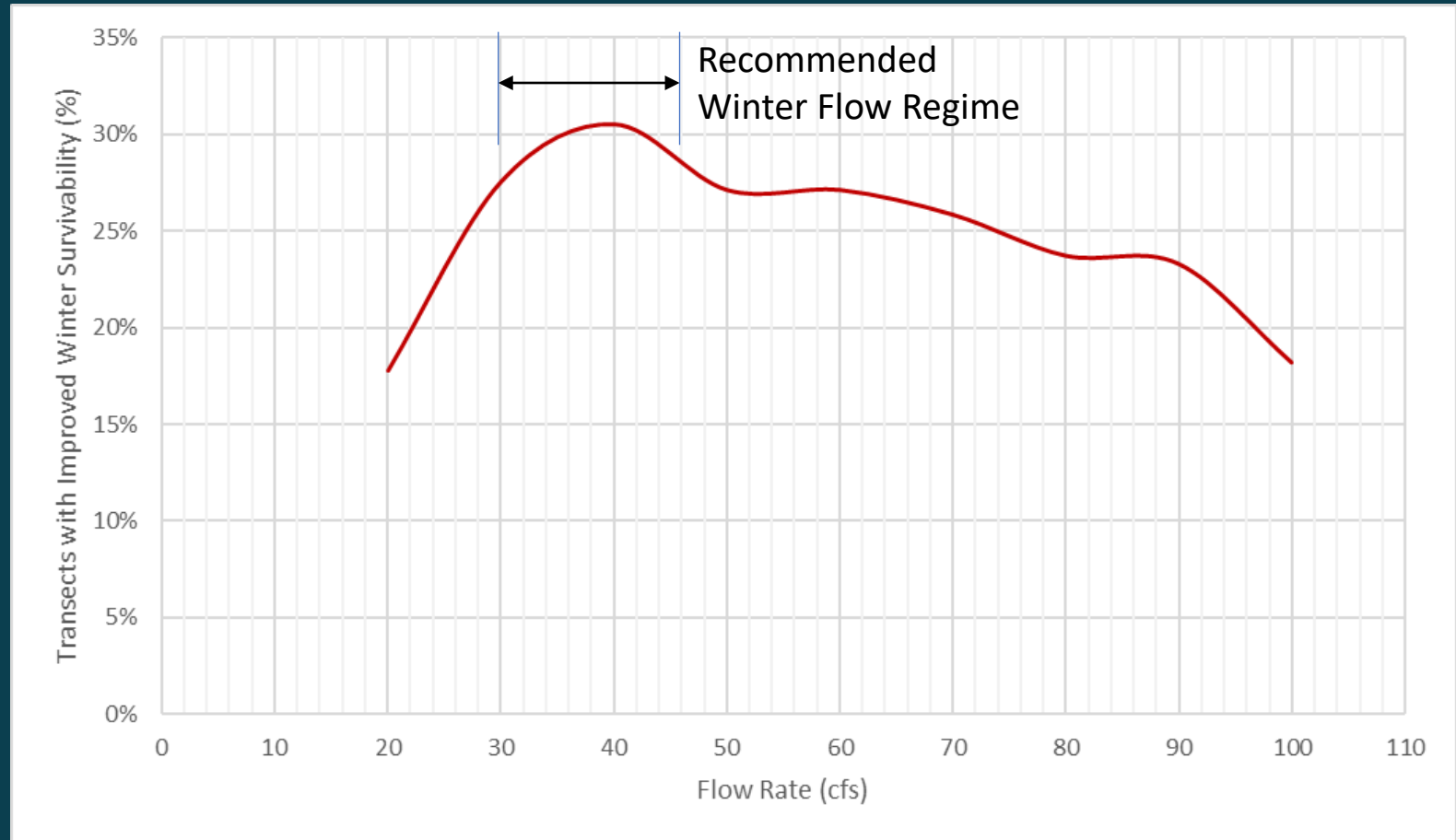
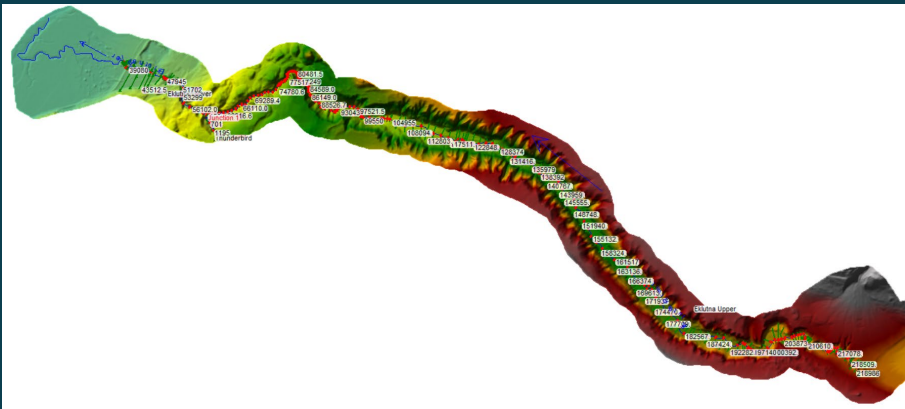
Criteria

Using 1D River Model (236 Transects):

Determine Number of Transects with:

$$v < 2.0 \text{ ft/s}$$

$$d \geq 15''$$

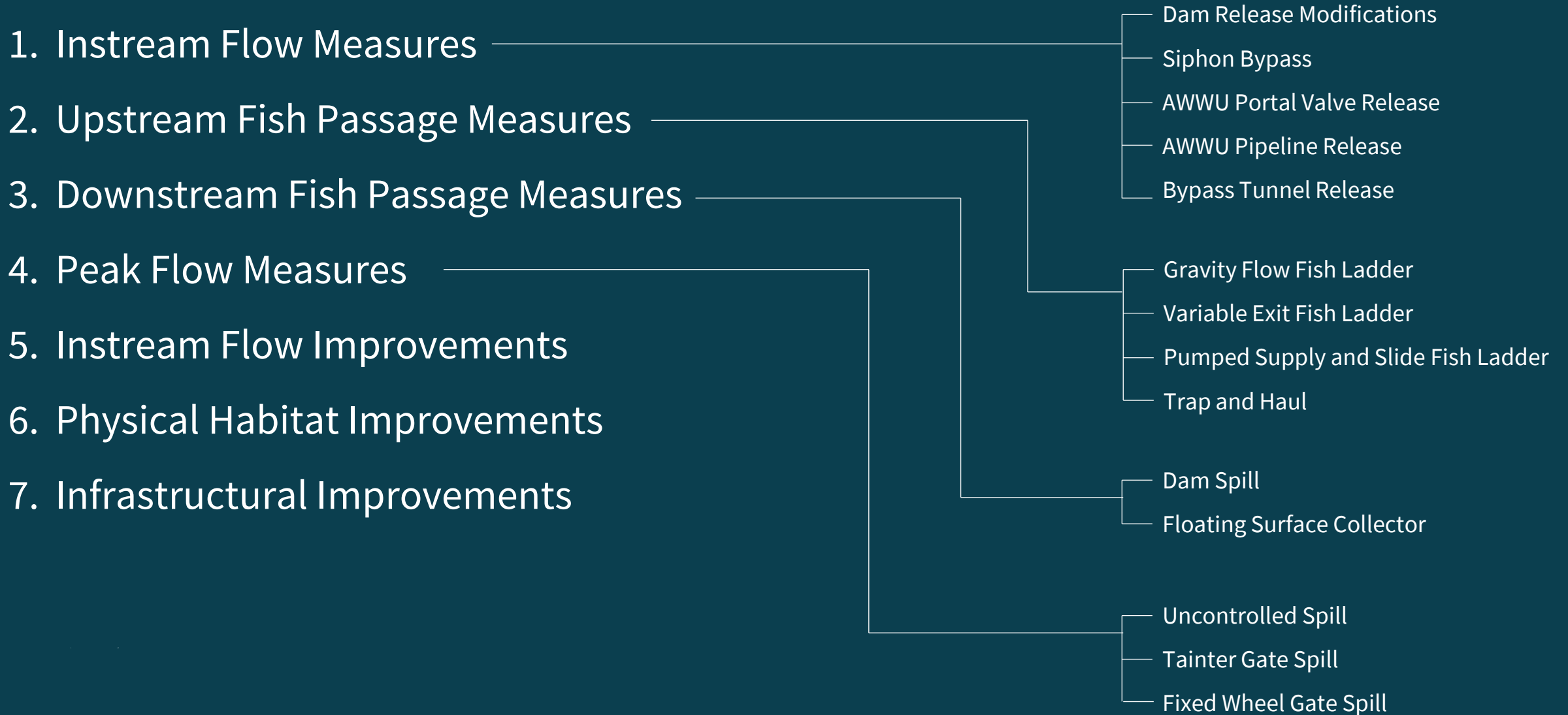


Phase 1 Engineering Design

Phase 1 Engineering Design

1. Instream Flow Measures (Qty = 5)
2. Upstream Fish Passage Measures (Qty = 4)
3. Downstream Fish Passage Measures (Qty = 2)
4. Peak Flow Measures (Qty = 3)
5. Instream Flow Improvements (Qty = 2)
6. Physical Habitat Improvements (Qty = 1)
7. Infrastructural Improvements (Qty = 2)

Phase 1 Engineering Design



Phase 1 Engineering Design

1. Instream Flow Measures
2. Upstream Fish Passage Measures
3. Downstream Fish Passage Measures
4. Peak Flow Measures
5. Instream Flow Improvements
6. Physical Habitat Improvements
7. Infrastructural Improvements

Lach Q'Atnu Re-Route
Dam Outlet Excavation

Physical Habitat Manipulation

AWWU Maintenance Bridges
Lakeside Trail Improvements

Phase 1 Engineering Design

- 1. Instream Flow Measures (Qty = 5)
- 2. Upstream Fish Passage Measures (Qty = 4)
- 3. Downstream Fish Passage Measures (Qty = 2)
- 4. Peak Flow Measures (Qty = 3)
- 5. Instream Flow Improvements (Qty = 2)
- 6. Physical Habitat Improvements (Qty = 1)
- 7. Infrastructural Improvements (Qty = 2)

Combinations of these measures make up comprehensive "Alternatives" for Phase 2 Engineering Evaluation

Example:

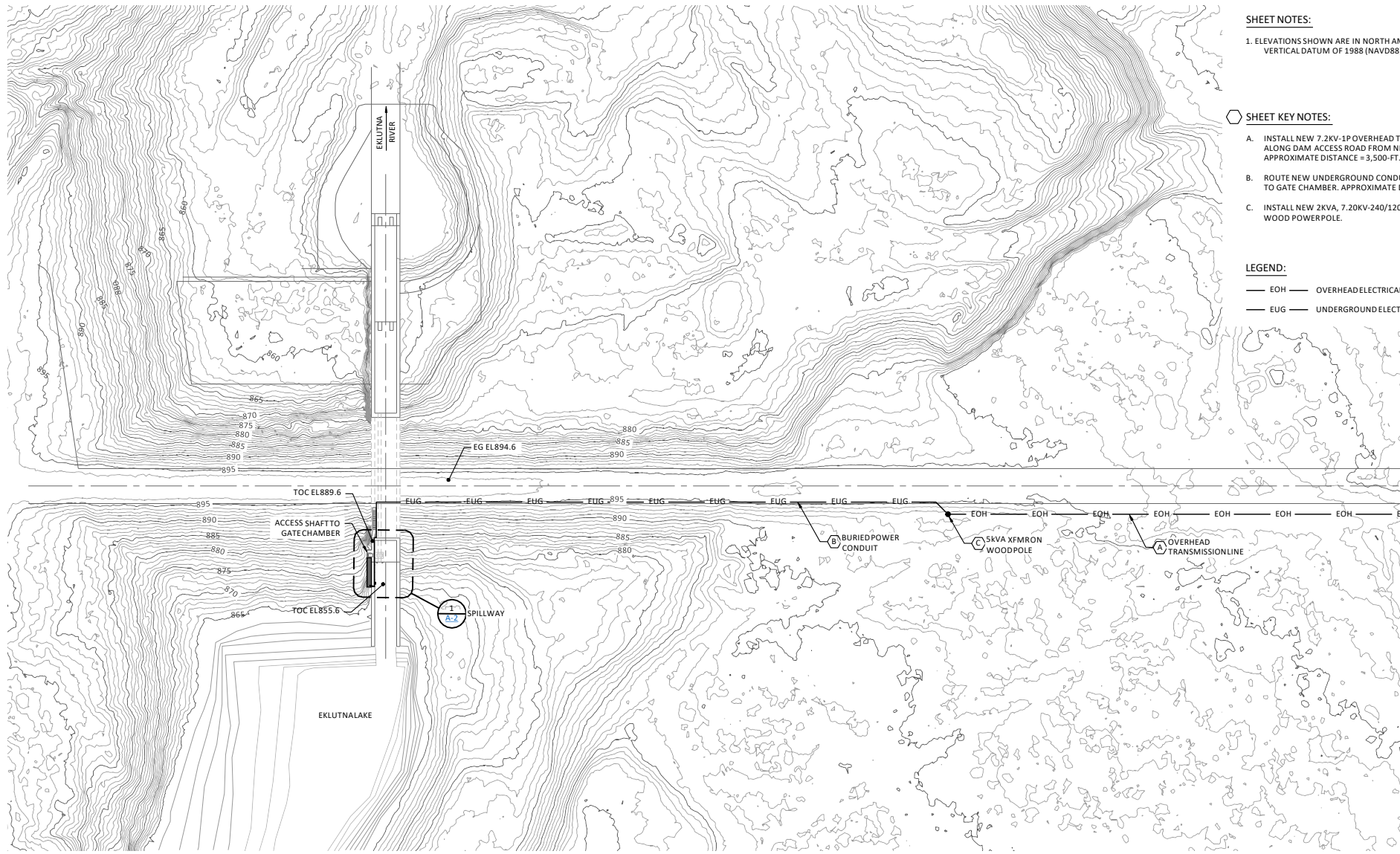
	<u>Instream Flow</u>	<u>U/S Passage</u>	<u>D/S Passage</u>	<u>Peak Flow</u>	<u>Flow Imp.</u>	<u>Habitat</u>	<u>Infrastructure</u>
i -	Dam Release	Variable Exit Fish Ladder	Dam Spill	Tainter Gate	Lach Q'Atnu	None	AWWU Bridges
ii -	Pipeline Release	Trap/Haul	Floating Surface Collector	Fixed Wheel Gate	None	Improvements	Lakeside Trail
iii -	Portal Release	None	None	Uncontrolled	Lach Q'Atnu	Improvements	AWWU Bridges

Phase 1 Engineering Design

Instream Flow Measures

1. Dam Release Modifications
2. Siphon Bypass
3. AWWU Portal Valve Release
4. AWWU Pipeline Release
5. Bypass Tunnel Release





SHEET NOTES:

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

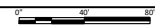
SHEET KEY NOTES:

- A. INSTALL NEW 7.2KV-1P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B. ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO GATE CHAMBER. APPROXIMATE DISTANCE = 600-FT.
- C. INSTALL NEW 2KVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

SITE PLAN
SCALE: 1" = 40'



PROJECT: VILVATION/ALASKA ELECTRIC/FEASIBILITY STUDY/AL LONG PLOT DATE: MAR 15, 2022/10:35:00am CAD USER: GUERRERO

JOB NO: 000000

REV	DESCRIPTION

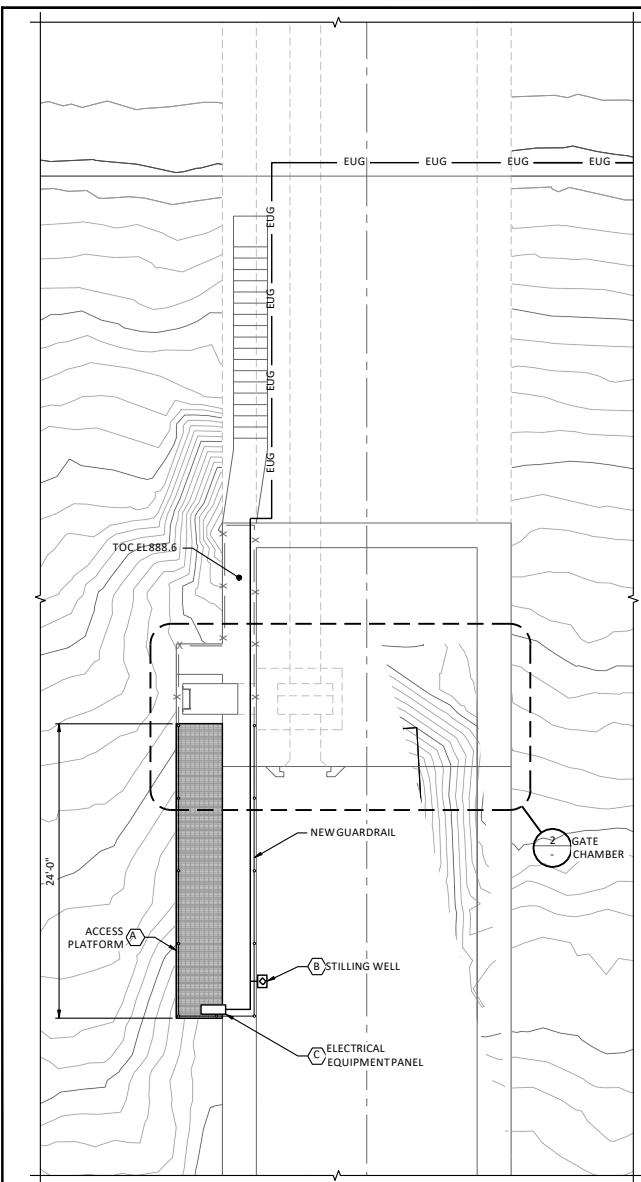
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



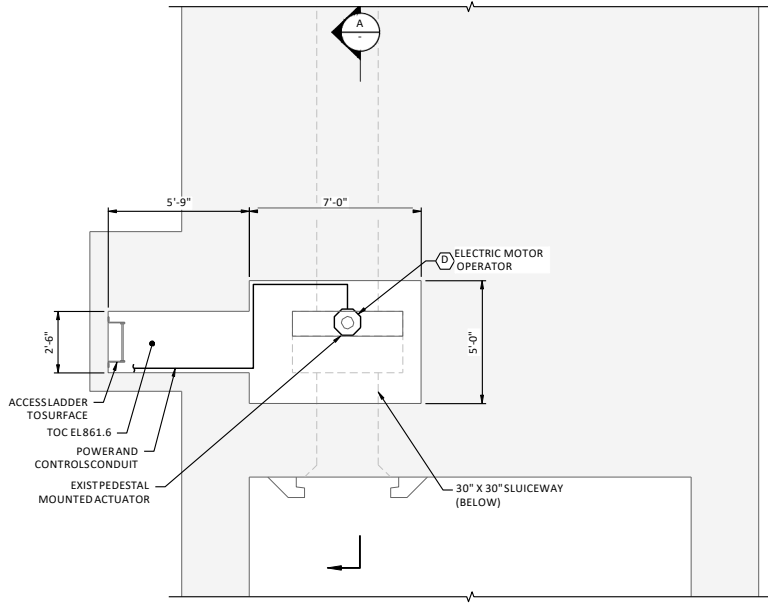
EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW DAM RELEASE MODIFICATIONS SITE PLAN	

DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

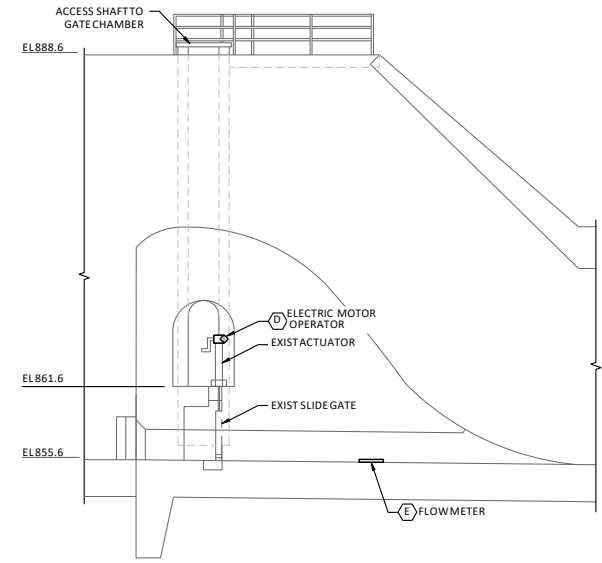
DRAWING
A-1



SPILLWAY DETAIL
SCALE: 3/16"=1'-0"



GATE CHAMBER PLAN
SCALE: 3/8"=1'-0"



GATE CHAMBER SECTION
SCALE: 3/16"=1'-0"

SHEET NOTES:

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

SHEET KEY NOTES:

- A. INSTALL NEW O&M ACCESS PLATFORM ON SPILLWAY TRAINING WALL.
- B. INSTALL NEW STILLING WELL WITH SUBMERSIBLE PRESSURE TRANSDUCER.
- C. INSTALL NEW ELECTRICAL EQUIPMENT AND CONTROLS PANEL.
- D. INSTALL NEW 1,500 W 240V/1P ELECTRIC MOTOR OPERATOR ON EXISTING PEDESTAL ACTUATOR.
- E. INSTALL NEW ACOUSTIC DOPPLER VELOCITY METER IN EXISTING SLUICEWAY, SONTEK-IQ PIPE OR EQ.

REV	12/23/22	SPE	CONCEPTUAL DESIGN
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WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW DAM RELEASE MODIFICATIONS SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING
A-2

P:\EKLUTNA\FEASIBILITY STUDY\A2.dwg PLOT DATE: 12/23/22 09:50 AM CAD USER: GUERRERO

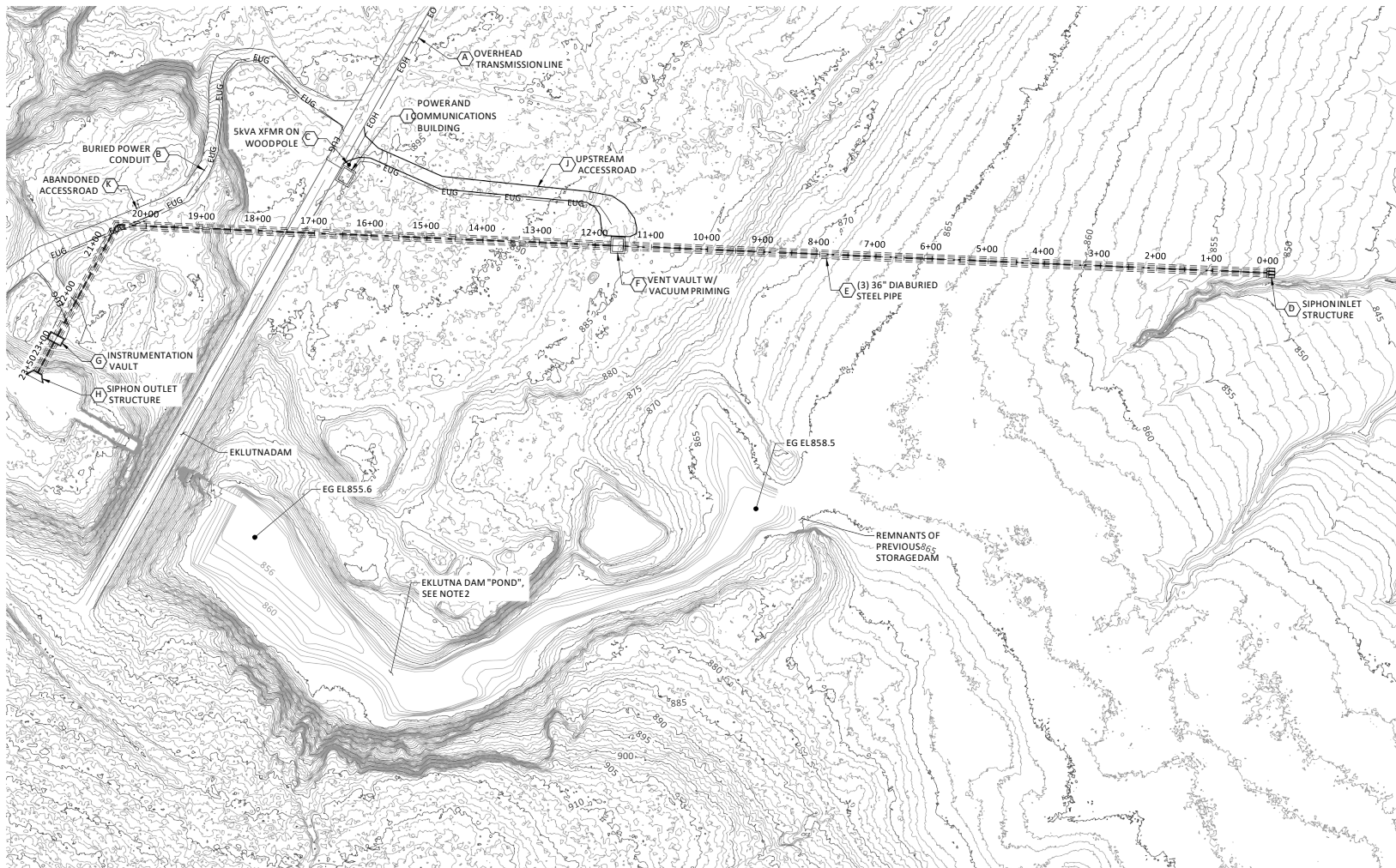
Cost Estimate - Dam Release Modifications

Capital Costs

Indirects:	\$90,000
Site Construction/Access:	\$40,000
Spillway Modification:	\$45,000
Gate Chamber Modification:	\$25,000
Electrical/Transmission:	\$335,000
OH&P/Bonds:	\$88,000
Contingency:	\$155,000
Total:	\$775,000
Range (-50% - +100%):	\$390,000 - \$1,550,000

Annual O&M

Personnel:	\$61,000/Yr
Energy:	\$1,200/Yr
Materials:	\$500/Yr
Contingency:	\$19,000/Yr
Total:	\$82,000/Yr



SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTHAMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. POND BATHYMETRIC PROFILE IS UNKNOWN, TOPOGRAPHY ESTIMATED BASED ON AS-BUILT DRAWINGS OF DAM AND FIELD DATA.

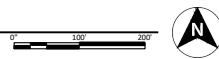
SHEET KEY NOTES:

- A INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B. ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO CONTROL BUILDING AND INSTRUMENTATION VAULT. APPROXIMATE DISTANCE = 1,200-FT.
- C. INSTALL NEW 5KVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.
- D CONSTRUCT NEW SIPHON INTAKE STRUCTURE WITHIN EKLUTNA RESERVOIR AT ELEVATION 847.0FT.
- E EXCAVATE CHANNEL AROUND RIGHT ABUTMENT OF DAM TO A DEPTH OF 5- TO 25- FEET. INSTALL 3X -36-INCH DIAMETER STEEL PIPES IN TRENCH AND BACKFILL.
- F CONSTRUCT VALVE VAULT FOR SIPHON VENTS AND VACUUM PRIMING PUMPSYSTEM.
- G CONSTRUCT INSTRUMENTATION VAULT FOR FLOW MONITORING AND CONTROLS.
- H CONSTRUCT NEW SIPHON OUTLET STRUCTURE DOWNSTREAM OF DAM WITHIN PLUNGE POOL AT ELEVATION 843.0FT.
- I CONSTRUCT NEW POWER AND COMMUNICATIONS BUILDING.
- J CONSTRUCT NEW ACCESS ROAD TO VENT VAULT.
- K REGRADE, REPAIR, AND IMPROVE EXISTING ACCESS ROAD DOWNSTREAM OF DAM RIGHT ABUTMENT.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

SITE PLAN
SCALE: 1" = 100'



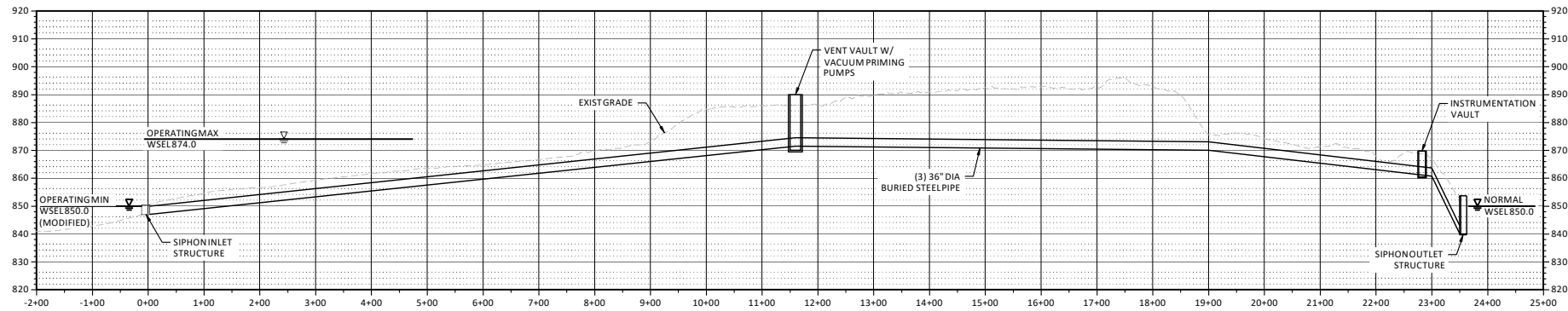
PUBLIC UTILITIES DIVISION/ALASKA ELECTRIC DELIVERY RELIABILITY STUDY/3-1-2017/POST CENTER: AUC-15, 2024-03-25 10:00 AM, CAD USER: GUAJERRERO

<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			<p>EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY</p>		<p>DESIGNED <u>S. ELLENSON</u></p>	<p>DRAWING B-1</p>
			<p>PME ALTERNATIVES ANALYSIS - INSTREAM FLOW SIPHON BYPASS SITE PLAN</p>		<p>DRAWN <u>R. GUERRERO</u></p> <p>CHECKED <u>J. BOAG</u></p> <p>PROJECT DATE <u>12/23/22</u></p>	

JOB NO: 000000

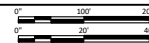
SHEET NOTES:

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



PIPELINE PROFILE

SCALE: HORIZ 1" = 100'
VERT 1" = 20'



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



EKLUTNA FISH & WILDLIFE PROJECT	
ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW SIPHON BYPASS PROFILE	

DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

DRAWING	B-2
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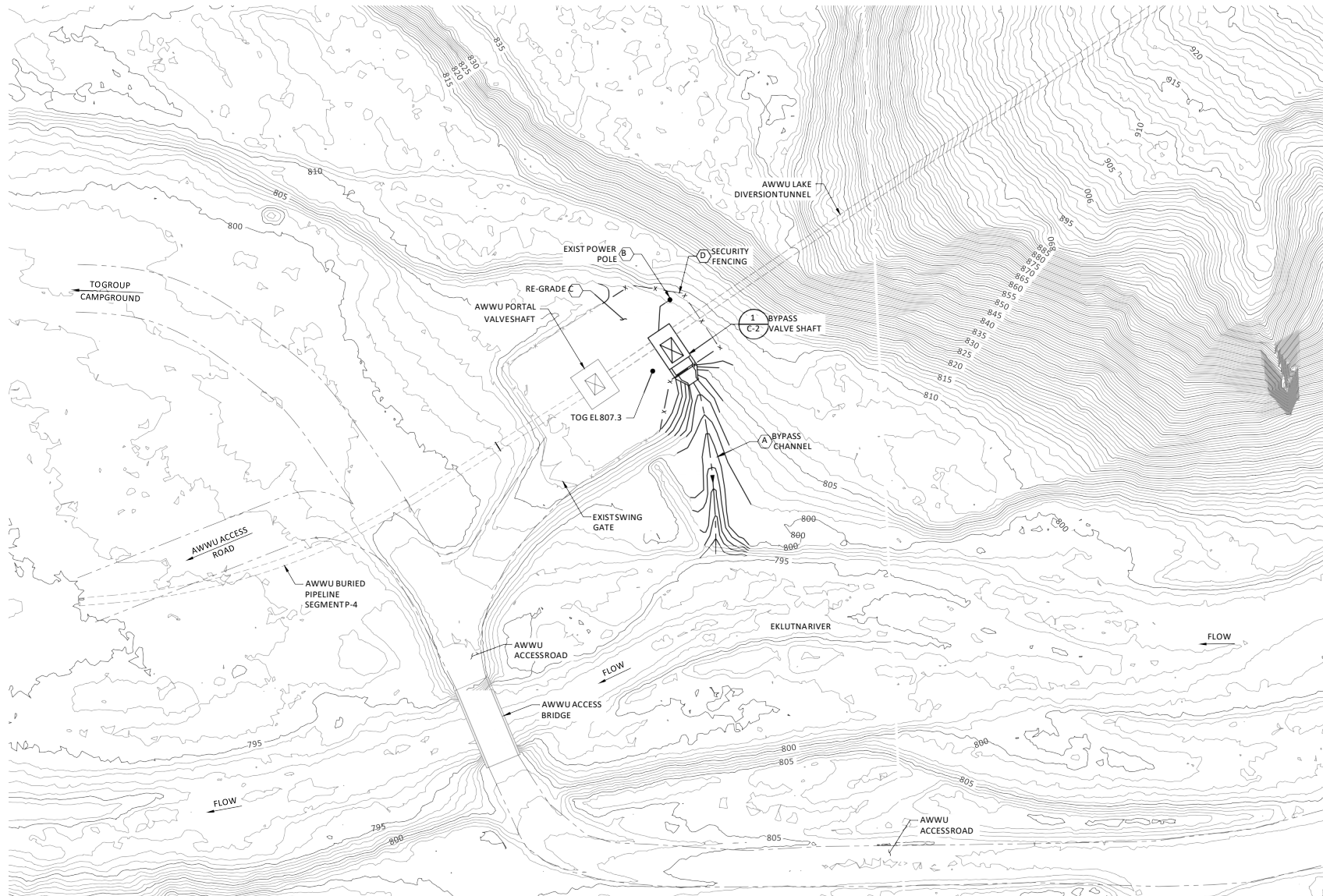
Cost Estimate – Siphon Bypass

Capital Costs

Indirects:	\$2,170,000
Site Construction/Access:	\$405,000
Siphon Construction:	\$8,400,000
Electrical/Transmission:	\$2,050,000
OH&P/Bonds:	\$2,100,000
Contingency:	\$3,790,000
Total:	\$19,000,000
Range (-50% - +100%):	\$9,500,000 - \$38,000,000

Annual O&M

Personnel:	\$120,000/Yr
Energy:	\$10,000/Yr
Materials:	\$6,000/Yr
Contingency:	\$41,000/Yr
Total:	\$178,000/Yr



SHEET NOTES:

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

SHEET KEY NOTES:

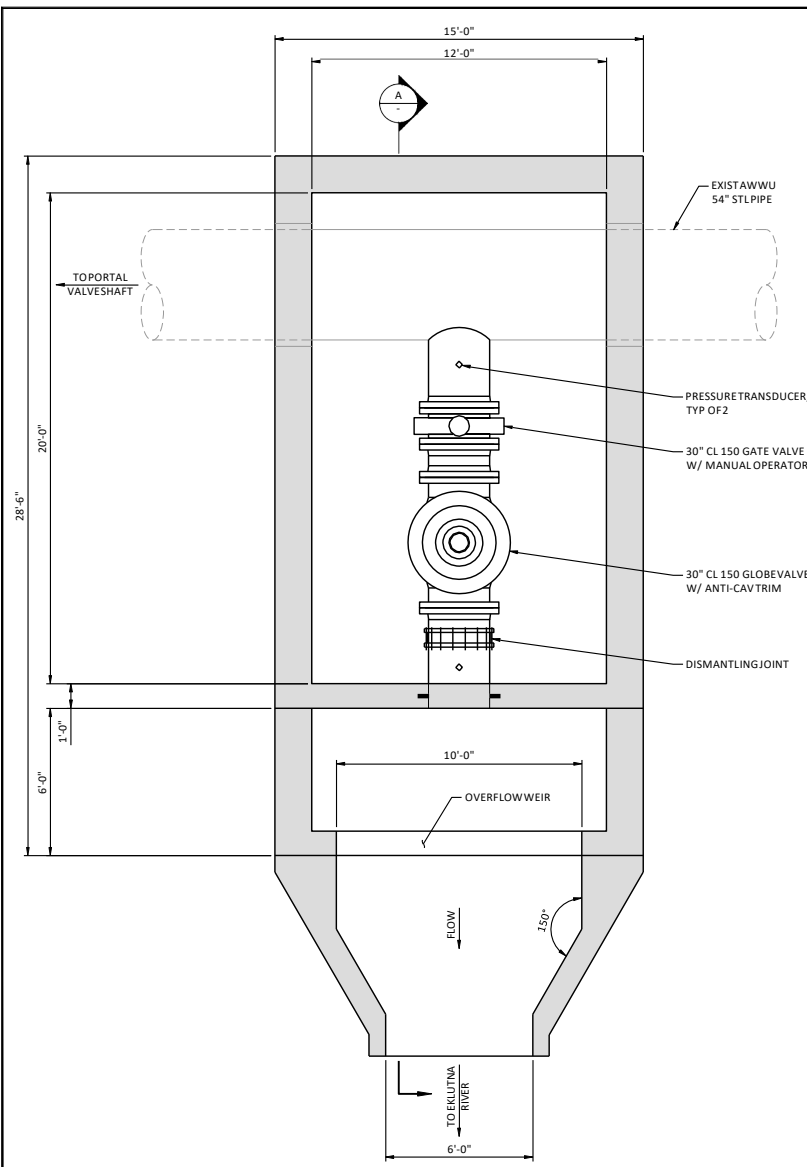
- A EXCAVATE NEW TRAPEZOIDAL BYPASS CHANNEL FROM BYPASS VALVE WET WELL TO EKLUTNA RIVER.
- B TAP NEW 240V-3P FEEDER OFF EXISTING 7.2 KV TRANSMISSION LINE.
- C FOLLOWING EXCAVATION FOR BYPASS VALVE SHAFT, RE-GRADE PAD TO ELEVATION 807.3 FT IN VICINITY OF BYPASS VALVE STRUCTURE.
- D EXTEND SECURITY FENCING AROUND PERIMETER OF NEW STRUCTURE.

SITE PLAN
SCALE: 1" = 30'

P:\PROJECTS\AWWU\AWWU Portal Valve Shaft\AWWU Portal Valve Shaft.dwg, 12/23/22, 10:00 AM, J. BOAG

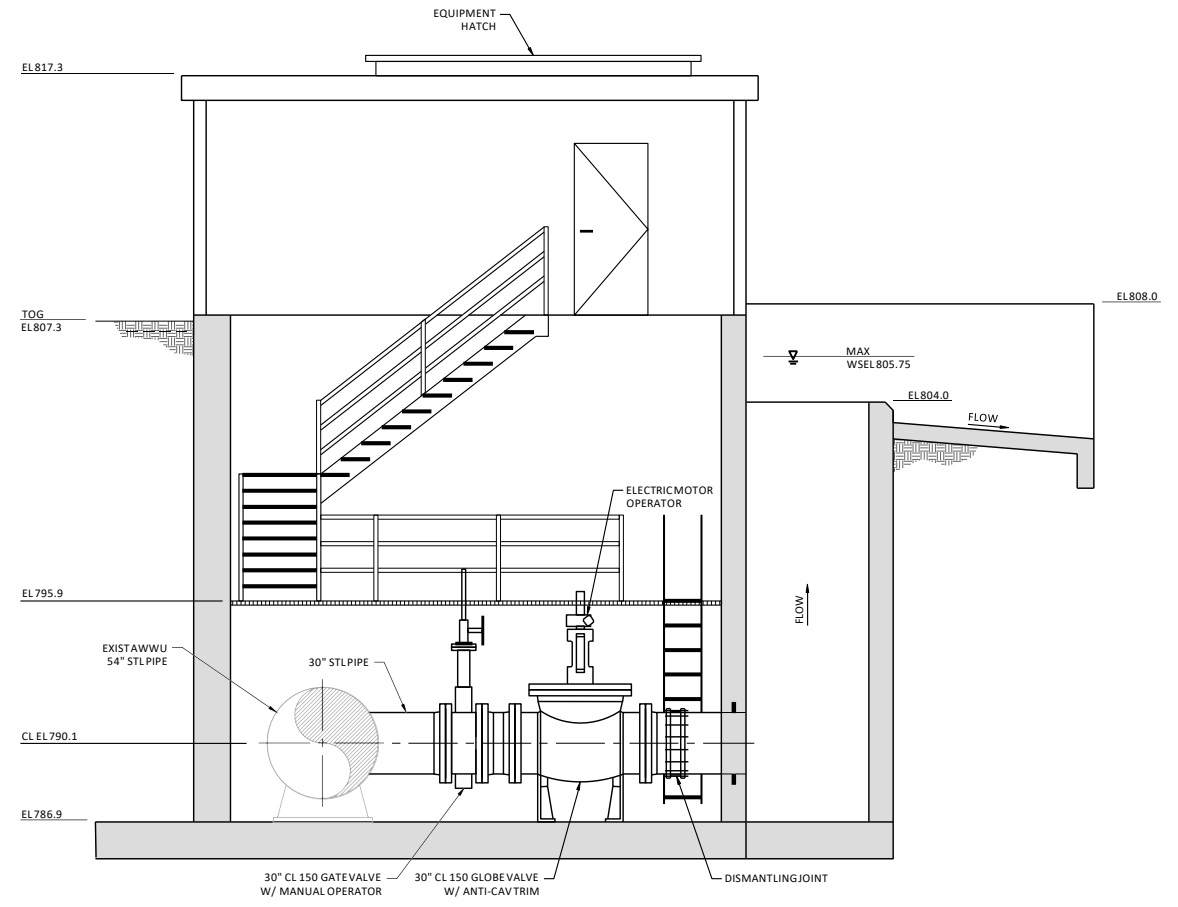
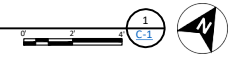
REV			<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			<p>EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY</p>	<p>DESIGNED <u>S. ELLENSON</u></p>	<p>DRAWING C-1</p>
						<p>PME ALTERNATIVES ANALYSIS - INSTREAM FLOW AWWU PORTAL VALVE RELEASE SITE PLAN</p>	<p>DRAWN <u>R. GUERRERO</u></p> <p>CHECKED <u>J. BOAG</u></p> <p>PROJECT DATE <u>12/23/22</u></p>	

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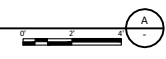
BYPASS STRUCTURE

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



SECTION

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



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

REV	DESCRIPTION

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



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW
AWWU PORTAL VALVE RELEASE
SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING
C-2

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Cost Estimate – AWWU Portal Valve Release

Capital Costs

Indirects:	\$635,000
Site Construction/Access:	\$40,000
Civil Works/Grading:	\$520,000
Shaft Structure:	\$530,000
Piping/Valves:	\$346,000
Electrical/Transmission:	\$1,700,000
OH&P/Bonds:	\$625,000
Contingency:	\$1,100,000

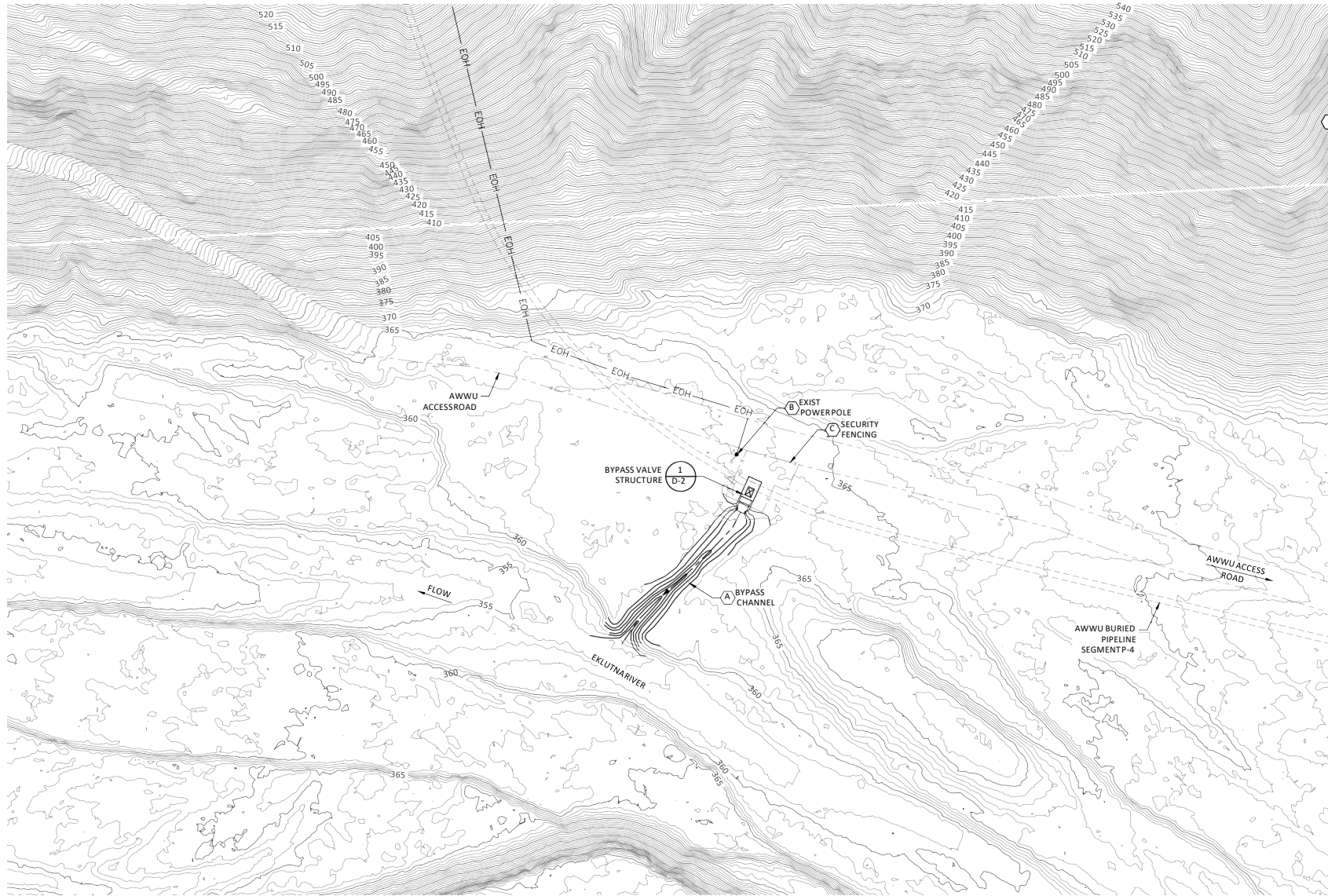
Total: **\$5,500,000**

Range (-50% - +100%): **\$2,800,000 - \$11,100,000**

Annual O&M

Personnel:	\$120,000/Yr
Energy:	\$22,000/Yr
Materials:	\$2,000/Yr
Contingency:	\$44,000/Yr

Total: **\$188,500/Yr**



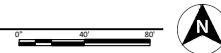
SHEET NOTES:

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

SHEET KEY NOTES:

- A. EXCAVATE NEW TRAPEZOIDAL BYPASS CHANNEL FROM BYPASS VALVE WET WELL TO EKLUTNA RIVER.
- B. INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG AWWU ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 2,000-FT.
- C. CONSTRUCT SECURITY FENCING AROUND PERIMETER OF NEW STRUCTURE.

SITE PLAN
SCALE: 1"=40'



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



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY

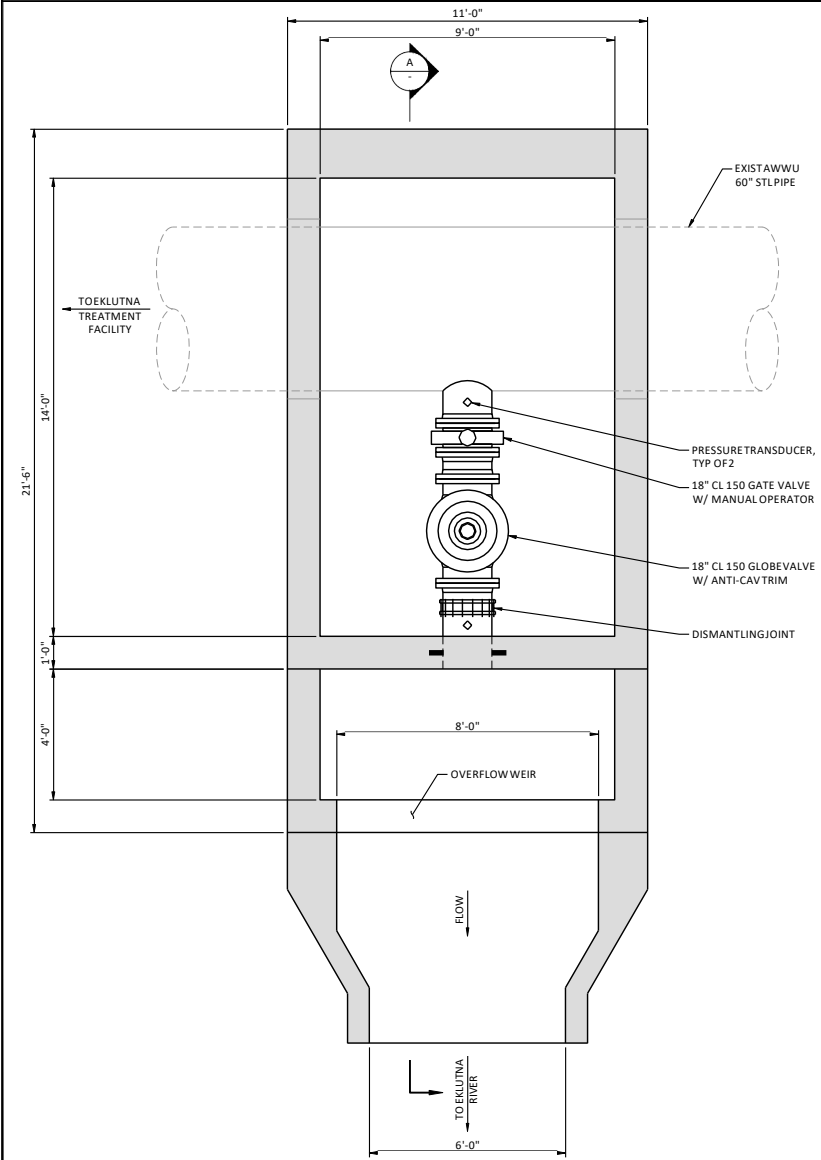
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW
AWWU PIPELINE RELEASE
SITE PLAN

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

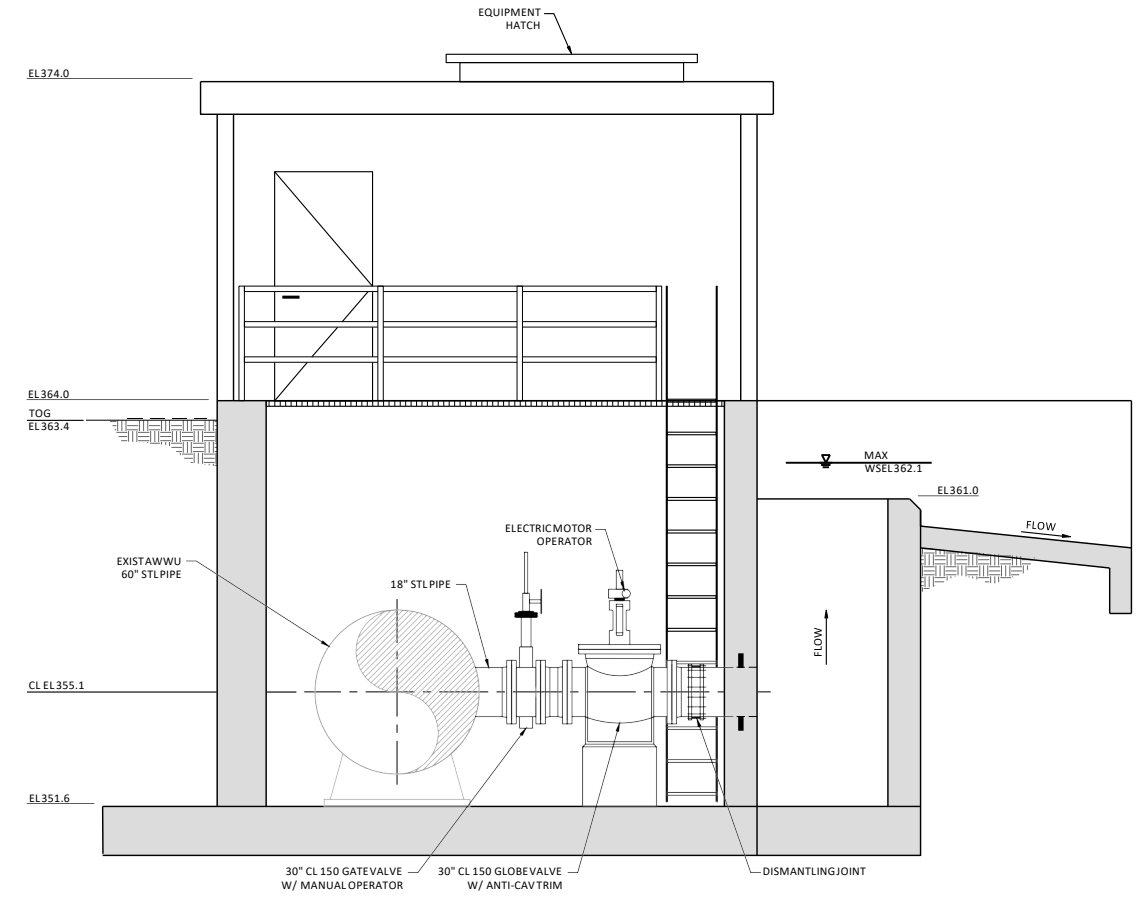
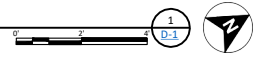
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D-1

P:\PROJECTS\2022\EKLUTNA FISH & WILDLIFE PROJECT\FEASIBILITY STUDY\03 Long\PILOT.BAR: 15_102723.DWG: 12/23/22 10:40:00 AM: AWWU BURIED PIPELINE RELEASE

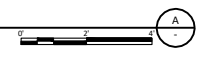
REV



BYPASS STRUCTURE
SCALE: 1/2" = 1'-0"



SECTION
SCALE: 1/2" = 1'-0"



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

PROJECT: VADN/AVN/Chugach Electric/Feasibility Study/02-2022.dwg PLOT DATE: DEC 15 2022 09:51:01 AM CAD USER: GWERRERO

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



EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW AWWU PIPELINE RELEASE SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING D-2

108107000000

Cost Estimate – AWWU Pipeline Release

Capital Costs

Indirects:	\$260,000
Site Construction/Access:	\$40,000
Civil Works/Grading:	\$91,000
Shaft Structure:	\$250,000
Piping/Valves:	\$315,000
Electrical/Transmission:	\$590,000
OH&P/Bonds:	\$250,000
Contingency:	\$450,000
Total:	\$2,300,000
Range (-50% - +100%):	\$1,100,000 - \$4,500,000

Annual O&M

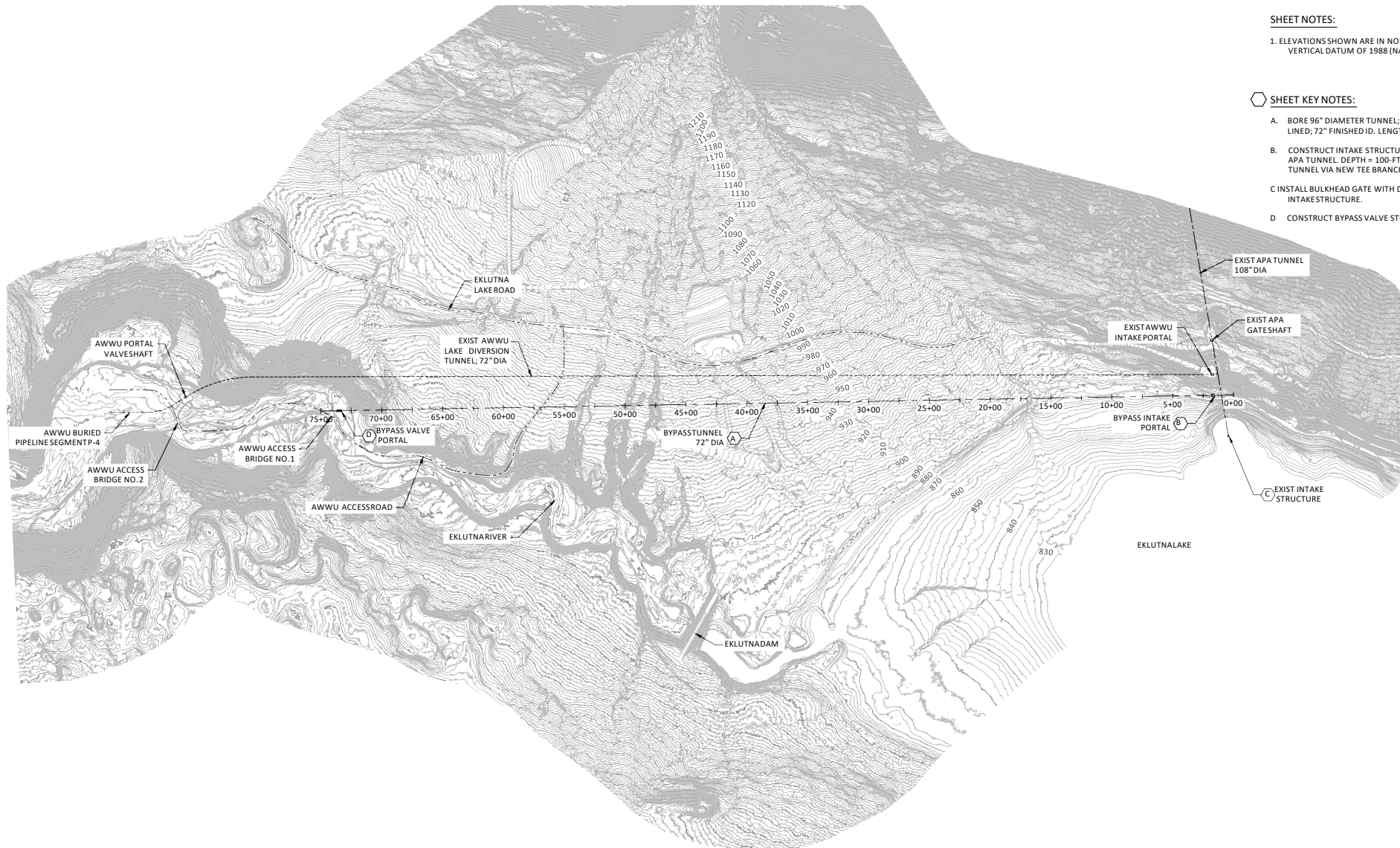
Personnel:	\$120,000/Yr
Energy:	\$22,000/Yr
Materials:	\$2,000/Yr
Contingency:	\$44,000/Yr
Total:	\$188,500/Yr

SHEET NOTES:

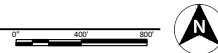
1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

SHEET KEY NOTES:

- A. BORE 96" DIAMETER TUNNEL; SEGMENTALLY CONCRETE LINED; 72" FINISHED I.D. LENGTH = 7,200-FT.
- B. CONSTRUCT INTAKE STRUCTURE ADJACENT TO EXISTING APA TUNNEL. DEPTH = 100-FT. TAP INTO EXISTING TUNNEL VIA NEW TEE BRANCH SEGMENT.
- C. INSTALL BULKHEAD GATE WITH DIVERS IN EXISTING INTAKE STRUCTURE.
- D. CONSTRUCT BYPASS VALVE STRUCTURE. DEPTH = 30-FT.



SITE PLAN
SCALE: 1" = 400'



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REV			
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WARNING
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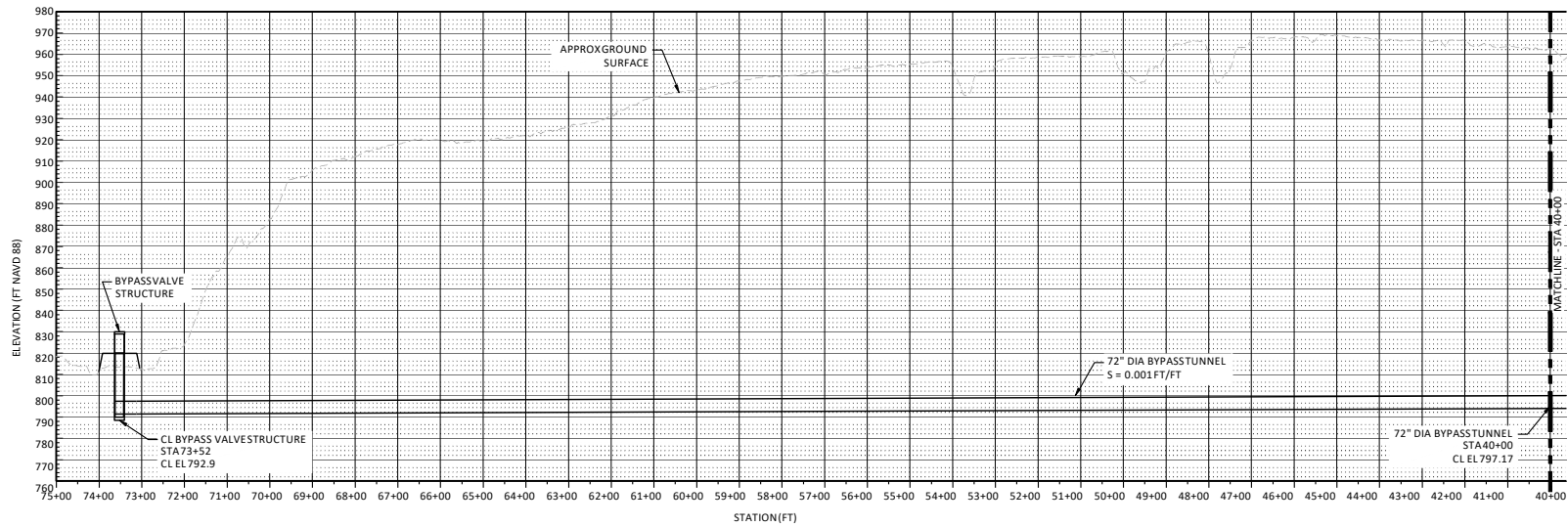
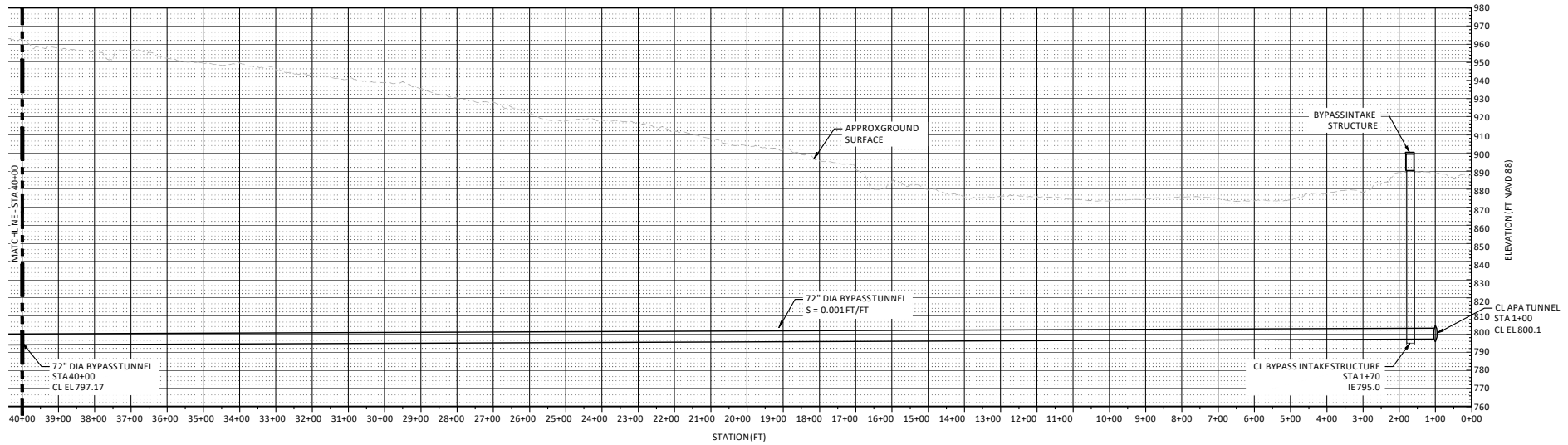


EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW BYPASS TUNNEL RELEASE SITE PLAN	

DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

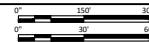
DRAWING	E-1
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12/23/22



TUNNEL PROFILE

SCALE: HORIZ 1" = 150'
VERT 1" = 30'



REV	DESCRIPTION

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



EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - INSTREAM FLOW BYPASS TUNNEL RELEASE TUNNEL PROFILE	

DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

DRAWING	E-2
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PUBLIC:\VARDON\Chugach_Electrical\Feasibility_Study\FE2.dwg PLOT DATE: DEC 15, 2022 10:52:26am CAD USER: QUERREROCB01

Cost Estimate – Bypass Tunnel Release

Capital Costs

Indirects:	\$7,700,000
Site Construction/Access:	\$120,000
Civil Works/Grading:	\$400,000
Shaft Structure:	\$1,000,000
Tunnel Construction:	\$30,000,000
Intake Portal:	\$5,000,000
Electrical/ Transmission:	\$1,800,000
OH&P/Bonds:	\$15,100,000
Contingency:	\$15,300,000
Total:	\$77,000,000
Range (-50% - +100%):	\$38,400,000 - \$153,500,000

Annual O&M

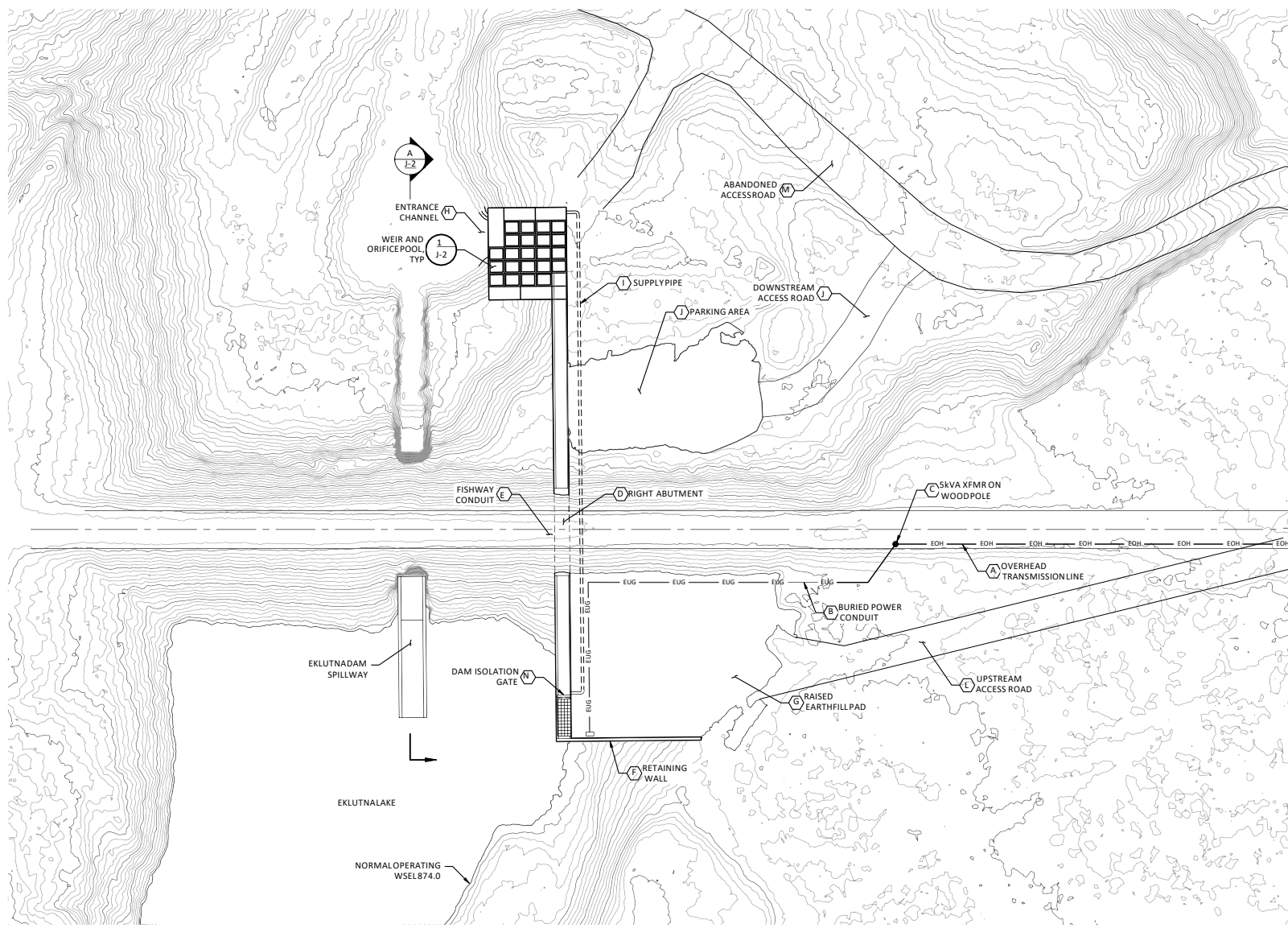
Personnel:	\$130,000/Yr
Energy:	\$22,000/Yr
Materials:	\$4,000/Yr
Contingency:	\$47,000/Yr
Total:	\$203,000/Yr

Phase 1 Engineering Design

Upstream Fish Passage Measures

1. Gravity Flow Fish Ladder
2. Variable Exit Fish Ladder
3. Pumped Supply and Slide Fish Ladder
4. Trap and Haul
5. Nature-Like Fishway (In Progress)
6. New Dam Structure (In Progress)





SITE PLAN
SCALE: 1" = 40'

SHEET NOTES:

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

SHEET KEY NOTES:

- A INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO CONTROL ENCLOSURE. APPROXIMATE DISTANCE = 500-FT.
- C INSTALL NEW SKVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.
- D. EXCAVATE RIGHT ABUTMENT OF EXISTING DAM TO ELEVATION 868.0.
- E. CONSTRUCT NEW CONCRETE FISHWAY THROUGH DAM SECTION.
- D. CONSTRUCT RETAINING WALL TO ELEVATION 888.6.
- E. CONSTRUCT NEW RAISED EARTHFILL PAD TO ELEVATION 888.6 ADJACENT TO NEW FISHWAY.
- F. EXCAVATE NEW CHANNEL WITHIN EXISTING PLUNGE POOL TO FISHWAY ENTRANCE POOL.
- G. INSTALL NEW 24" SUPPLY PIPE TO ENTRANCE POOL.
- H. CONSTRUCT NEW ACCESS ROAD TO DOWNSTREAM TOE OF DAM.
- I. CONSTRUCT NEW PARKING AND EQUIPMENT PAD AT DOWNSTREAM TOE OF DAM.
- L CONSTRUCT NEW ACCESS ROAD TO FISHWAY EXITSTRUCTURE.
- M REGRADE, REPAIR, AND IMPROVE EXISTING ABANDONED ACCESS ROAD DOWNSTREAM OF DAM RIGHT ABUTMENT.
- N INSTALL DAM ISOLATION BULKHEAD GATE AT DOWNSTREAM EXTENT OF EXIT CHANNEL.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

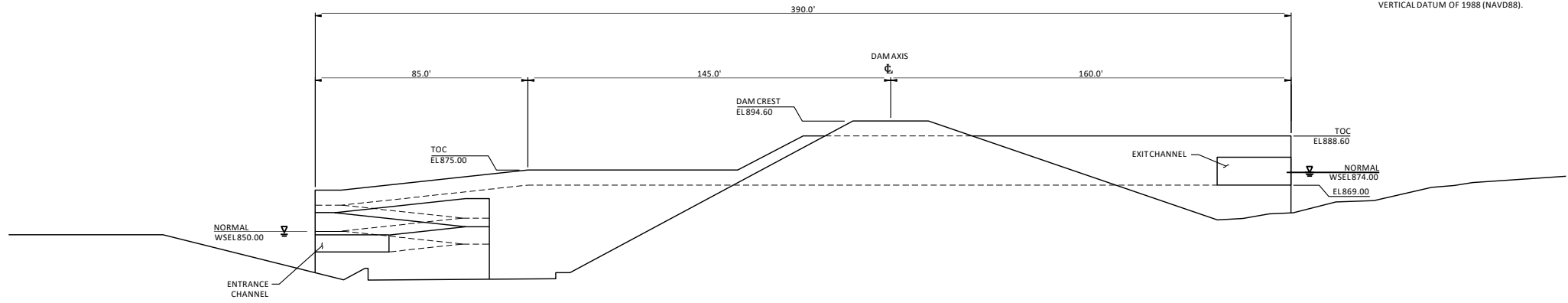
PROJECT: EKLUTNA WILDLIFE PROJECT - FEASIBILITY STUDY P.1.dwg PLOT DATE: 12/23/22 12:23:53 PM CAD USER: GUERRERO

<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			<p>EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY</p>		<p>DESIGNED <u>S. ELLENSON</u></p>	<p>DRAWING J-1</p>
			<p>PME ALTERNATIVES ANALYSIS - FISH PASSAGE GRAVITY FLOW FISH LADDER SITE PLAN</p>		<p>DRAWN <u>R. GUERRERO</u></p> <p>CHECKED <u>J. BOAG</u></p> <p>PROJECT DATE <u>12/23/22</u></p>	

12/23/22 12:23:53 PM CAD USER: GUERRERO

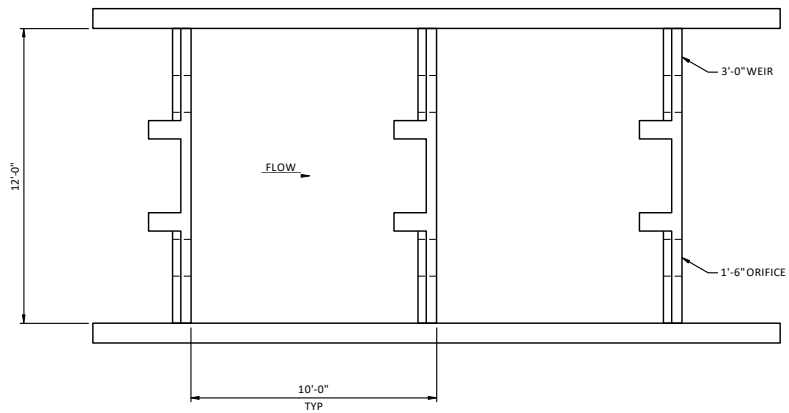
SHEET NOTES:

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



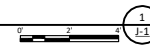
SECTION

SCALE: 1"=20'



WIER AND ORIFICE POOL DETAIL, TYP

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



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 PROJECT: EKLUTNA FISH & WILDLIFE PROJECT - FEASIBILITY STUDY (P2-2) - 12/23/22
 DATE: 12/23/22
 TIME: 10:45 AM
 USER: JBOAG

REV	DATE	BY	CONCEPTUAL DESIGN	DESCRIPTION

WARNING

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EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - FISH PASSAGE GRAVITY FLOW FISH LADDER SECTIONS AND DETAILS

DESIGNED	S. ELLENSON
DRAWN	D. JOHNSTON
CHECKED	J. BOAG
PROJECT DATE	12/23/22

DRAWING	J-2
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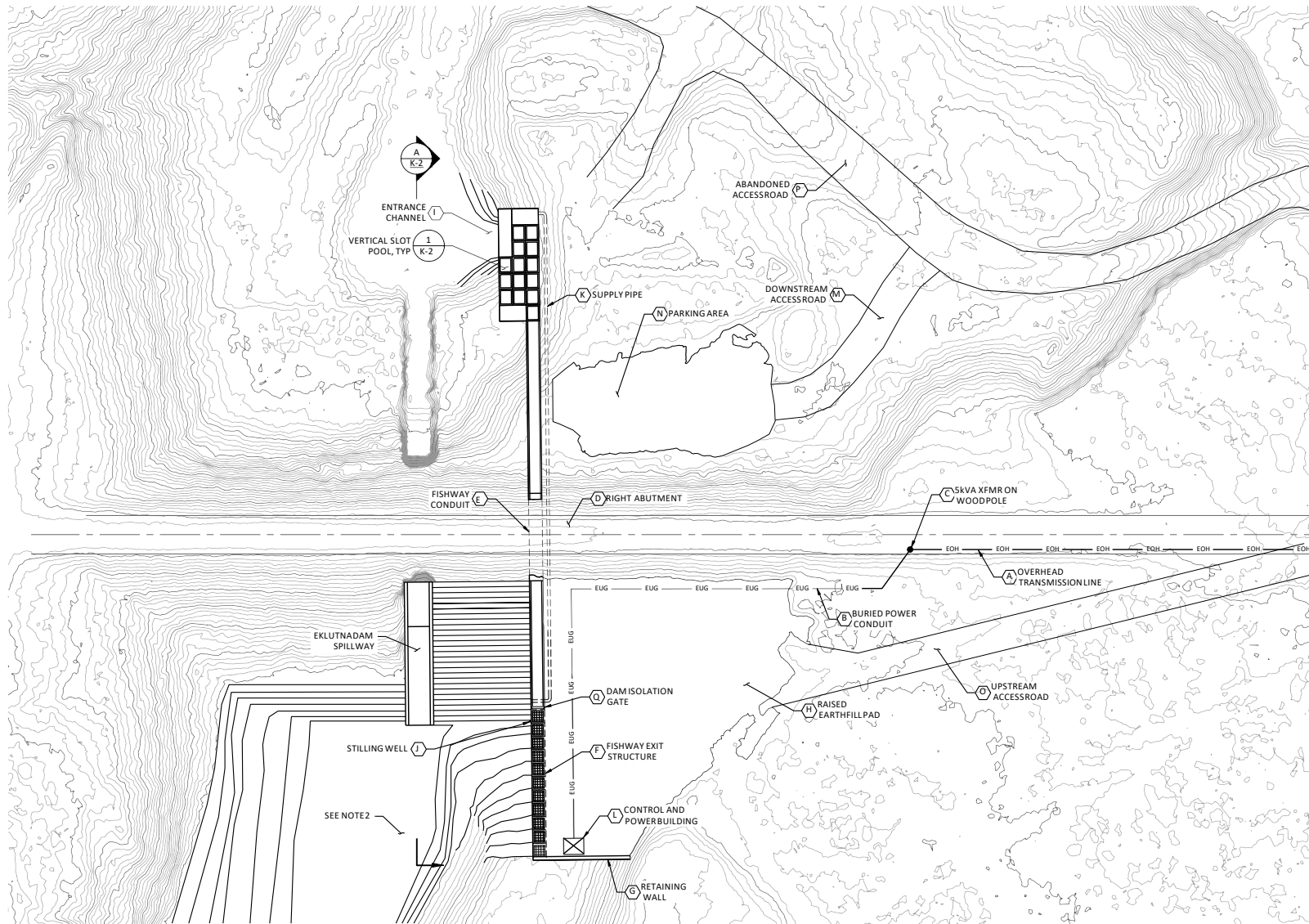
Cost Estimate – Gravity Flow Fish Ladder

Capital Costs

Indirects:	\$1,100,000
Site Construction/Access:	\$460,000
Fish Ladder Structure:	\$3,400,000
Electrical/Transmission:	\$1,900,000
OH&P/Bonds:	\$1,100,000
Contingency:	\$2,000,000
Total:	\$10,000,000
Range (-50% - +100%):	\$5,000,000 - \$20,000,000

Annual O&M

Personnel:	\$90,000/Yr
Energy:	\$500/Yr
Contingency:	\$28,000/Yr
Total:	\$121,000/Yr



SITE PLAN
SCALE: 1" = 40'

SHEET NOTES:

1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. POND BATHYMETRIC PROFILE IS UNKNOWN, TOPOGRAPHY ESTIMATED BASED ON AS BUILT DRAWINGS OF DAM AND FIELD DATA.

SHEET KEY NOTES:

- A INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO CONTROL ENCLOSURE. APPROXIMATE DISTANCE = 500-FT.
- C INSTALL NEW SKVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.
- D. EXCAVATE RIGHT ABUTMENT OF EXISTING DAM TO ELEVATION 859.0.
- E. CONSTRUCT NEW CONCRETE FISHWAY THROUGH DAM SECTION.
- D. CONSTRUCT NEW GATED EXIT CHANNEL.
- E. CONSTRUCT RETAINING WALL TO ELEVATION 888.6.
- F. CONSTRUCT NEW RAISED EARTH FILL PAD TO EL. 888.6 ADJACENT TO NEW FISHWAY.
- G. EXCAVATE NEW CHANNEL WITHIN EXISTING PLUNGE POOL TO FISHWAY ENTRANCE POOL.
- H. INSTALL NEW STILLING WELL WITH REDUNDANT PRESSURE TRANSDUCERS UPSTREAM OF FISHWAY STRUCTURE..
- K INSTALL NEW 24" SUPPLY PIPE TO ENTRANCE POOL. L CONSTRUCT NEW CONTROL AND POWER BUILDING.
- M CONSTRUCT NEW ACCESS ROAD TO DOWNSTREAM TOE OF DAM.
- N CONSTRUCT NEW PARKING AND EQUIPMENT PAD AT DOWNSTREAM TOE OF DAM.
- O CONSTRUCT NEW ACCESS ROAD TO FISHWAY EXIT STRUCTURE.
- P. REGRADE, REPAIR, AND IMPROVE EXISTING ABANDONED ACCESS ROAD DOWNSTREAM OF DAM RIGHT ABUTMENT.
- Q. INSTALL DAM ISOLATION BULKHEAD GATE AT DOWNSTREAM EXTENT OF EXIT STRUCTURE.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

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



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - FISH PASSAGE
VARIABLE EXIT FISH LADDER
SITE PLAN

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING
K-1

P:\PROJECTS\2022\12\23\22\122322\FISHWAY\FISHWAY_SITING\122322_SITING\122322_SITING.dwg 12/23/22 10:00 AM

Cost Estimate – Variable Exit Fish Ladder

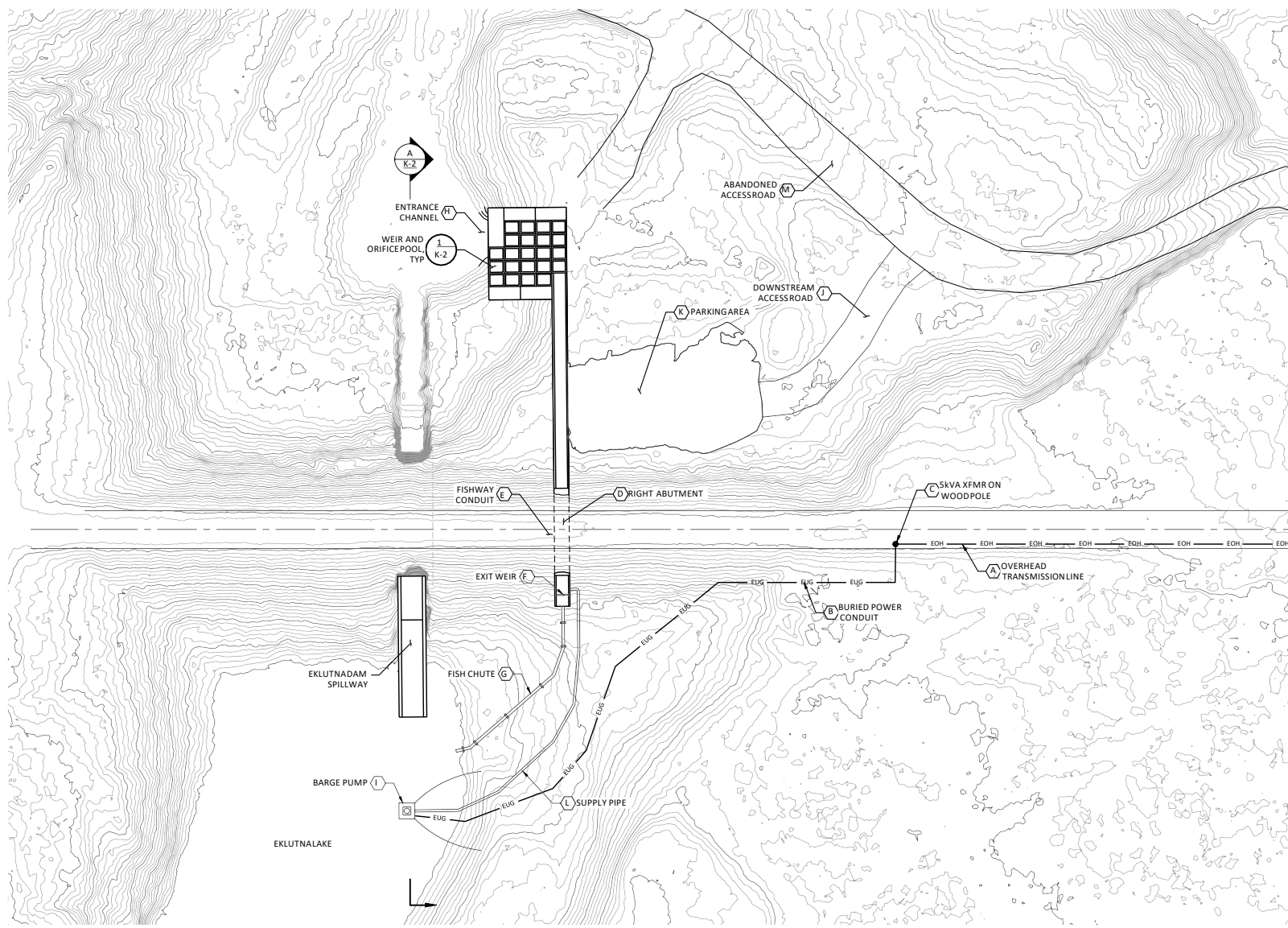
Capital Costs

Indirects:	\$1,300,000
Site Construction/Access:	\$460,000
Fish Ladder Structure:	\$3,800,000
Electrical/Transmission:	\$2,000,000
OH&P/Bonds:	\$1,200,000
Contingency:	\$2,200,000

Total:	\$11,000,000
Range (-50% - +100%):	\$5,500,000 - \$22,000,000

Annual O&M

Personnel:	\$131,000/Yr
Energy:	\$1,400/Yr
Materials:	\$1,200
Contingency:	\$40,000/Yr
Total:	\$174,000/Yr



- SHEET NOTES:**
- ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
 - POND BATHYMETRIC PROFILE IS UNKNOWN, TOPOGRAPHY ESTIMATED BASED ON AS BUILT DRAWINGS OF DAM AND FIELD DATA.
- SHEET KEY NOTES:**
- INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
 - ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO CONTROL ENCLOSURE. APPROXIMATE DISTANCE = 600-FT.
 - INSTALL NEW SKVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.
 - EXCAVATE RIGHT ABUTMENT OF EXISTING DAM TO ELEVATION 859.0.
 - CONSTRUCT NEW CONCRETE FISHWAY THROUGH DAM SECTION.
 - CONSTRUCT NEW EXIT POOL WITH FISH WEIR.
 - CONSTRUCT NEW 24" DIAMETER HDPE FISH CHUTE FOR PASSAGE INTO EKLUTNA LAKEPOND.
 - EXCAVATE NEW CHANNEL WITHIN EXISTING PLUNGE POOL TO FISHWAY ENTRANCE POOL.
 - INSTALL NEW VERTICAL TURBINE PUMP FLOATING ON BARGE STRUCTURE WITHIN EKLUTNA LAKEPOND.
 - CONSTRUCT NEW ACCESS ROAD TO DOWNSTREAM TOE OF DAM.
 - CONSTRUCT NEW PARKING AND EQUIPMENT PAD AT DOWNSTREAM TOE OF DAM.
 - CONSTRUCT NEW 20" HDPE SUPPLY PIPE FROM BARGE PUMP TO FISH LADDER EXIT POOL.
 - REGRADE, REPAIR, AND IMPROVE EXISTING ABANDONED ACCESS ROAD DOWNSTREAM OF DAM RIGHT ABUTMENT.

LEGEND:

— EOH — OVERHEAD ELECTRICAL/POWER

— EUG — UNDERGROUND ELECTRICAL

SITE PLAN
SCALE: 1" = 40'

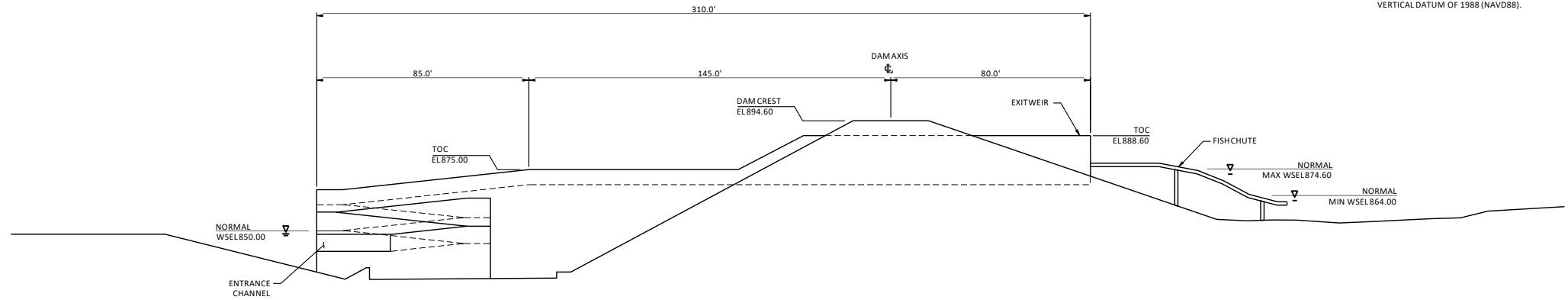
PROJECT: WILDLIFE AND FISHERY FEASIBILITY STUDY; DATE: 12/23/22; PROJECT CENTER: WAC; 15; 2022-03-24; 10:00 AM; AND USER: GUYER/000002

<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			<p>EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY</p>		<p>DESIGNED <u>S. ELLENSON</u></p>	<p>DRAWING L-1</p>
			<p>PME ALTERNATIVES ANALYSIS - FISH PASSAGE PUMPED SUPPLY AND SLIDE FISH LADDER SITE PLAN</p>		<p>DRAWN <u>R. GUERRERO</u></p> <p>CHECKED <u>J. BOAG</u></p> <p>PROJECT DATE <u>12/23/22</u></p>	

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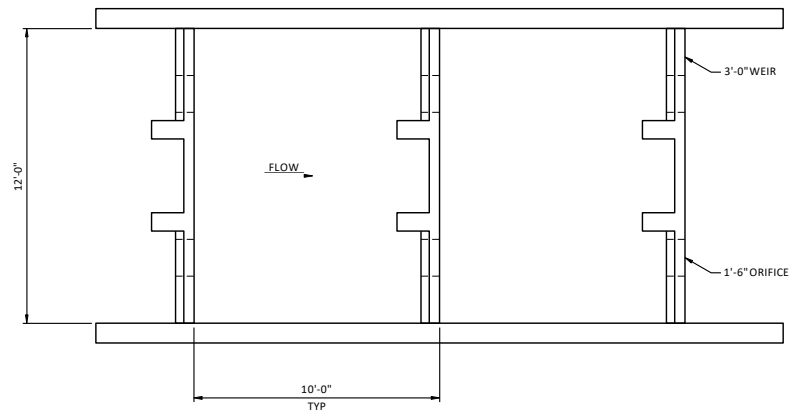
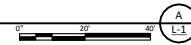
SHEET NOTES:

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



SECTION

SCALE: 1"=20'



WIER AND ORIFICE POOL DETAIL, TYP

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




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DATE BY

REV	DESCRIPTION
A	12/23/22 SPE CONCEPTUAL DESIGN

WARNING

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



EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY

PME ALTERNATIVES ANALYSIS - FISH PASSAGE
 PUMPED SUPPLY AND SLIDE FISH LADDER
 SECTIONS AND DETAILS

DESIGNED S. ELLENSON
 DRAWN D. JOHNSTON
 CHECKED J. BOAG
 PROJECT DATE 12/23/22

DRAWING
L-2

Cost Estimate – Pumped Supply Fish Ladder

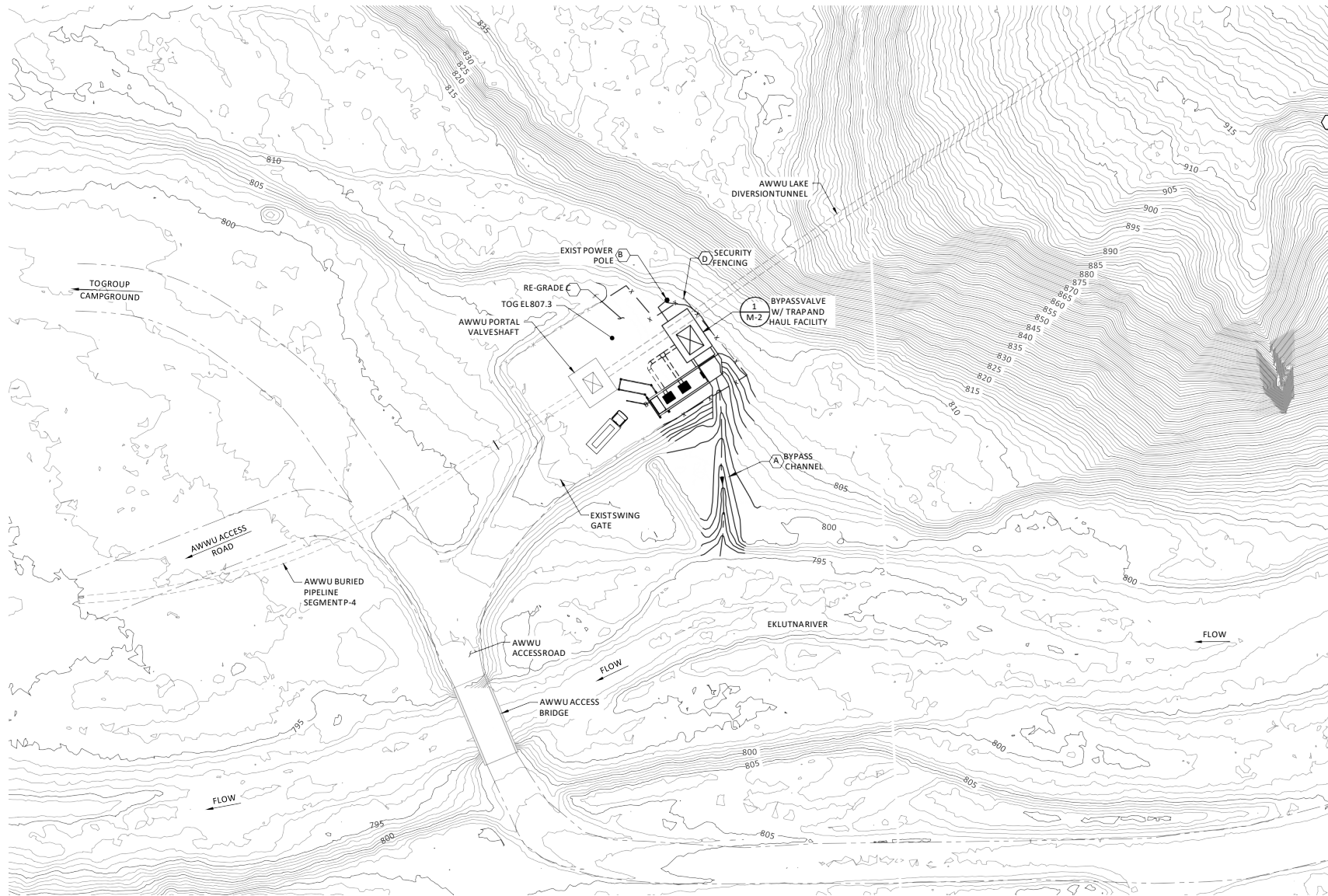
Capital Costs

Indirects:	\$1,000,000
Site Construction/Access:	\$460,000
Fish Ladder Structure:	\$2,500,000
Electrical/Transmission:	\$2,000,000
OH&P/Bonds:	\$1,000,000
Contingency:	\$1,800,000

Total:	\$8,600,000
Range (-50% - +100%):	\$4,300,000 - \$17,200,000

Annual O&M

Personnel:	\$131,000/Yr
Energy:	\$96,000/Yr
Materials:	\$1,200
Contingency:	\$69,000/Yr
Total:	\$298,000/Yr



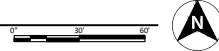
SHEET NOTES:

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

SHEET KEY NOTES:

- A EXCAVATE NEW TRAPEZOIDAL BYPASS CHANNEL FROM BYPASS VALVE WET WELL TO EKLUTNA RIVER.
- B TAP NEW 240V-3P FEEDER OFF EXISTING 7.5-KV TRANSMISSION LINE.
- C FOLLOWING EXCAVATION FOR BYPASS VALVE SHAFT, RE-GRADE PAD TO ELEVATION 807.3 FT IN VICINITY OF BYPASS VALVE STRUCTURE.
- D EXTEND SECURITY FENCING AROUND PERIMETER OF NEW STRUCTURE.

SITE PLAN
SCALE: 1" = 30'



PROJECT: WILDLIFE AND FISHERIES ENGINEERING STUDY; MAP: AWWU; DATE: 12/23/22; USER: JBOAG

REV	DESCRIPTION

WARNING

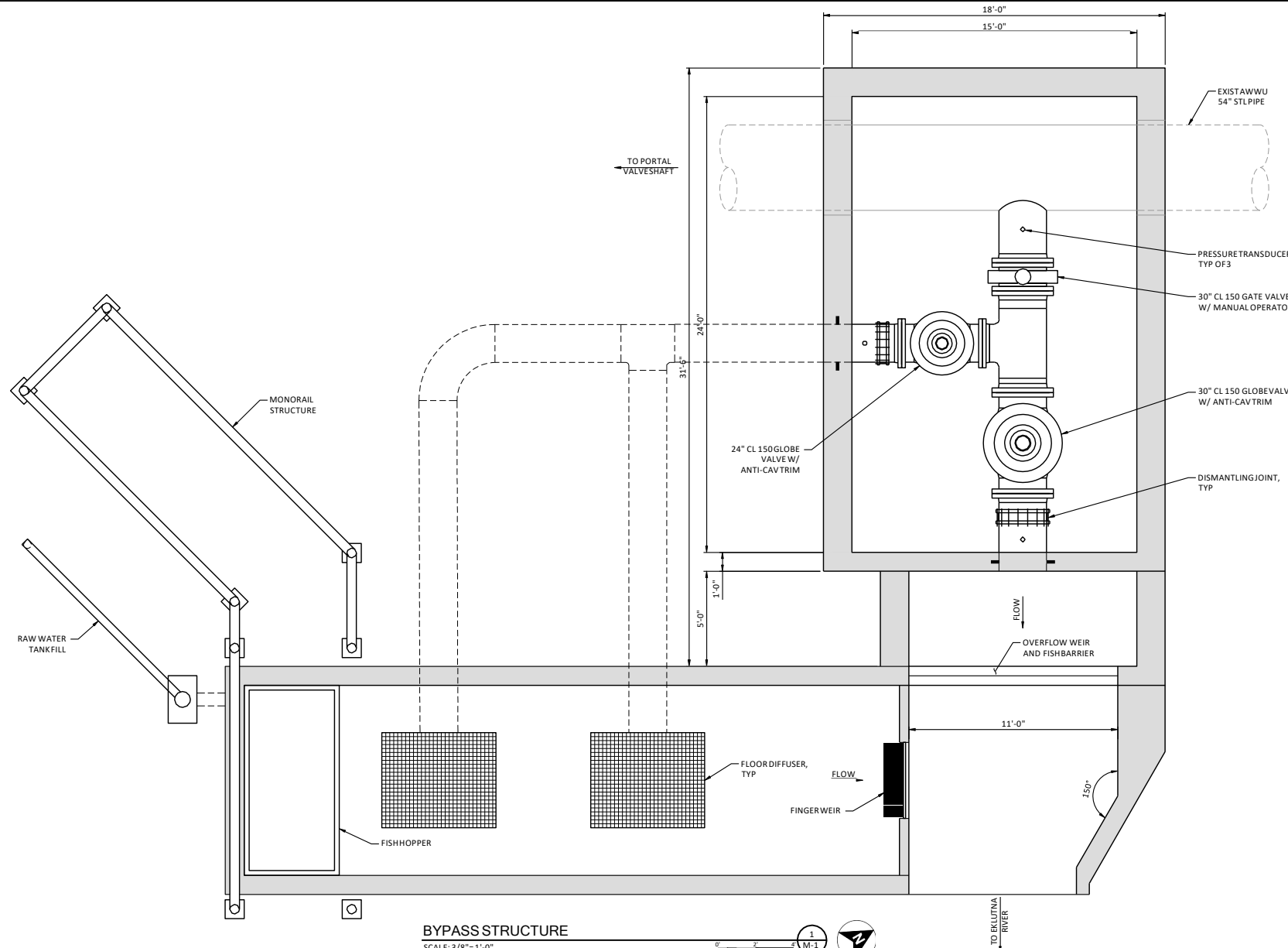
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - FISH PASSAGE TRAP AND HAUL FACILITY SITE PLAN

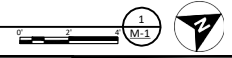
DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING M-1



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

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



PUBLIC WORKS AND UTILITIES DEPARTMENT - FEASIBILITY STUDY WORK - DATE: DEC 15, 2022 09:54:00 AM - CADD USER: CLAUDETTE@CIW.BET

REV	DATE	DESCRIPTION
A	12/23/22	SPE CONCEPTUAL DESIGN

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



EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY

PME ALTERNATIVES ANALYSIS - FISH PASSAGE TRAP AND HAUL FACILITY SECTIONS AND DETAILS

DESIGNED S. ELLENSON
 DRAWN R. GUERRERO
 CHECKED J. BOAG
 PROJECT DATE 12/23/22

DRAWING
M-2

Cost Estimate – Trap and Haul

Capital Costs

Indirects:	\$1,000,000
Site Construction/Access:	\$40,000
Civil Works/Grading:	\$720,000
Bypass Valve Shaft/Raceway:	\$830,000
Piping and Valves:	\$700,000
Fish Transport:	\$830,000
Electrical/Transmission:	\$1,700,000
OH&P/Bonds:	\$830,000
Contingency:	\$1,700,000
Total:	\$8,300,000
Range (-50% - +100%):	\$4,200,000 - \$16,700,000

Annual O&M

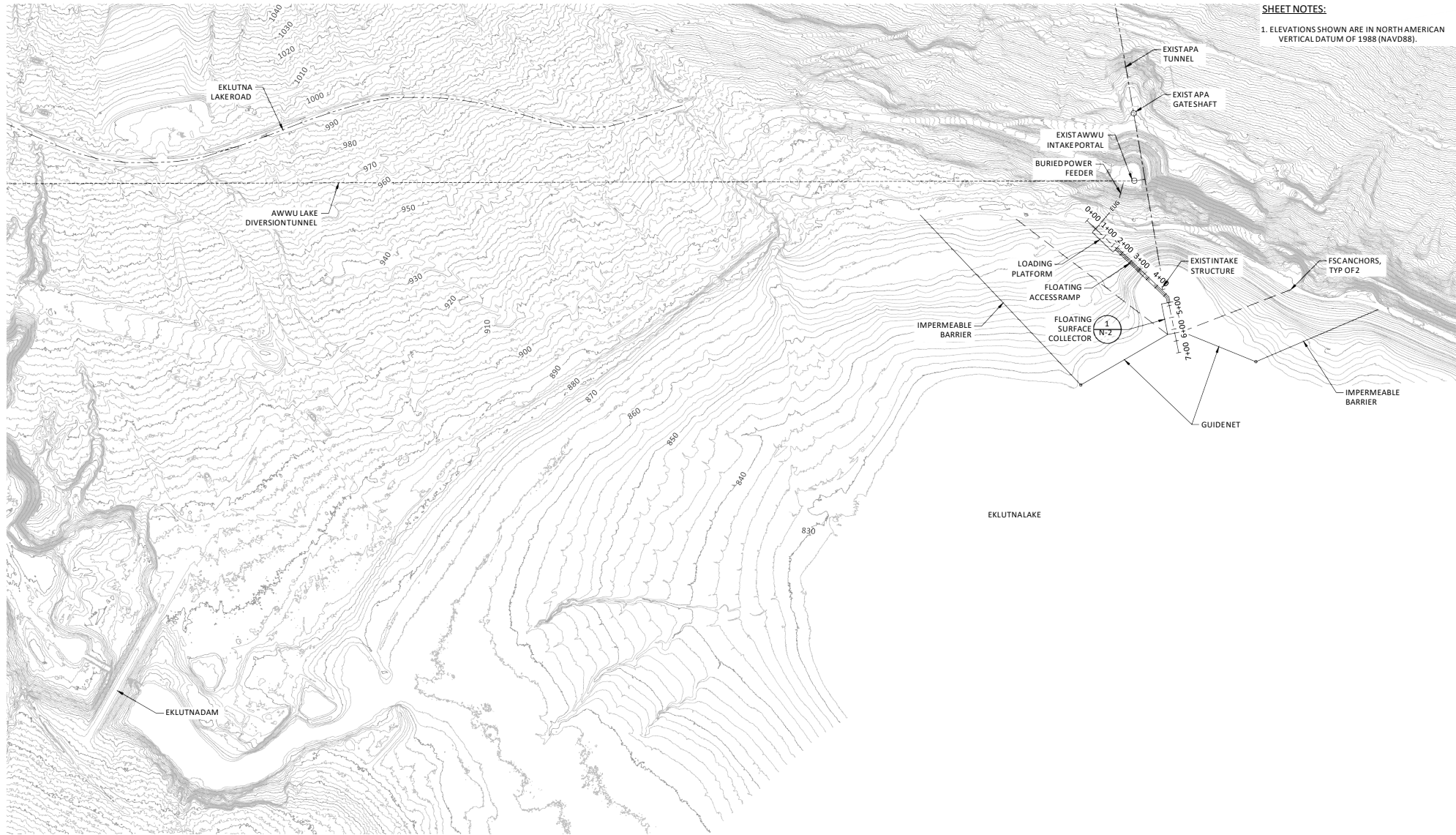
Personnel:	\$145,000/Yr
Transportation:	\$2,300
Energy:	\$1,000/Yr
Materials:	\$4,800
Contingency:	\$46,000/Yr
Total:	\$200,000/Yr

Phase 1 Engineering Design

Downstream Fish Passage Measures

1. Dam Spill (Phase 1 Design Not Required)
2. Floating Surface Collector





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

SITE PLAN
 SCALE: 1" = 200'



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REV	DESCRIPTION

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



EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - FISH PASSAGE FLOATING SURFACE COLLECTOR SITE PLAN

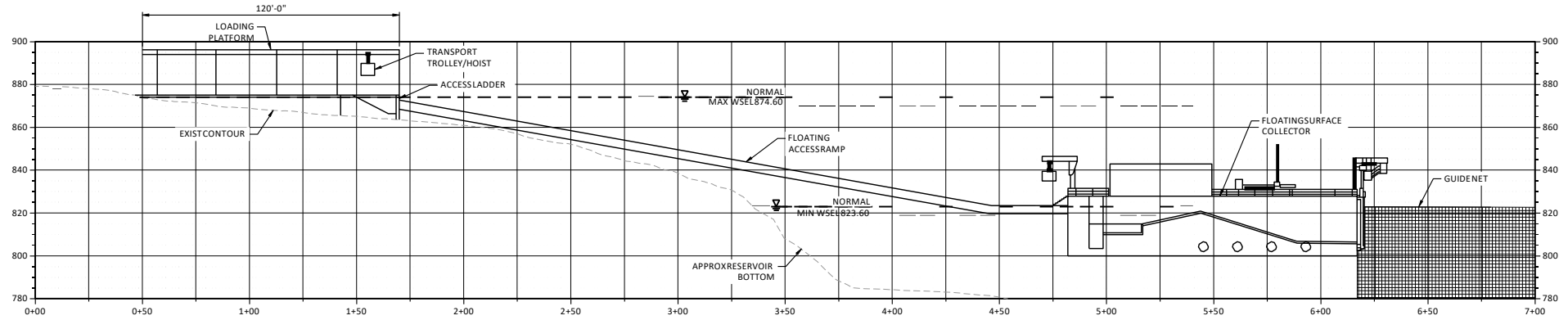
DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

DRAWING
N-1

DATE BY

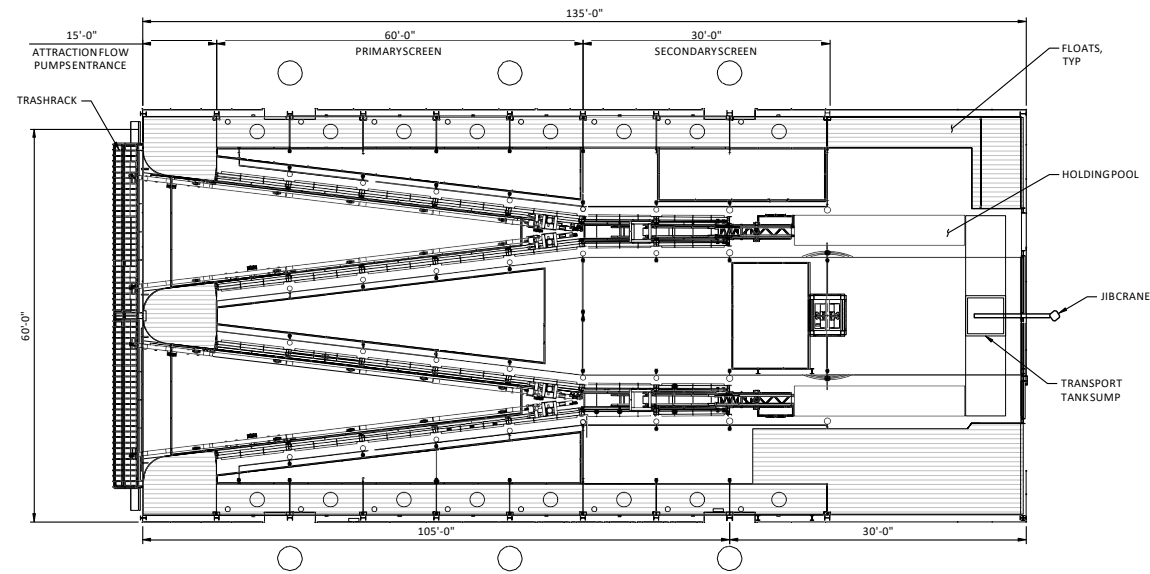
SHEET NOTES:

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



OVERALL PROFILE

SCALE: NTS



FLOATING SURFACE COLLECTOR DETAIL

SCALE: NTS

1
N-1

PUBLIC: \\VAD\WORK\CHUGACH\ESTRICK\ESTRICK\FEASIBILITY\Study\N2.dwg; PLOT DATE: DEC 15, 2017 09:35:50 AM; CAD USER: GWATER@GOWDNET

REV	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY		DESIGNED <u>S. ELLENSON</u>	DRAWING
					PME ALTERNATIVES ANALYSIS - FISH PASSAGE FLOATING SURFACE COLLECTOR SECTIONS AND DETAILS		DRAWN <u>R. GUERRERO</u> CHECKED <u>J. BOAG</u> PROJECT DATE <u>12/23/22</u>	
DATE	BY							

108107-000000

Cost Estimate – Floating Surface Collector

Capital Costs

Indirects:	\$6,700,000
Site Construction/Access:	\$160,000
Debris Boom:	\$610,000
Exclusion/Guidance Nets:	\$3,800,000
FSC/Barge:	\$24,600,000
Fish Transport:	\$900,000
Electrical/Transmission:	\$3,200,000
OH&P/Bonds:	\$6,100,000
Contingency:	\$11,500,000
Total:	\$57,600,000

Range (-50% - +100%): **\$29,000,000 - \$115,000,000**

Annual O&M

Personnel:	\$270,000/Yr
Transportation:	\$3,800
Energy:	\$393,000/Yr
Materials:	\$94,000
Contingency:	\$229,000/Yr
Total:	\$991,000/Yr

Impacts to Reservoir Operations

Requires Modified Reservoir Operations

Instream Flow Measures:

1. Dam Release Modifications
2. Siphon Bypass

Upstream Fish Passage Measures:

1. Gravity Flow Fish Ladder
2. Variable Exit Fish Ladder
3. Pumped Supply and Slide Fish Ladder

Downstream Fish Passage Measures:

1. Reservoir Spill

No Change to Reservoir Operations

Instream Flow Measures:

1. AWWU Portal Valve Release
2. AWWU Pipeline Release
3. Bypass Tunnel Release

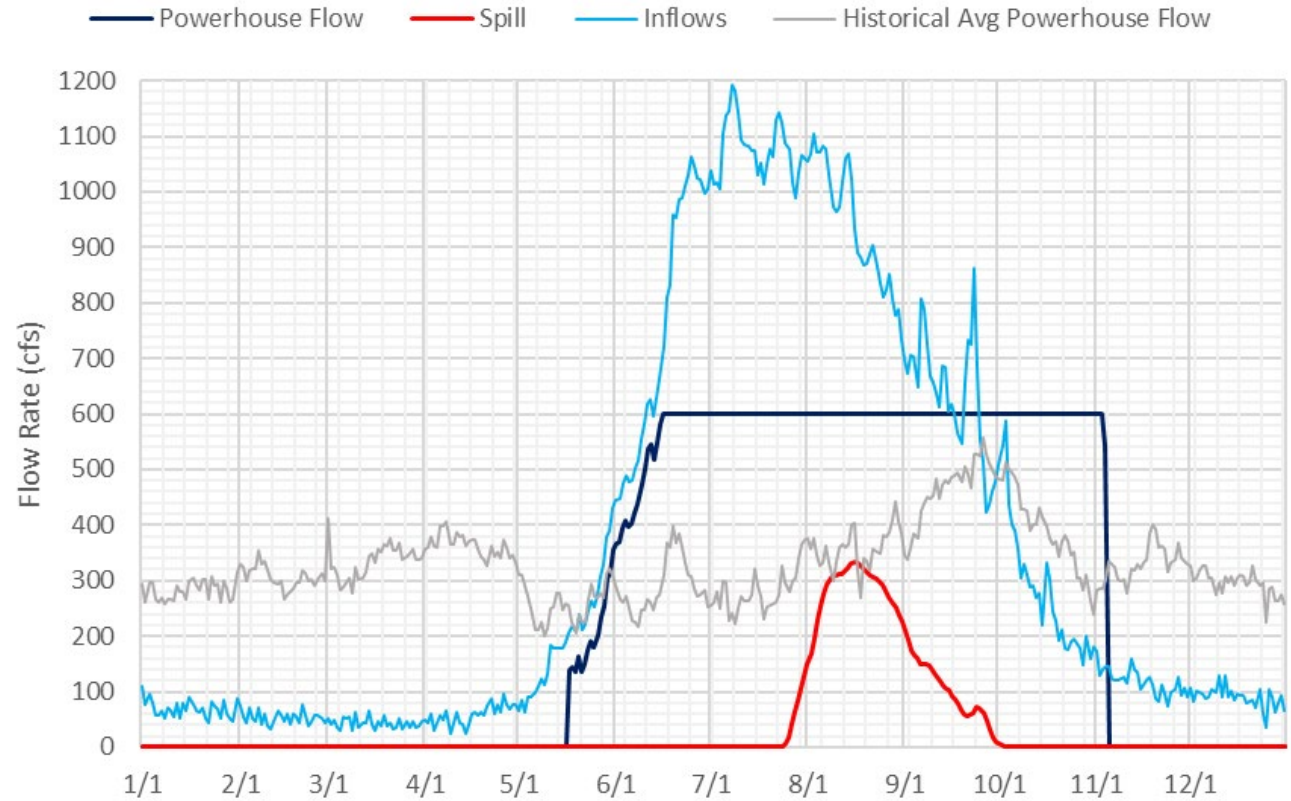
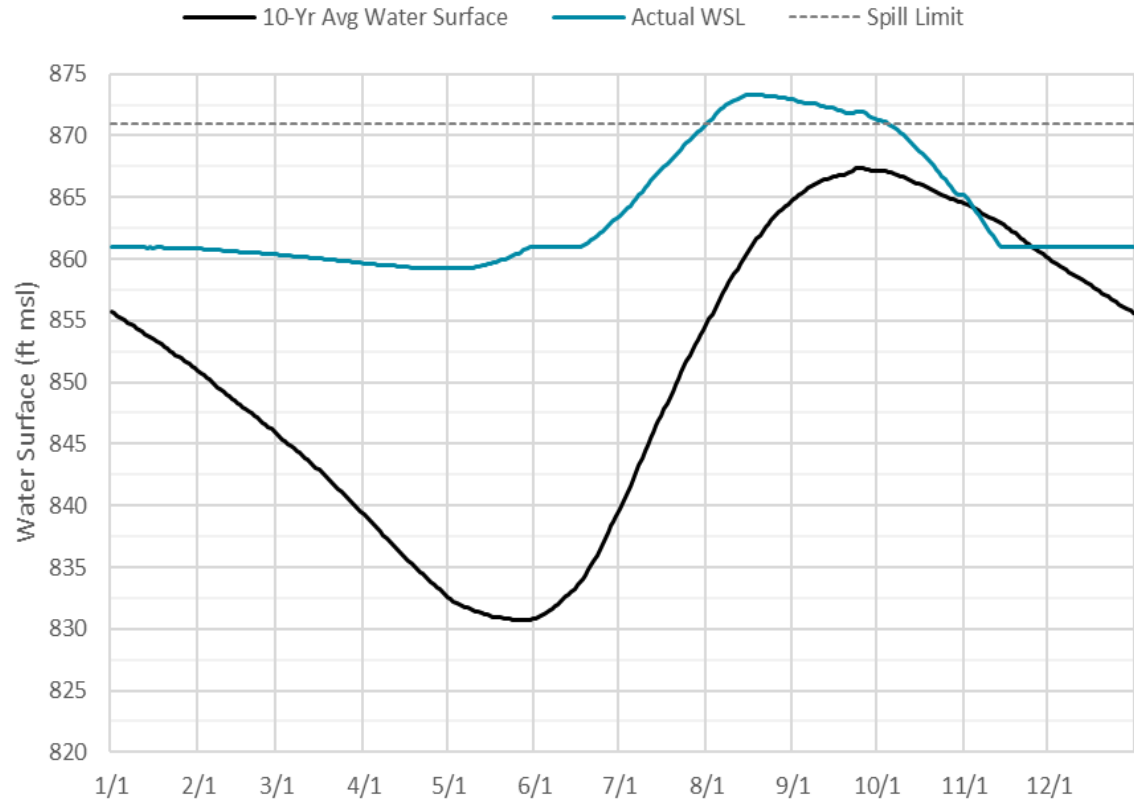
Upstream Fish Passage Measures:

1. Trap and Haul

Downstream Fish Passage Measures:

1. Floating Surface Collector

Operational Limitations (Modified Reservoir WSL)



Eklutna Lake Active Storage Reduced by 80%

Operation Impacts if Powerhouse Offline

- Highest Power Needs in Winter through Railbelt
- MEA Capacity Constraints for Grid Reliability
- Replacement Energy – Gas/Thermal (Higher Costs/Carbon Emissions)
 - Cook Inlet Gas Supply Uncertainty
- Need reservoir capacity to regulate new renewables
- Currently utilized for system support/regulation
- Increased likelihood of spill events in summer (Public Safety risk, Habitat Degradation)
- Dam Safety Risks
- Powerhouse Impacts – Winterization

Cost Estimate – Dam and Powerhouse Upgrades

Capital Costs

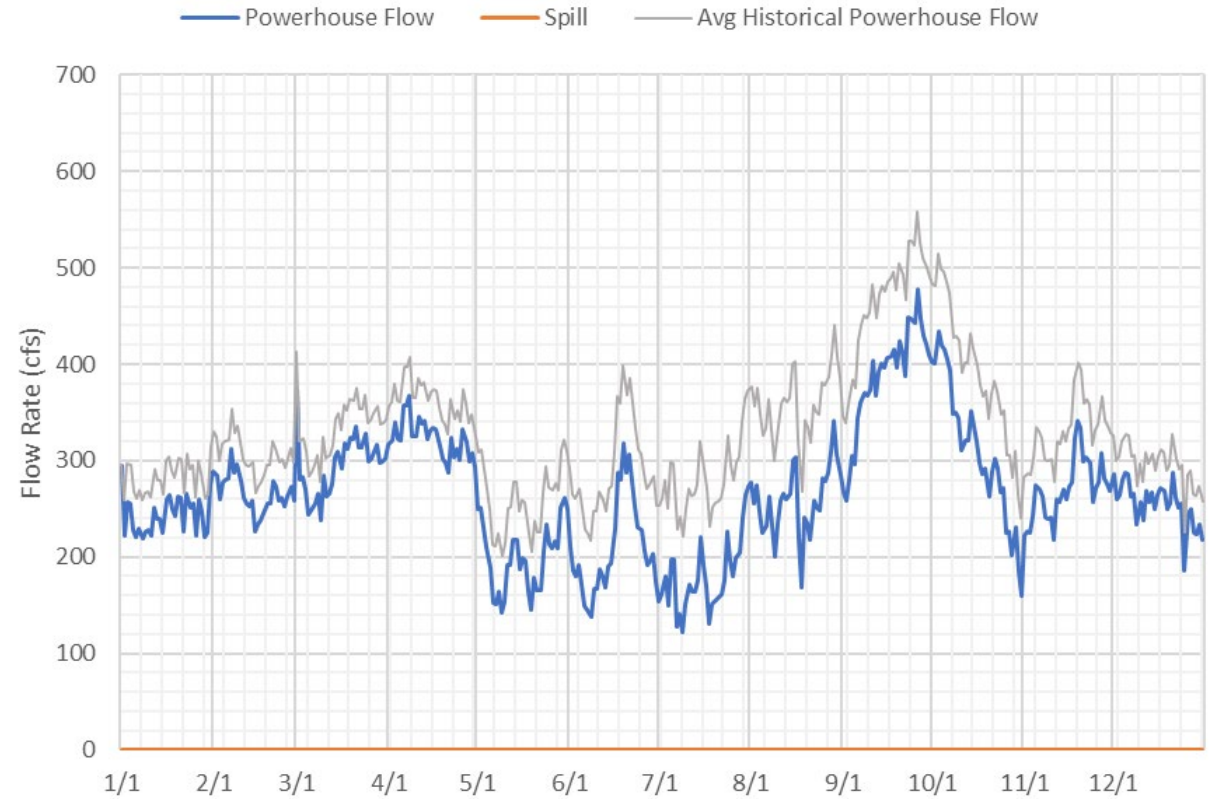
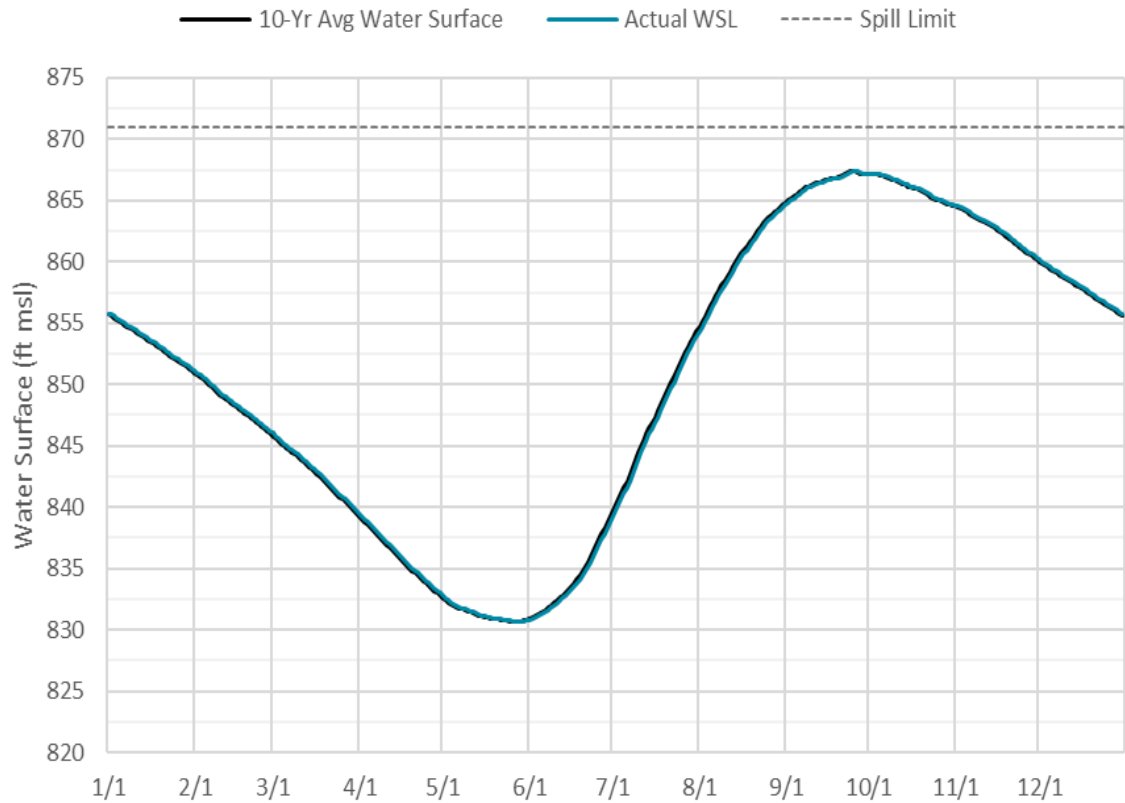
Indirects:	\$770,000
Site Construction/Access:	\$40,000
Powerhouse Upgrades:	\$1,300,000
Dam Upgrades:	\$2,500,000
OH&P/Bonds:	\$370,000
Contingency:	\$1,200,000
Total:	\$6,200,000
Range (-50% - +100%):	\$3,100,000 - \$12,400,000

Annual O&M

Energy:	\$293,000/Yr
Contingency:	\$88,000/Yr
Total:	\$382,000/Yr

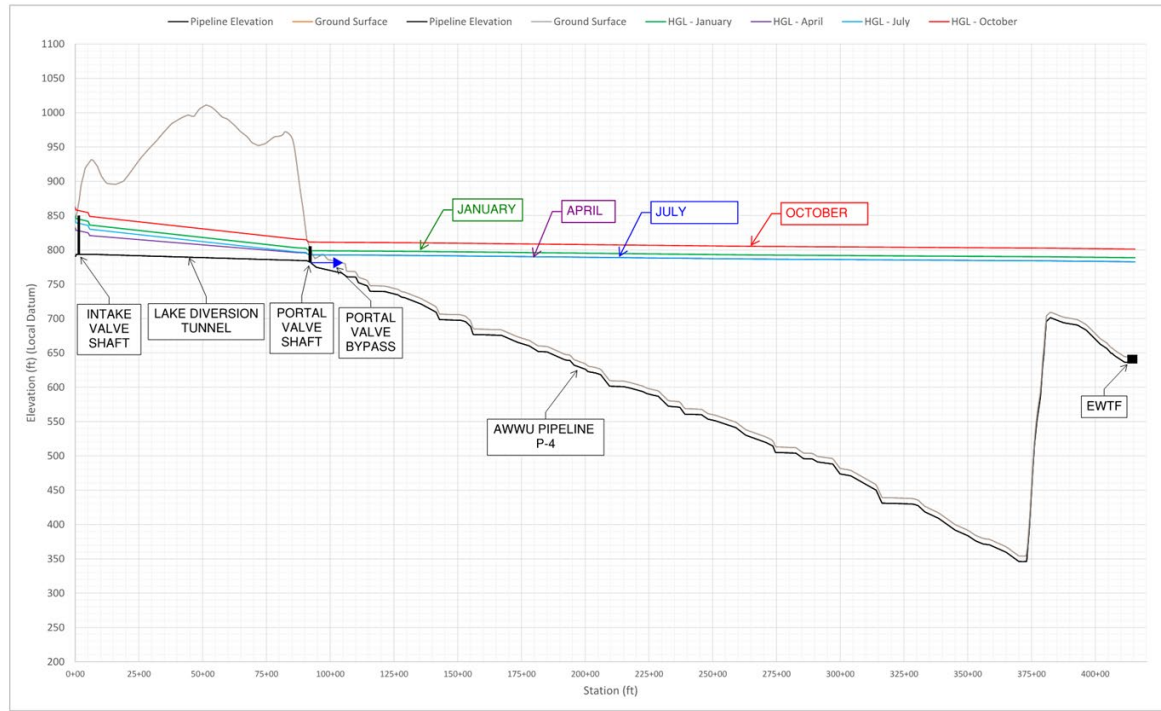


Operational Limitations (Unchanged Reservoir WSL)

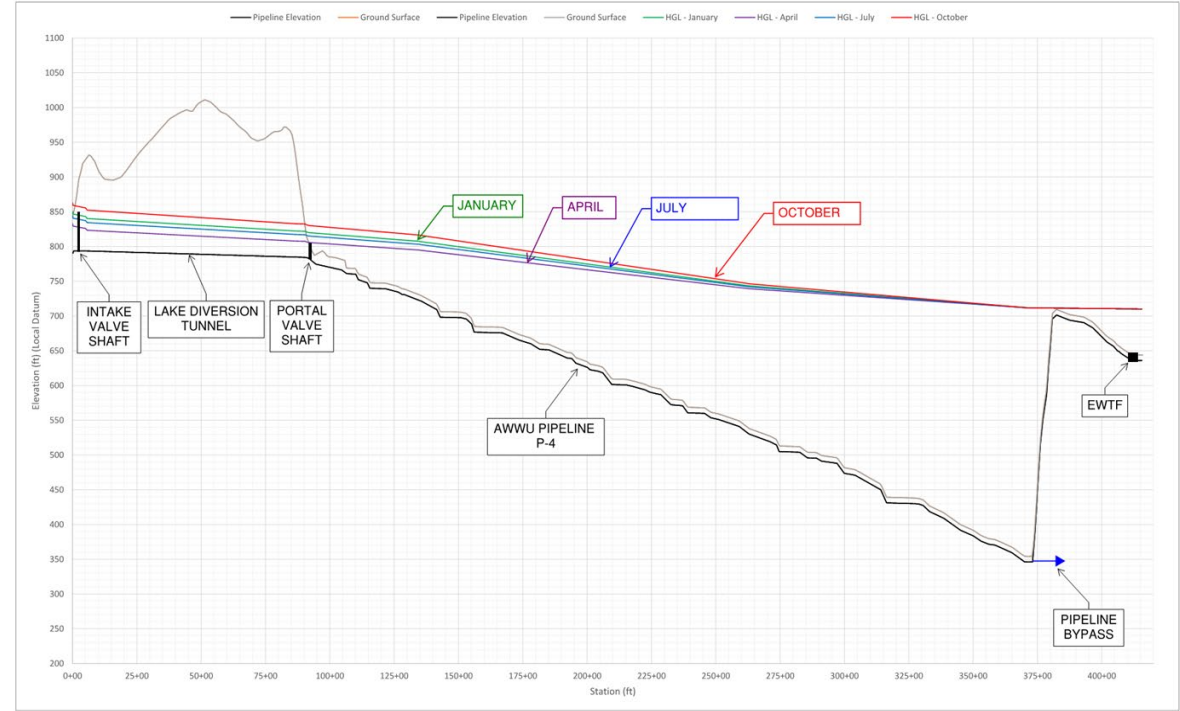


Operational Limitations (AWWU Infrastructure)

Portal Valve Release



Pipeline Release



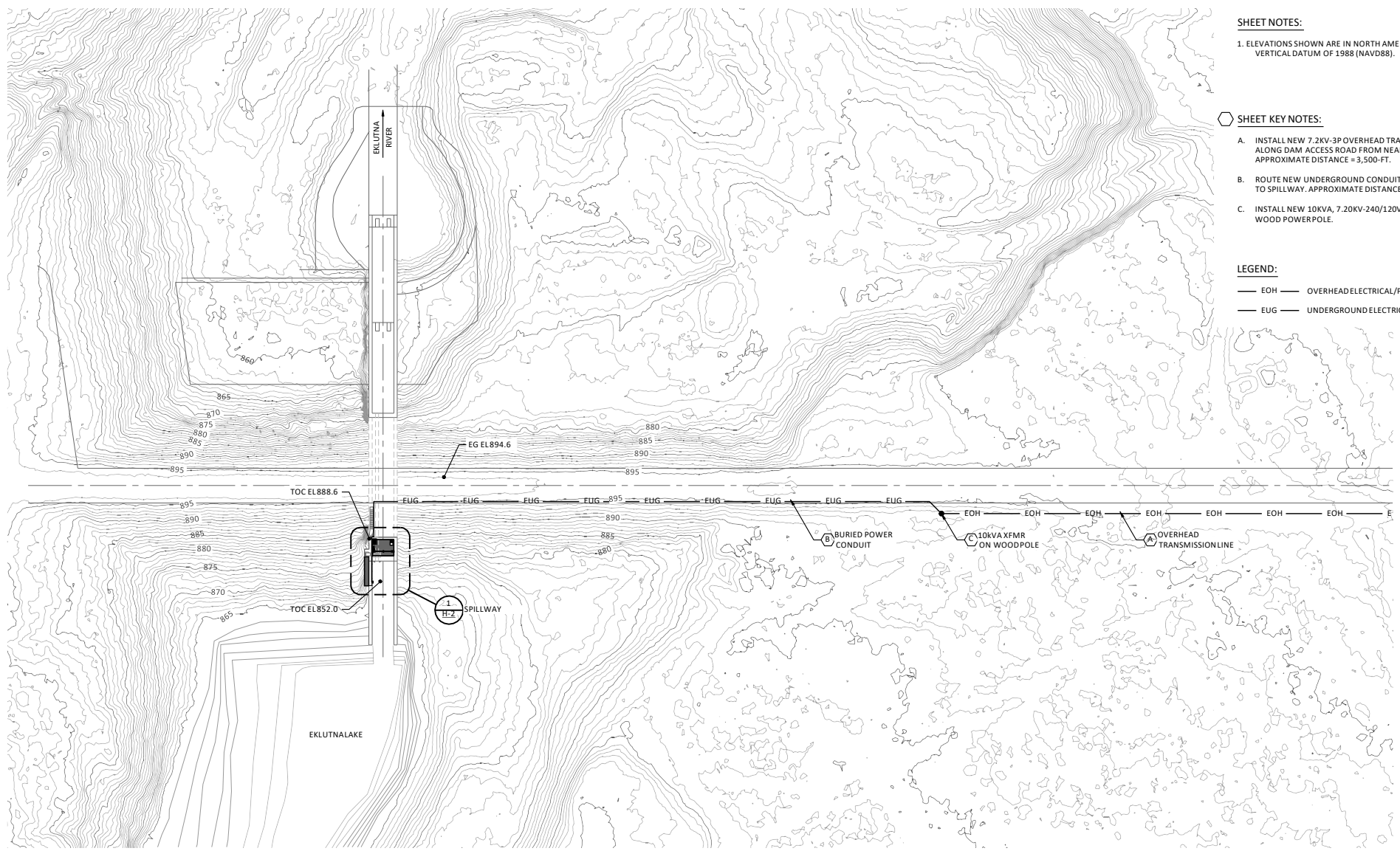
Both Alternatives are limited by peak velocities through the inlet/portal valve structures.
Max allowable bypass ~100 cfs

Phase 1 Engineering Design

Peak Flow Measures

1. Uncontrolled Spill (Phase 1 Design Not Required)
2. Tainter Gate
3. Fixed Wheel Gate





SHEET NOTES:

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

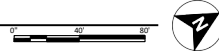
SHEET KEY NOTES:

- A. INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B. ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO SPILLWAY. APPROXIMATE DISTANCE = 600-FT.
- C. INSTALL NEW 10KVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

SITE PLAN
SCALE: 1" = 40'



PROJECT: EKLUTNA FISH & WILDLIFE PROJECT - ENGINEERING FEASIBILITY STUDY - TAILER GATE - 12/23/22 - 15:00:00 - 12/23/22 - 15:00:00

DATE BY

REV	DESCRIPTION

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

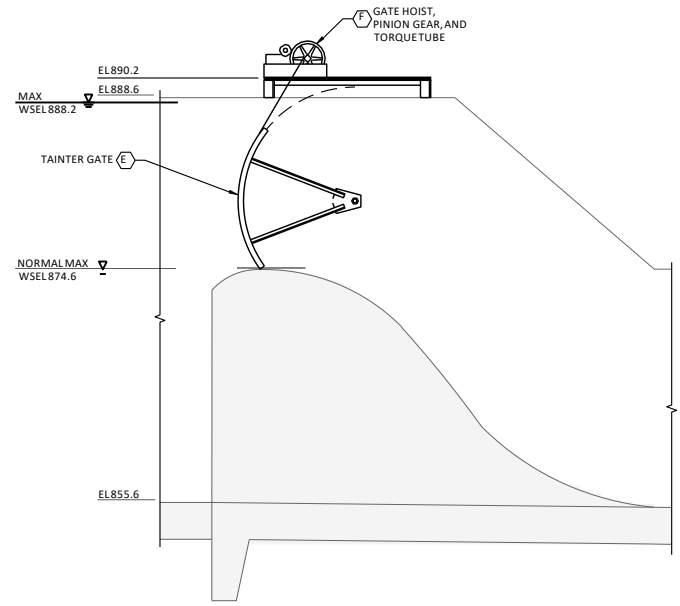
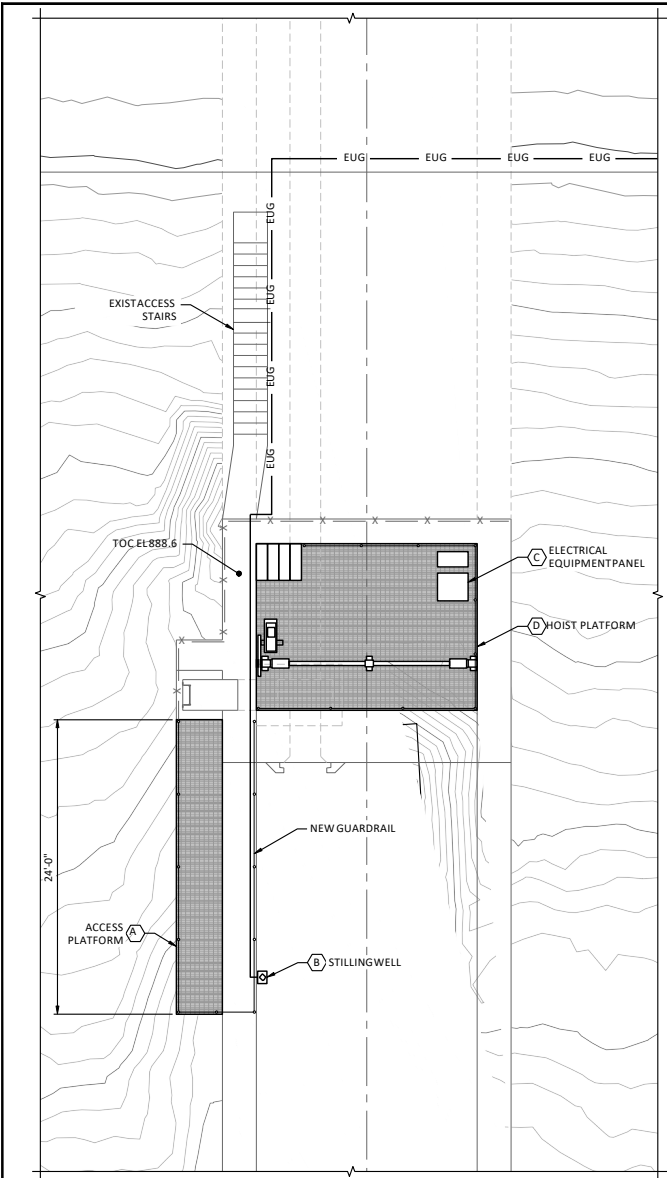


EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - PEAK FLOW SPILLWAY MODIFICATIONS - TAILER GATE EL 874.6 SITE PLAN	

DESIGNED	S. ELLENSON
DRAWN	R. GUERRERO
CHECKED	J. BOAG
PROJECT DATE	12/23/22

DRAWING
H-1

108-107-000000



SHEET NOTES:

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

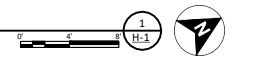
SHEET KEY NOTES:

- A. INSTALL O&M ACCESS PLATFORM ON SPILLWAY TRAINING WALL. B. INSTALL STILLING WELL WITH SUBMERSIBLE PRESSURE TRANSDUCER.
- C. INSTALL ELECTRICAL EQUIPMENT AND CONTROLS PANEL.
- D. INSTALL O&M HOIST PLATFORM ABOVE SPILLWAY.
- C. INSTALL 18-FT WIDE X 12-FT TALL TAITNER GATE ON LIP OF EXISTING SPILLWAY. MOUNT TRUNNIONS ON EXISTING SPILLWAY TRAINING WALLS. INSTALL SEALING SURFACE ON LIP OF EXISTING SPILLWAY CREST.
- D. INSTALL HOIST, PINION GEAR, GEAR REDUCER, TORQUETUBE, AND BEARINGS ON HOIST PLATFORM.

SPILLWAY DETAIL
SCALE: 3/16"=1'-0"

SECTION
SCALE: 3/16"=1'-0"

REV	DATE	BY	DESCRIPTION
A	12/23/22	SPE	CONCEPTUAL DESIGN



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



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY

PME ALTERNATIVES ANALYSIS - PEAK FLOW
SPILLWAY MODIFICATIONS - TAITNER GATE EL 874.6
SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING
H-2

PROJECT: VARIOUS WILDLIFE PROJECTS - FEASIBILITY STUDY - PEAK FLOW SPILLWAY MODIFICATIONS - TAITNER GATE EL 874.6
 DATE: 12/23/22
 DRAWING NO: 000000

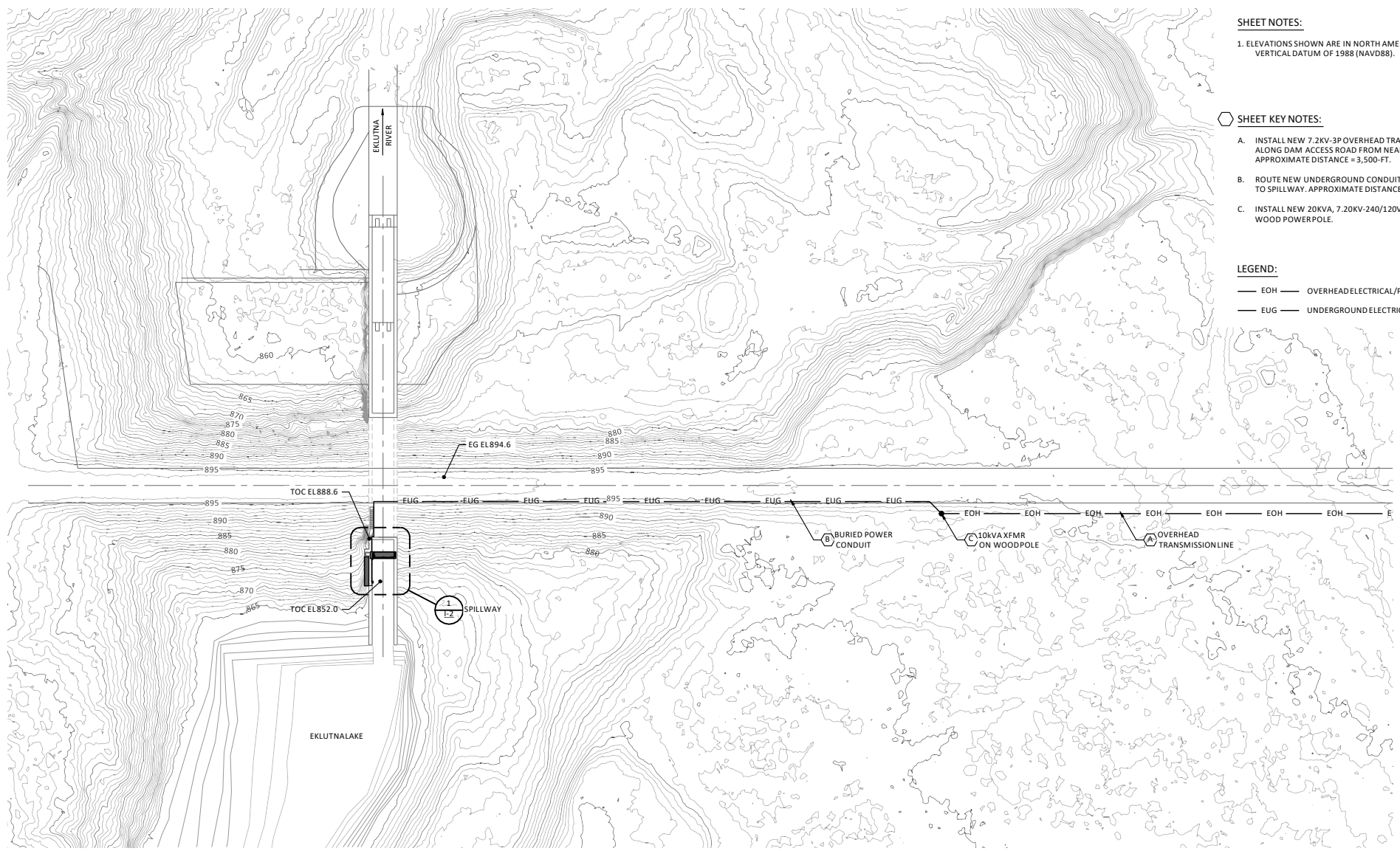
Cost Estimate – Tainter Gate

Capital Costs

Indirects:	\$638,000
Site Construction/Access:	\$80,000
Spillway Modifications:	\$250,000
Mechanical Equipment:	\$980,000
Electrical/Transmission:	\$1,900,000
OH&P/Bonds:	\$630,000
Contingency:	\$1,100,000
Total:	\$5,600,000
Range (-50% - +100%):	\$2,800,000 - \$11,200,000

Annual O&M

Personnel:	\$22,000/Yr
Energy:	\$1,300/Yr
Materials:	\$1,500
Contingency:	\$7,500/Yr
Total:	\$32,500/Yr



SHEET NOTES:

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

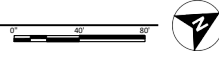
SHEET KEY NOTES:

- A. INSTALL NEW 7.2KV-3P OVERHEAD TRANSMISSION LINE ALONG DAM ACCESS ROAD FROM NEAREST POI. APPROXIMATE DISTANCE = 3,500-FT.
- B. ROUTE NEW UNDERGROUND CONDUIT FROM POWER POLE TO SPILLWAY. APPROXIMATE DISTANCE = 600-FT.
- C. INSTALL NEW 20KVA, 7.20KV-240/120V TRANSFORMER ON WOOD POWERPOLE.

LEGEND:

- EOH — OVERHEAD ELECTRICAL/POWER
- EUG — UNDERGROUND ELECTRICAL

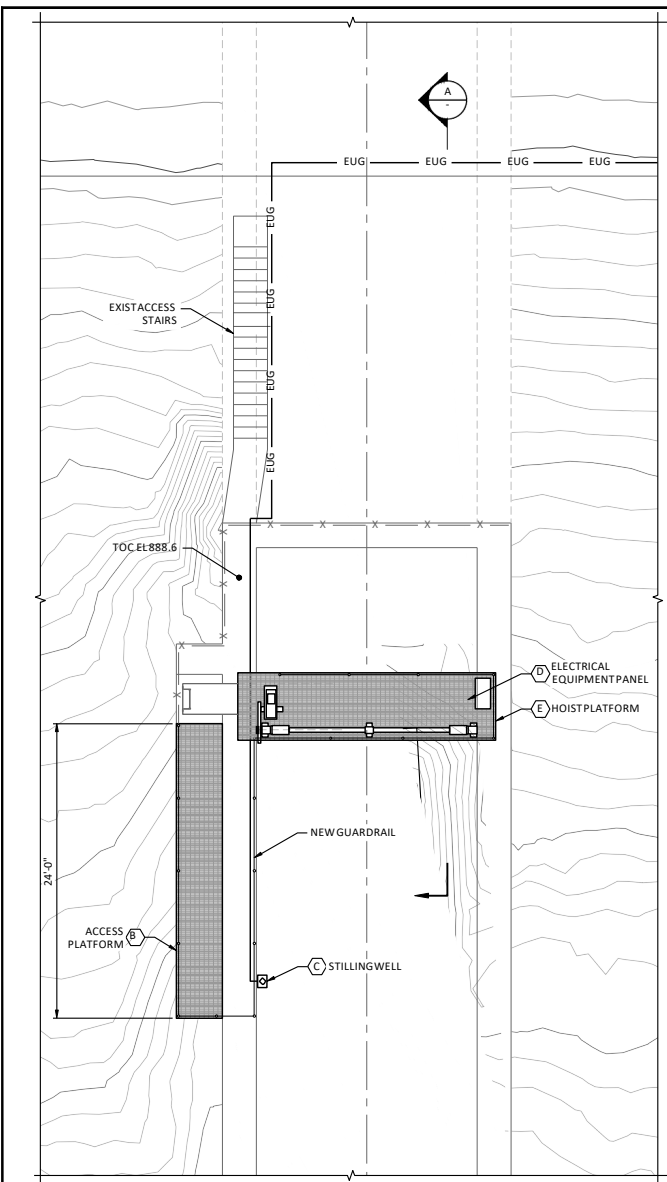
SITE PLAN
SCALE: 1" = 40'



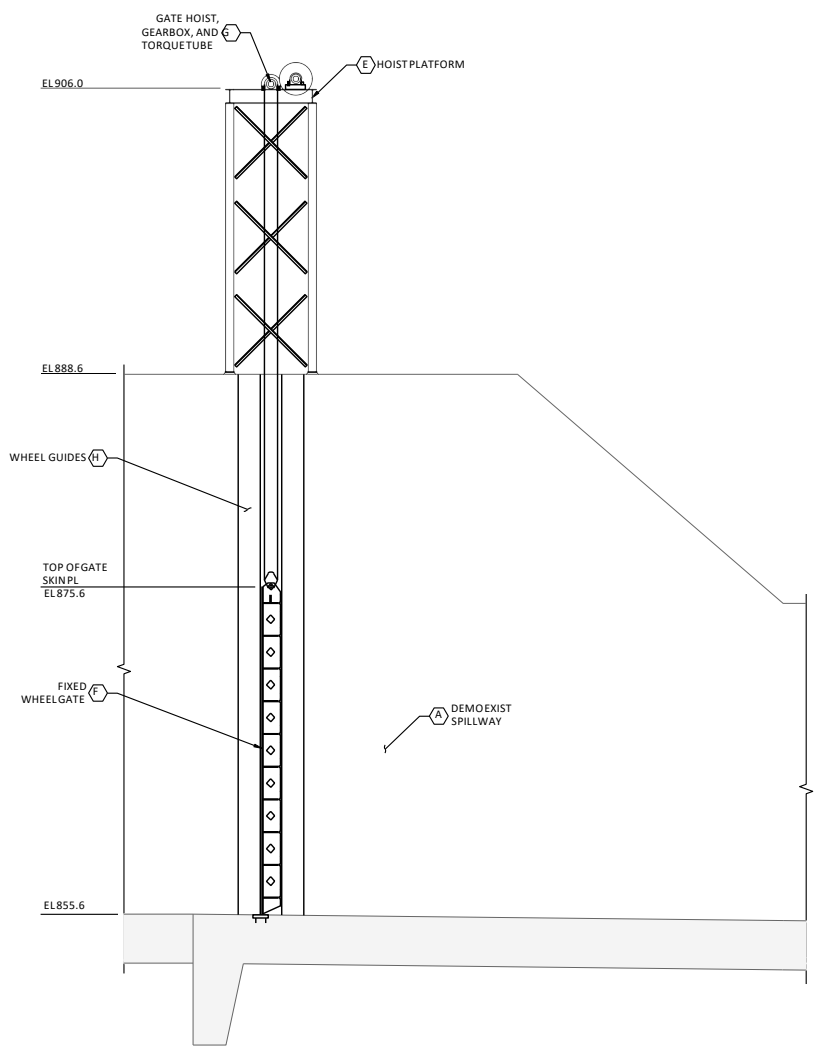
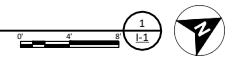
PROJECT: WILDLIFE AND FISHERY MANAGEMENT PLAN FOR THE EKLUTNA RIVER AND LAKE, 2012-2013. DRAWN BY: J. BOAG. DATE: 12/23/22.

DATE	BY	REV	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT		DESIGNED <u>S. ELLENSON</u>	DRAWING
							ENGINEERING FEASIBILITY STUDY			
PME ALTERNATIVES ANALYSIS - PEAK FLOW								CHECKED <u>J. BOAG</u>	PROJECT DATE <u>12/23/22</u>	I-1
SPILLWAY MODIFICATIONS - FIXED WHEEL GATE EL 855.6										
SITE PLAN										

JOB NO: 000000



SPILLWAY DETAIL
SCALE: 3/16" = 1'-0"



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



SHEET NOTES:

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

SHEET KEY NOTES:

- A DEMOLISH EXISTING CONCRETE SPILLWAY, GATE CHAMBER, AND OUTLET GATE TO EXISTING SPILLWAY SLAB EL. 855.6.
- B. INSTALL O&M ACCESS PLATFORM ON SPILLWAY TRAINING WALL.
- C. INSTALL STILLING WELL WITH SUBMERSIBLE PRESSURE TRANSDUCER.
- D. INSTALL ELECTRICAL EQUIPMENT AND CONTROLS PANEL.
- E. INSTALL O&M HOIST PLATFORM ABOVE SPILLWAY.
- F. INSTALL 16-FT WIDE X 20-FT TALL FIXED WHEEL GATE WITHIN THE EXISTING SPILLWAY STRUCTURE. INSTALL SEALING SURFACE ON LIP OF EXISTING SPILLWAY CREST.
- G. INSTALL HOIST, GEAR REDUCER, TORQUE TUBE, AND BEARINGS ON HOIST PLATFORM.
- H. MODIFY EXISTING SPILLWAY TRAINING WALLS. INCLUDE NEW WHEEL GUIDE BLOCKOUTS FOR FIXED WHEEL GATE.

PROJECT: VARIOUS WILDLIFE ELECTRICITY FEASIBILITY STUDY 12.23.22 DATE: 12.23.22 12:55 PM CAD USER: QUERRERO

JOB NO: 000000

DATE BY

REV	DATE	BY	DESCRIPTION
A	12/23/22	SPE	CONCEPTUAL DESIGN

WARNING
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EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - PEAK FLOW SPILLWAY MODIFICATIONS - FIXED WHEEL GATE EL 855.6 SECTIONS AND DETAILS

DESIGNED S. ELLENSON
DRAWN R. GUERRERO
CHECKED J. BOAG
PROJECT DATE 12/23/22

DRAWING
1-2

Cost Estimate – Fixed Wheel Gate

Capital Costs

Indirects:	\$750,000
Site Construction/Access:	\$80,000
Spillway Modifications:	\$570,000
Mechanical Equipment:	\$1,300,000
Electrical/Transmission:	\$1,900,000
OH&P/Bonds:	\$740,000
Contingency:	\$1,300,000
Total:	\$6,600,000
Range (-50% - +100%):	\$3,300,000 - \$13,100,000

Annual O&M

Personnel:	\$22,000/Yr
Energy:	\$1,300/Yr
Materials:	\$1,500
Contingency:	\$7,500/Yr
Total:	\$32,500/Yr

Phase 1 Engineering Design

Instream Flow Improvements

1. Lach Q'Atnu Re-Route
2. Channel Excavation (Lake Outlet)



SHEET NOTES:

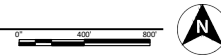
1. ELEVATIONS SHOWN ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

SHEET KEY NOTES:

- A CONSTRUCT DIVERSIONARY EMBANKMENT BERM AT HEAD OF EXISTING LACH Q'ATNU CREEK TO NEW CHANNEL.
- B CONSTRUCT NEW TRAPEZOIDAL STREAM CHANNEL ALONG PROPOSED ALIGNMENT. LENGTH = 5,500-FT. POOLS/STEPS SHALL BE DEVELOPED AT 100-FT INTERVALS ALONG LENGTH. PROVIDE VEGETATIVE BANK PROTECTION MEASURES USING NATIVE TREES/SHRUBS ALONG LENGTH.
- C CONSTRUCT CULVERT FOR LACH Q'ATNU CREEK UNDER EKLUTNA LAKEROAD.

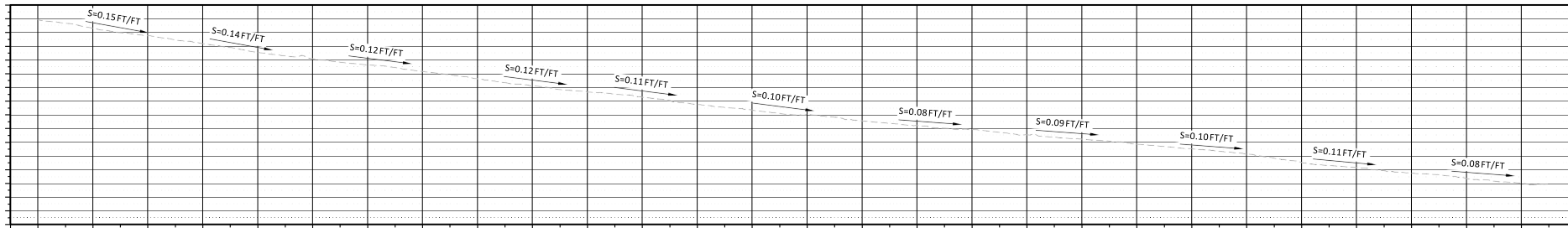


SITE PLAN
SCALE: 1"= 400'



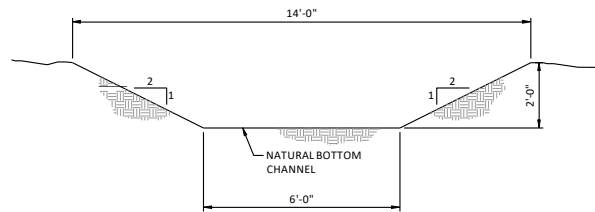
PROJECT: VULNERABILITY ASSESSMENT FOR EKLUTNA FISHERY STATION 15; POST DATE: APR. 15, 2012; 03:52:21 PM; CAD USER: GWG/REG/06/05/21

DATE	BY	REV	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			<p>EKLUTNA FISH & WILDLIFE PROJECT</p> <p>ENGINEERING FEASIBILITY STUDY</p>	<p>DESIGNED S. ELLENSON</p> <p>DRAWN R. GUERRERO</p> <p>CHECKED J. BOAG</p> <p>PROJECT DATE 12/23/22</p>	<p>DRAWING</p> <h1>G-1</h1>
<p>PME ALTERNATIVES ANALYSIS - INSTREAM FLOW</p> <p>LACH Q'ATNU CREEK RE-ROUTE</p> <p>SITE PLAN</p>									



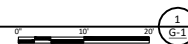
PROFILE

SCALE: 1"=200'




DETAIL

SCALE: 1"=10'



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DATE BY REV DESCRIPTION

WARNING

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 MEASURE 1" THEN
 DRAWING IS NOT TO SCALE.



EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY
 PME ALTERNATIVES ANALYSIS - INSTREAM FLOW
 LACH Q'ATNU CREEK RE-ROUTE
 SECTIONS AND DETAILS

DESIGNED S. ELLENSON
 DRAWN R. GUERRERO
 CHECKED J. BOAG
 PROJECT DATE 12/23/22

DRAWING
G-2

1081000000

Cost Estimate – Lach Q'Atnu Re-Route

Capital Costs

Indirects:	\$175,000
Site Construction/Access:	\$490,000
Earthwork:	\$380,000
OH&P/Bonds:	\$170,000
Contingency:	\$300,000
Total:	\$1,500,000
Range (-50% - +100%):	\$760,000 - \$3,000,000

Cost Estimate – Channel Excavation

Capital Costs

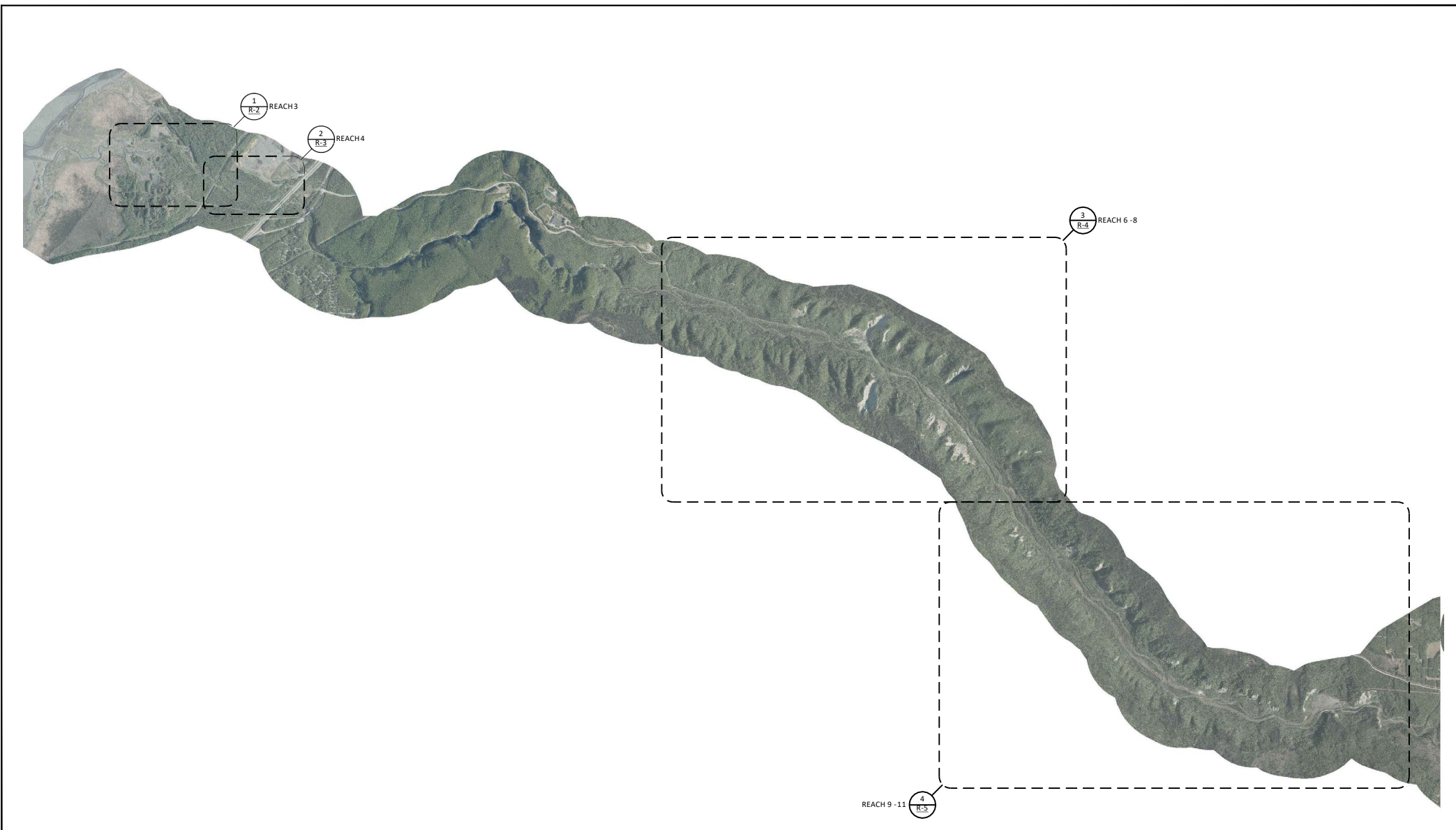
Indirects:	\$65,000
Site Construction/Access:	\$140,000
Earthwork:	\$190,000
OH&P/Bonds:	\$64,000
Contingency:	\$114,000
Total:	\$570,000
Range (-50% - +100%):	\$280,000 - \$1,100,000

Phase 1 Engineering Design

Physical Habitat Improvements

1. Physical Habitat Manipulation





SITE PLAN
SCALE: NTS

REV	DATE	BY	DESCRIPTION
A	12/23/22	SPE	CONCEPTUAL DESIGN

WARNING
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 DRAWING IS NOT TO SCALE.



EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY
 PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS
 SITE PLAN

DESIGNED S. STANLEY
 DRAWN R. GUERRERO
 CHECKED S. ELLENSON
 PROJECT DATE 12/23/22

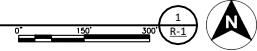
DRAWING
R-1

PUBLIC: \\VAV\WORK\CHUGACH\FEASIBILITY STUDY\ECI\Habitat\Habitat\Study\ECI_Long\POST CENTER\ARC_15_2022\031555pm_CAD USER QUERRERO.DWG



- SHEET KEY NOTES:**
- A. CONSTRUCT BEAVER DAM ANALOG (BDA) MID CHANNEL TO INCREASE REARING AND OVERWINTERING HABITAT IN MAIN CHANNEL OF EKLUTNA RIVER.
 - B. CONSTRUCT ENGINEERED LOG JAMS TO IMPROVE HYDRAULIC DIVERSITY WITHIN CHANNEL AND INCREASE SCOUR DEPTH.

REACH 3 PLAN
SCALE: 1" = 150'



REV	DESCRIPTION

WARNING

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



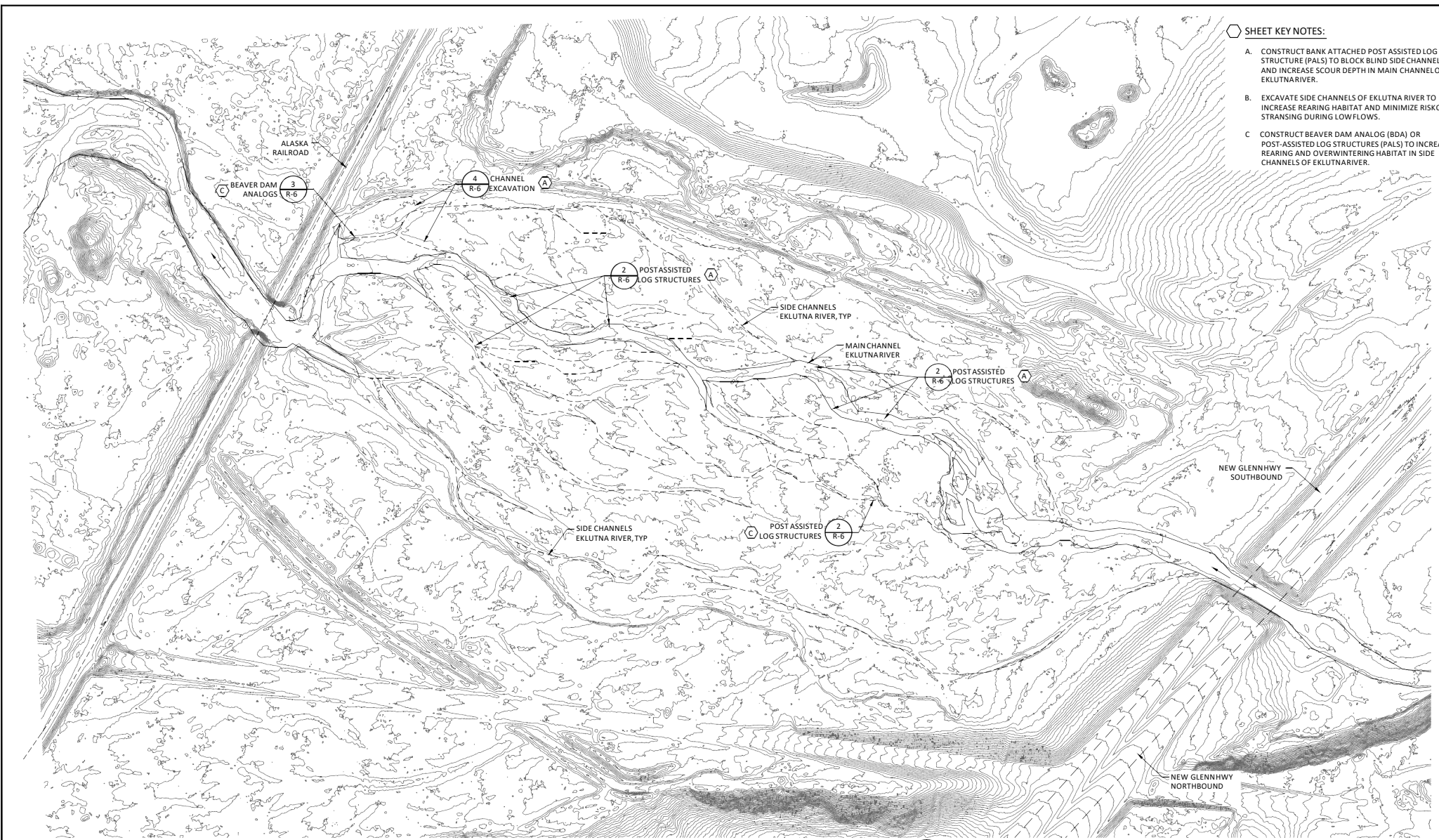
EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS REACH 3 PLAN	

DESIGNED	S. STANLEY
DRAWN	R. GUERRERO
CHECKED	S. ELLENSON
PROJECT DATE	12/23/22

DRAWING
R-2

DATE BY

FILE: \\P:\WORKING\ALASKA\PM\PROJECTS\EKLUTNA\FEASIBILITY\STUDY\REACH 3\REACH 3 PLAN.dwg, PLOT DATE: DEC 15, 2022 03:25:59pm, CAD USER: QUINCY CORREIA



- SHEET KEY NOTES:**
- A. CONSTRUCT BANK ATTACHED POST ASSISTED LOG STRUCTURE (PALS) TO BLOCK BLIND SIDE CHANNELS AND INCREASE SCOUR DEPTH IN MAIN CHANNEL OF EKLUTNA RIVER.
 - B. EXCAVATE SIDE CHANNELS OF EKLUTNA RIVER TO INCREASE REARING HABITAT AND MINIMIZE RISK OF STRANSING DURING LOWFLOWS.
 - C. CONSTRUCT BEAVER DAM ANALOG (BDA) OR POST-ASSISTED LOG STRUCTURES (PALS) TO INCREASE REARING AND OVERWINTERING HABITAT IN SIDE CHANNELS OF EKLUTNA RIVER.

REACH 4 PLAN
SCALE: 1" = 100'



REV	DESCRIPTION

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



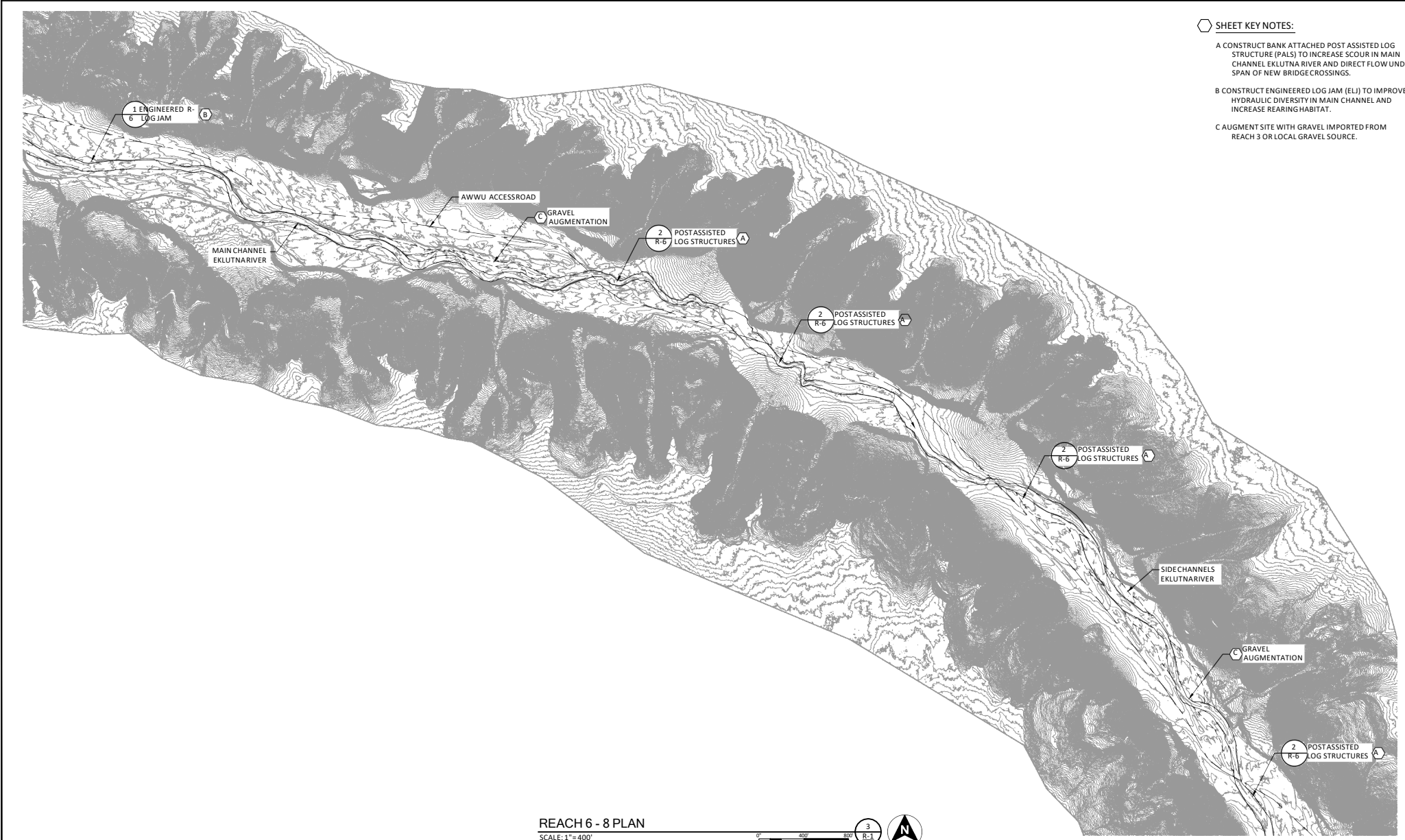
EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY	
PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS REACH 4 PLAN	

DESIGNED	S.STANLEY
DRAWN	R.GUERRERO
CHECKED	S.ELLENSON
PROJECT DATE	12/23/22

DRAWING
R-3

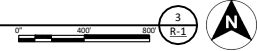
DATE BY

P:\EKLUTNA\FISH AND WILDLIFE\PROJECTS\HABITAT\REACH 4\REACH 4 PLAN.dwg, 12/23/22 10:00 AM, R-3



- SHEET KEY NOTES:**
- A CONSTRUCT BANK ATTACHED POST ASSISTED LOG STRUCTURE (PALS) TO INCREASE SCOUR IN MAIN CHANNEL EKLUTNA RIVER AND DIRECT FLOW UNDER SPAN OF NEW BRIDGE CROSSINGS.
 - B CONSTRUCT ENGINEERED LOG JAM (ELJ) TO IMPROVE HYDRAULIC DIVERSITY IN MAIN CHANNEL AND INCREASE REARING HABITAT.
 - C AUGMENT SITE WITH GRAVEL IMPORTED FROM REACH 3 OR LOCAL GRAVEL SOURCE.

REACH 6 - 8 PLAN
 SCALE: 1" = 400'

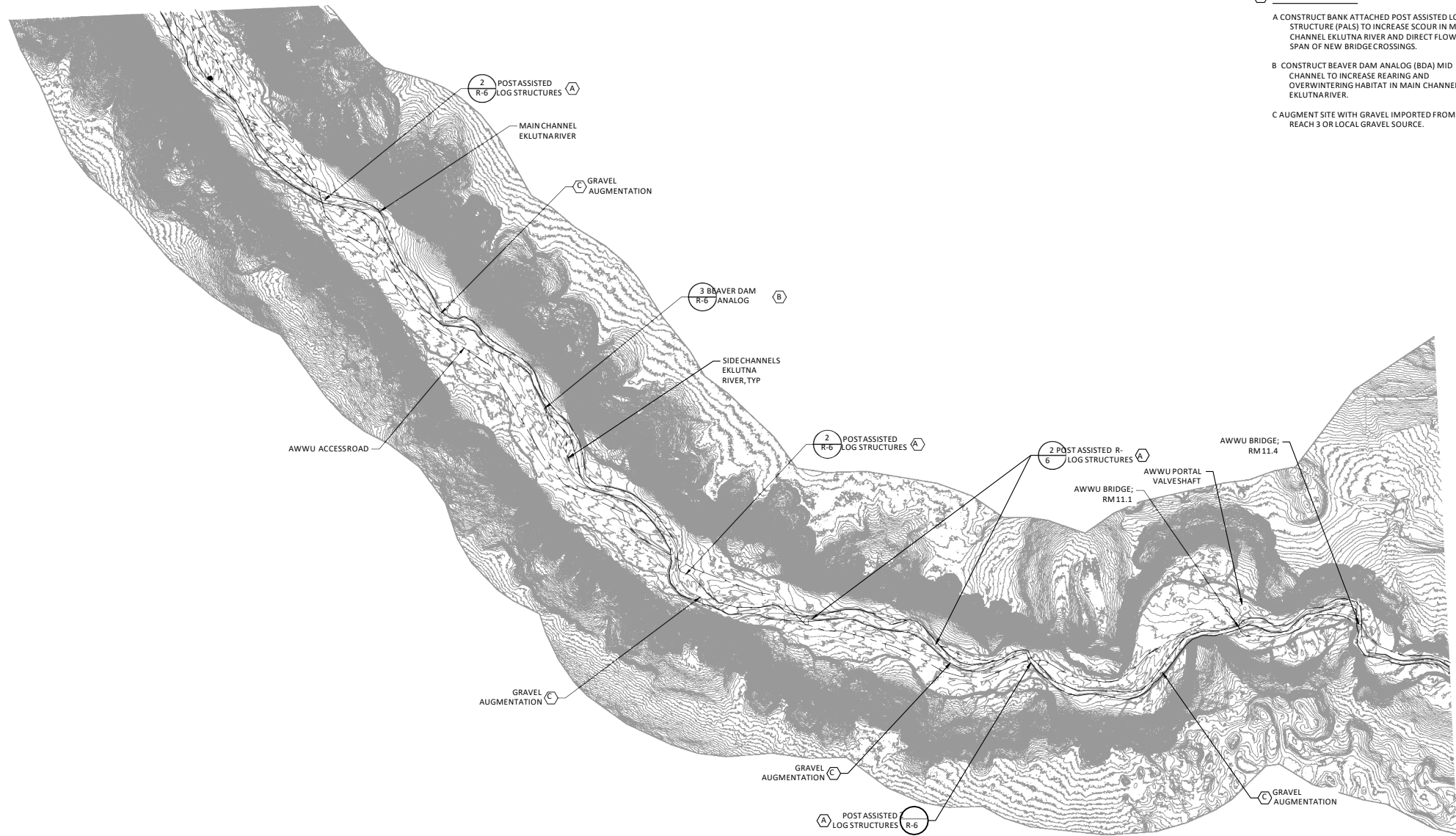


PUBLIC VERSION/ALTERNATIVE HABITAT IMPROVEMENTS FEASIBILITY STUDY/REACH 6-8 PLAN/POST CENTER/SCALE: 1"=400'/DATE: 12/23/22/PROJECT: EKLUTNA FISH & WILDLIFE PROJECT

REV	BY	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY		DESIGNED <u>S. STANLEY</u>	DRAWING
						PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS REACH 6 - 8 PLAN		DRAWN <u>R. GUERRERO</u> CHECKED <u>S. ELLENSON</u> PROJECT DATE <u>12/23/22</u>	

SHEET KEY NOTES:

- A CONSTRUCT BANK ATTACHED POST ASSISTED LOG STRUCTURE (PALS) TO INCREASE SCOUR IN MAIN CHANNEL EKLUTNA RIVER AND DIRECT FLOW UNDER SPAN OF NEW BRIDGE CROSSINGS.
- B CONSTRUCT BEAVER DAM ANALOG (BDA) MID CHANNEL TO INCREASE REARING AND OVERWINTERING HABITAT IN MAIN CHANNEL OF EKLUTNA RIVER.
- C AUGMENT SITE WITH GRAVEL IMPORTED FROM REACH 3 OR LOCAL GRAVEL SOURCE.

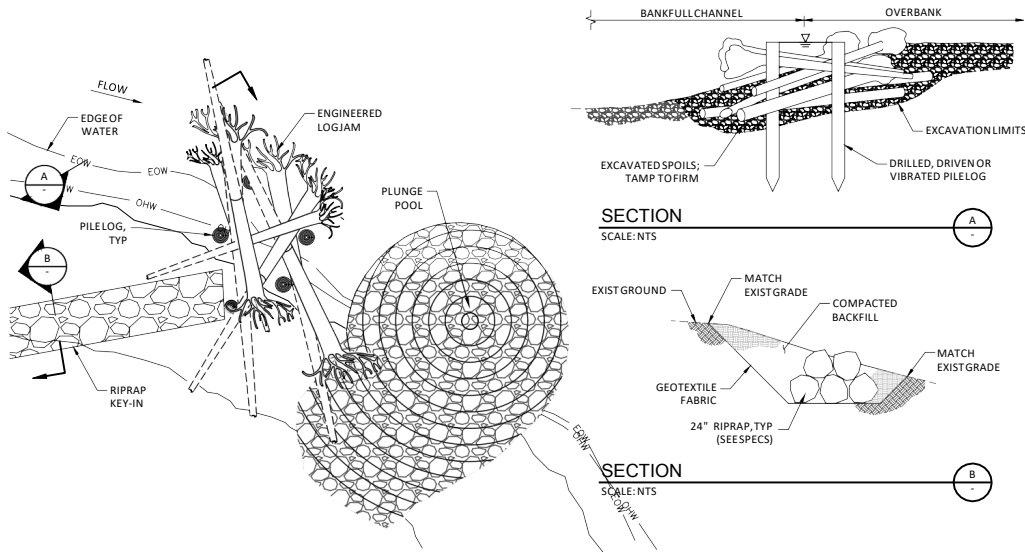


REACH 9 - 11 PLAN
SCALE: 1" = 500'



PROJECT LOCATION: EKLUTNA RIVER, ALASKA. DRAWING DATE: 12/23/22. PROJECT NUMBER: 2022-03-23-24. SCALE: 1" = 500'. SHEET: R-5 OF 5.

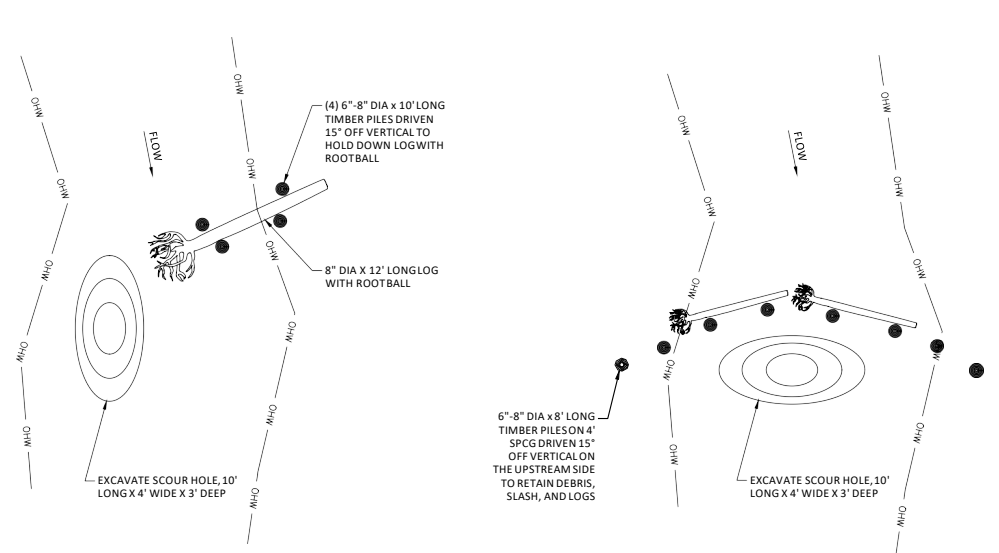
REV	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT		DESIGNED <u>S.STANLEY</u>	DRAWING
					ENGINEERING FEASIBILITY STUDY			
PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS					REACH 9 - 11 PLAN		CHECKED <u>S.ELLENSON</u>	R-5
DATE BY							PROJECT DATE <u>12/23/22</u>	



ENGINEERED LOG JAM (ELJ) DETAIL

SCALE: NTS

1



POST ASSISTED LOG STRUCTURE (PALS) DETAIL

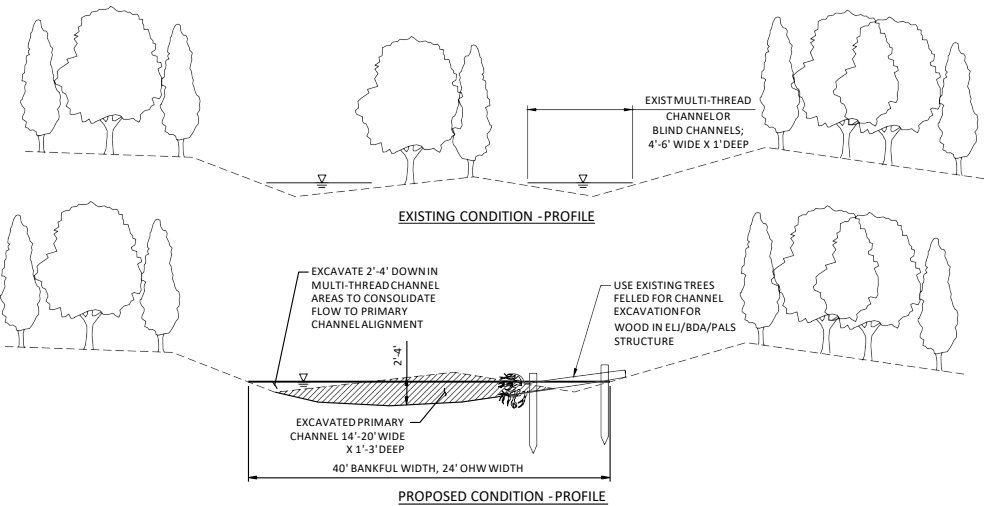
SCALE: NTS

2

BEAVER DAM ANALOG (BDA) DETAIL

SCALE: NTS

3



CHANNEL EXCAVATION DETAIL

SCALE: NTS

4

PUBLIC WORKS/CHUGACH ENGINEERING/FEASIBILITY STUDY/ALASKA STATE POST CENTER, DATE: 12/23/22, 12:00 PM, CAD USER: QUARTERMASTER

DATE BY REV DESCRIPTION

WARNING

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



EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY
 PME ALTERNATIVES ANALYSIS - HABITAT IMPROVEMENTS
 STANDARD DETAILS

DESIGNED S. STANLEY
 DRAWN R. GUERRERO
 CHECKED S. ELLENSON
 PROJECT DATE 12/23/22

DRAWING
R-6

Cost Estimate – Channel Excavation

Capital Costs

Indirects:	\$168,000
Site Construction/Access:	\$280,000
Engineered Log Jams:	\$130,000
Beaver Dam Analogs:	\$312,000
Gravel Augmentation:	\$30,000
Channel Excavation:	\$89,000
OH&P:	\$166,000
Contingency:	\$293,000
Total:	\$1,500,000
Range (-50% - +100%):	\$730,000 - \$2,900,000

Phase 1 Engineering Design

Infrastructural Improvements

1. AWWU Road Crossings (New Bridges)
2. Lakeside Trail Improvements





EKLUTNA RIVER AWWU INSPECTION CROSSINGS
SCALE: NTS



PROJECT: VAPORNAK/CHUGACH E-RESTORE/EKLUTNA FEASIBILITY STUDY/03/23/2022; PLOT CENTER: 148.15, 2022.03/23/2022; PLOT USER: QUANTER/03/23/2022

JOB NO: 000000

DATE BY REV DESCRIPTION

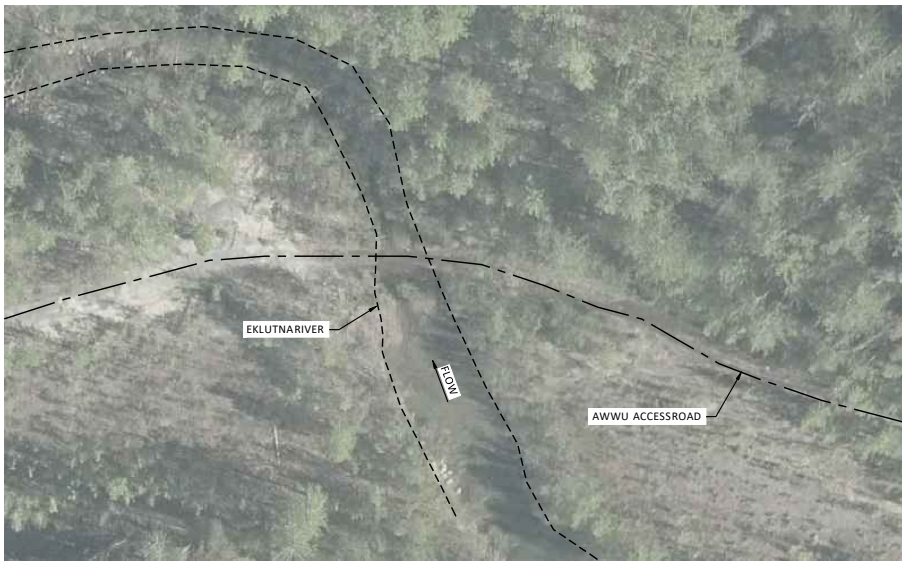
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IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.



EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - INFRASTRUCTURE IMPROVEMENTS
AWWU MAINTENANCE ROAD CROSSING
SITE OVERVIEW

DESIGNED S. STANLEY
DRAWN R. GUERRERO
CHECKED S. ELLENSON
PROJECT DATE 12/23/22

DRAWING
Q-1



PROPOSED CROSSING RIVER MILE 10.3
SCALE: NTS

1
Q-1



PROPOSED CROSSING RIVER MILE 10.1
SCALE: NTS

2
Q-1



PROPOSED CROSSING RIVER MILE 9.8
SCALE: NTS

3
Q-1



PROPOSED CROSSING RIVER MILE 8.7
SCALE: NTS

4
Q-1

PROJECT: VILVAVIYAN/CHUGACH ENGINEERING FEASIBILITY STUDY 1/22 - 8/22; PLOT DATE: MAR 15, 2022 03:25:50pm; AWC USER: QUAYLE/04/2022

REV	DESCRIPTION	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT	DESIGNED: S. STANLEY	DRAWING
					ENGINEERING FEASIBILITY STUDY	DRAWN: R. GUERRERO	
PME ALTERNATIVES ANALYSIS - INFRASTRUCTURE IMPROVEMENTS					CHECKED: S. ELLENSON	PROJECT DATE: 12/23/22	
AWWU MAINTENANCE ROAD CROSSINGS							
SITE PLANS 1							

DATE BY



PROPOSED CROSSING RIVER MILE 8.1
SCALE: NTS

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Q-1



PROPOSED CROSSING RIVER MILE 7.4
SCALE: NTS

6
Q-1



PROPOSED CROSSING RIVER MILE 6.9
SCALE: NTS

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Q-1



PROPOSED CROSSING RIVER MILE 6.5
SCALE: NTS

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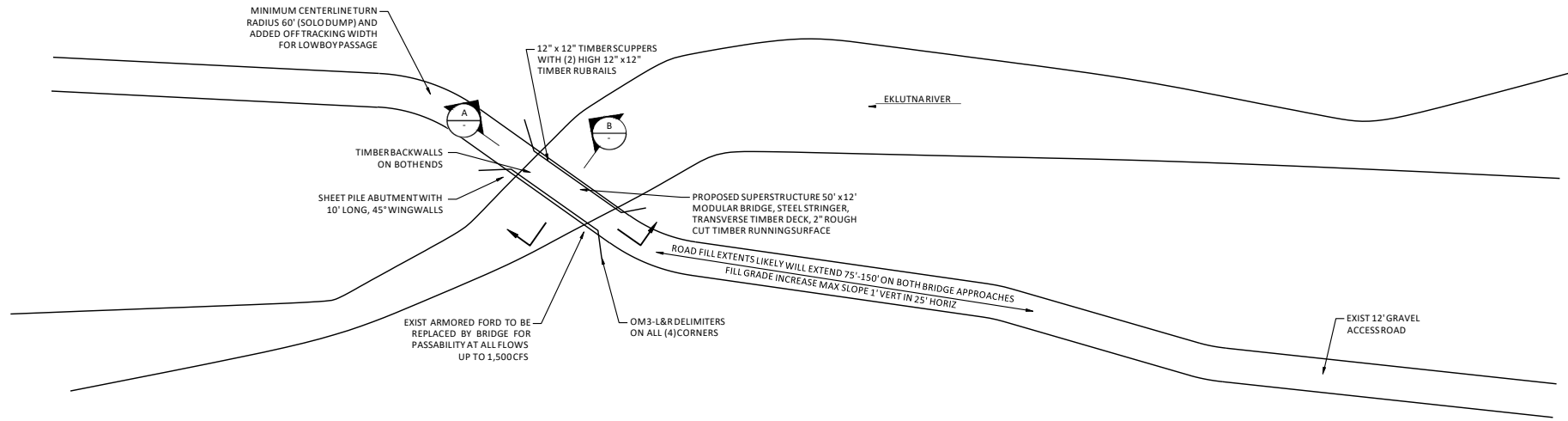


EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
PME ALTERNATIVES ANALYSIS - INFRASTRUCTURE IMPROVEMENTS
AWWU MAINTENANCE ROAD CROSSINGS
SITE PLANS 2

DESIGNED S. STANLEY
DRAWN R. GUERRERO
CHECKED S. ELLENSON
PROJECT DATE 12/23/22

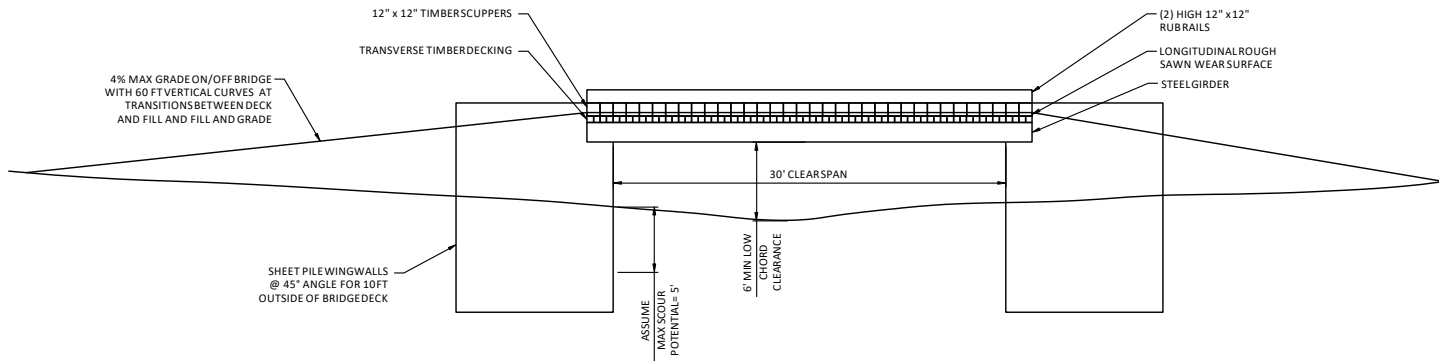
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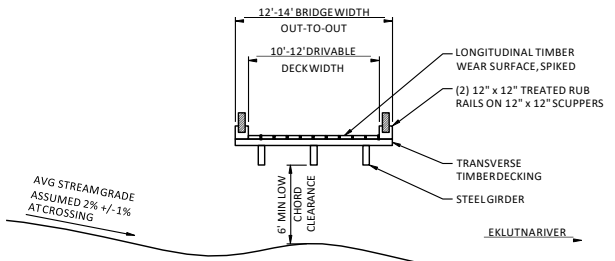
CONCEPT BRIDGE CROSSING - PLAN, TYP

SCALE: NTS



CONCEPT BRIDGE CROSSING - ROAD SECTION, TYP

SCALE: NTS



CONCEPT BRIDGE CROSSING - STREAM SECTION, TYP

SCALE: NTS



DATE BY REV DESCRIPTION

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EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY
 PME ALTERNATIVES ANALYSIS - INFRASTRUCTURE IMPROVEMENTS
 AWWU MAINTENANCE ROAD CROSSINGS
 SECTIONS AND DETAILS

DESIGNED S. STANLEY
 DRAWN R. GUERRERO
 CHECKED S. ELLENSON
 PROJECT DATE 12/23/22

DRAWING
Q-4

PROJECT: VARIOUS AWWU MAINTENANCE ROAD CROSSINGS FEASIBILITY STUDY (M&E) - RMP - PRR CENTER - DEC. 15, 2022 @ 09:25:50 AM - CAD USER: QUINCY GORCHET
 JOB NO: 2000000



PROPOSED CROSSING BRIDGE EXAMPLE - SECTION VIEW FROM RIVER BED LOOKING DOWNSTREAM
SCALE: NTS



PROPOSED CROSSING BRIDGE EXAMPLE - LOOKING AT RIVER-LEFT ABUTMENT FROM RIVERBED
SCALE: NTS



PROPOSED CROSSING BRIDGE EXAMPLE - LOOKING AT UPSTREAM SECTION OF BRIDGE FROM ROAD GRADE
SCALE: NTS



PROPOSED CROSSING BRIDGE EXAMPLE - LOOKING DOWNRIVER FROM ROAD GRADE
SCALE: NTS

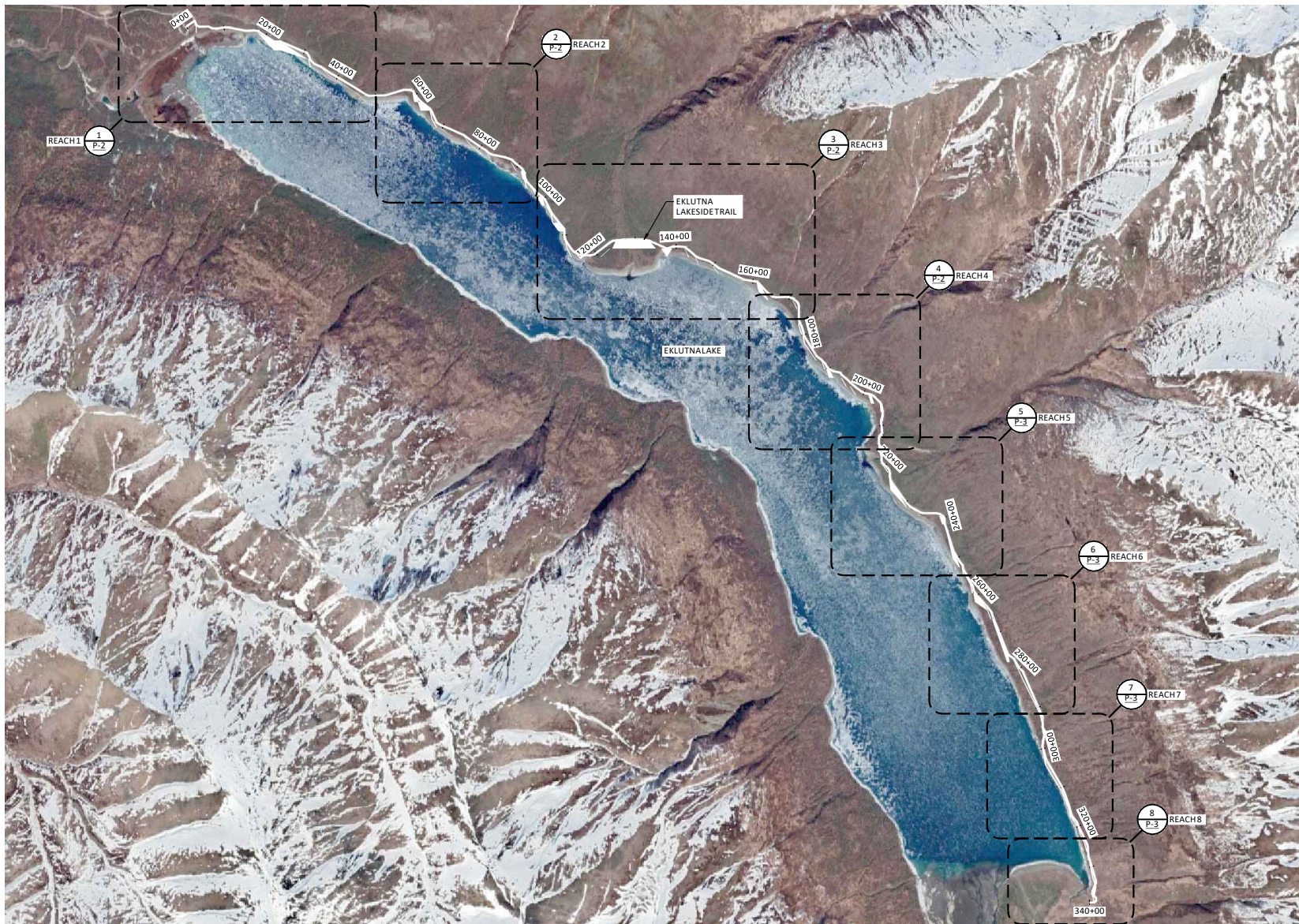
PUBLIC MEETING/REGISTRATION/FEASIBILITY STUDY/ISSUE/PROJ DATE: APR 15, 2024 03:25:50PM / CAD USER: QUAYLE/00000001

REV	DESCRIPTION	DATE BY	<p>WARNING</p> <p>IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.</p>			EKLUTNA FISH & WILDLIFE PROJECT	DESIGNED <u>S.STANLEY</u>	DRAWING
						ENGINEERING FEASIBILITY STUDY	DRAWN <u>R.GUERRERO</u>	
PME ALTERNATIVES ANALYSIS - INFRASTRUCTURE IMPROVEMENTS AWWU MAINTENANCE ROAD CROSSINGS EXAMPLE PHOTOS						CHECKED <u>S.ELLENSON</u>	PROJECT DATE <u>12/23/22</u>	

Cost Estimate – AWWU Bridges

Capital Costs


Indirects:	\$336,000
Site Construction/Access:	\$160,000
Civil Works/Grading:	\$244,000
AWWU Bridges (Qty = 8)	\$1,300,000
OH&P:	\$330,000
Contingency:	\$590,000
Total:	\$2,900,000
Range (-50% - +100%):	\$1,500,000 - \$5,900,000



SITE PLAN
SCALE: NTS



REV	DATE	DESCRIPTION
A	12/23/22	SPE CONCEPTUAL DESIGN

WARNING

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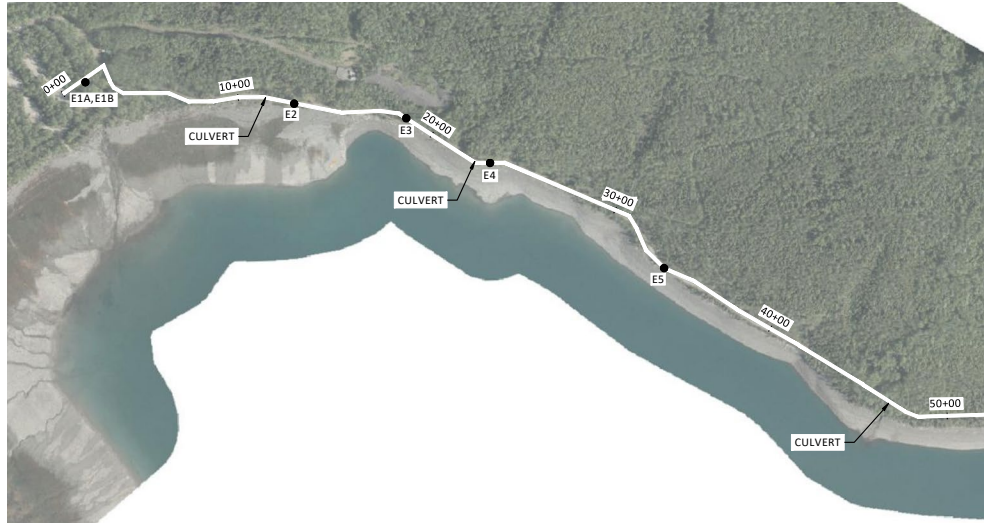


EKLUTNA FISH & WILDLIFE PROJECT ENGINEERING FEASIBILITY STUDY
LAKESIDE TRAIL IMPROVEMENTS SITE PLAN

DESIGNED S. STANLEY
DRAWN R. GUERRERO
CHECKED S. ELLENSON
PROJECT DATE 12/23/22

DRAWING P-1

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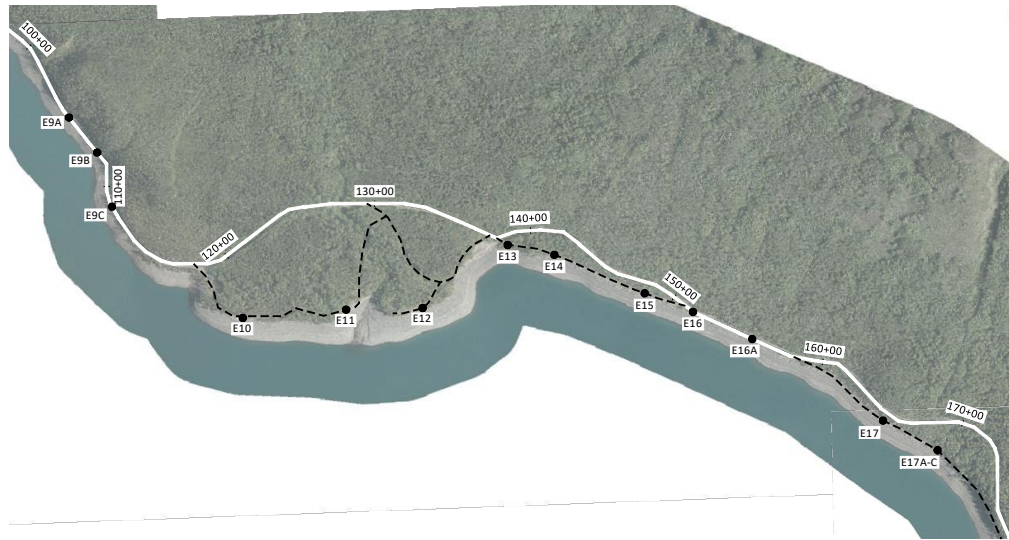
REACH 1 PLAN
SCALE: NTS

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P-1



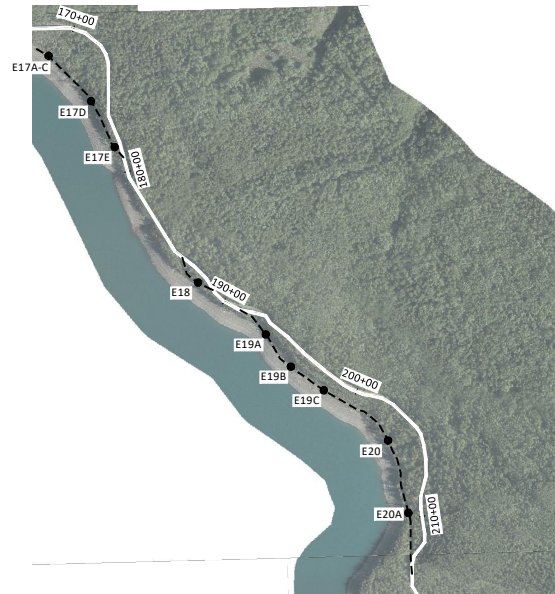
REACH 2 PLAN
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P-1



REACH 3 PLAN
SCALE: NTS

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P-1



REACH 4 PLAN
SCALE: NTS

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P-1

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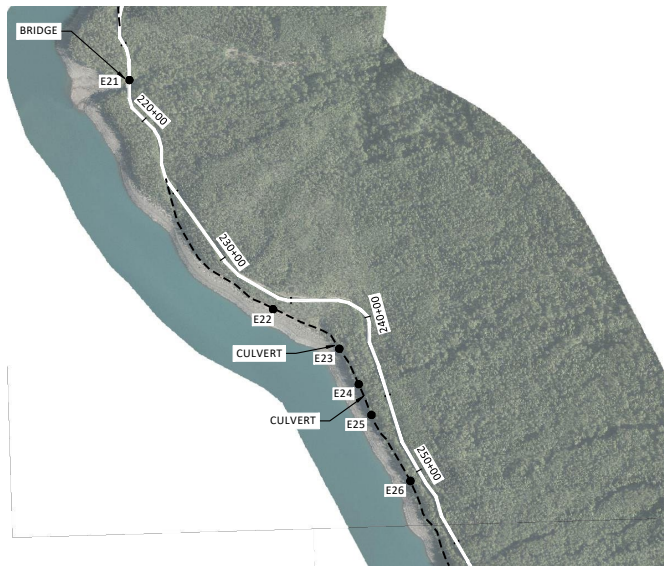


EKLUTNA FISH & WILDLIFE PROJECT
ENGINEERING FEASIBILITY STUDY
LAKESIDE TRAIL IMPROVEMENTS
REACH 1-4 PLANS

DESIGNED S. STANLEY
DRAWN R. GUERRERO
CHECKED S. ELLENSON
PROJECT DATE 12/23/22

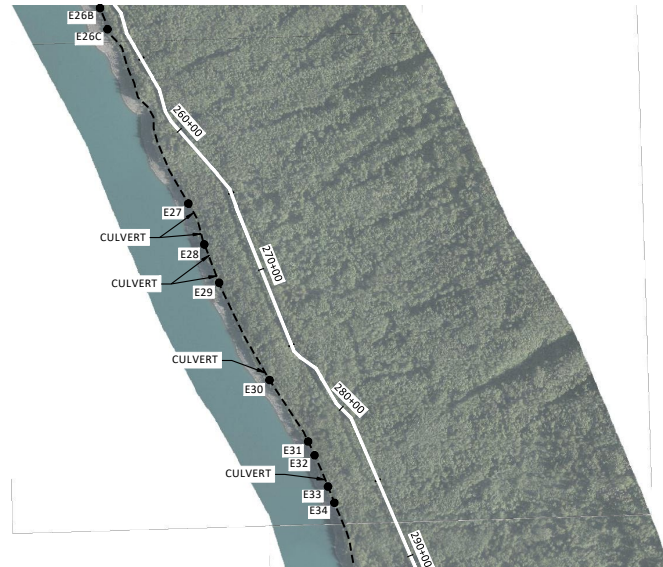
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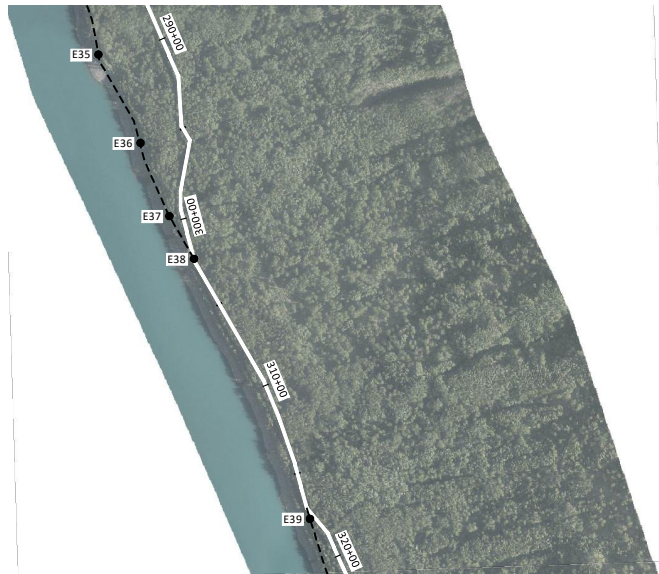
REACH 5 PLAN
SCALE: NTS

5
P-1



REACH 6 PLAN
SCALE: NTS

6
P-1



REACH 7 PLAN
SCALE: NTS

7
P-1



REACH 8 PLAN
SCALE: NTS

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P-1

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DATE BY REV DESCRIPTION

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EKLUTNA FISH & WILDLIFE PROJECT
 ENGINEERING FEASIBILITY STUDY
 LAKESIDE TRAIL IMPROVEMENTS
 REACH 5-8 PLANS

DESIGNED S. STANLEY
 DRAWN R. GUERRERO
 CHECKED S. ELLENSON
 PROJECT DATE 12/23/22

DRAWING
P-3

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TRAIL EROSION AND REPAIR INVENTORY					Expected Work and/or Structure	
SITEID	TRAILTYPE	EROSION FACTOR	EROSION TYPE	LENGTH	ProposedRemedy	
E1a	STREAMBANK	PEDESTRIAN USE	TRAMPLING	40	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC	CONSTRUCT 30 LIN FT SPLIT RAIL FENCE, DELINEATE/CONSTRUCT 40 LIN FT TRAIL
E1b	STREAMBANK	PEDESTRIAN USE	TRAMPLING	40	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC	CONSTRUCT 30 LIN FT SPLIT RAIL FENCE, DELINEATE/CONSTRUCT 40 LIN FT TRAIL
E2	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	70	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS, CLEAN DITCH, DRIVE PILES TO RETAIN WOOD	CLEAN 70 LIN FT DITCH, INSTALL 18" X 24FT CPP, DRIVE 20 LOG PILES
E3	MAIN TRAIL	WAVE ACTION	RAVELING	145	POTENTIAL RELOCATE TRAIL UPHILL,	100 LIN FT DITCH, INSTALL 18" X 24FT CPP, DRIVE 20 LOG PILES AND ADD 12 LOGS
E4	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	634	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAINS, INSTALL ADDITIONAL/UPSIZE CROSS DRAINS	600 LIN FT DITCH, INSTALL (3) 18" X 24FT CPP
E5	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	170	RELOCATE TRAIL INTO HILLSIDE (CAN'T GO UP DUE TO TOPO)	PULL DOWN FILL AND TREES, BUILD TRAIL UP OR MOVE TO LAKE SIDE OF TRAIL AS SACRIFICE (EST 170 LIN FT, 20 FT VERT, 5 FT HORIZ = 600CY)
E6	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	180	ABANDON LOWER TRAIL AND RELOCATE TRAIL UPHILL OR DRIVE TIMBER PILES FOR LOG REVETMENT	DRIVE 30 TIMBER PILES AND ADD 20 LOGS
E7	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	201	ABANDON LOWER TRAIL AND RELOCATE TRAIL UPHILL OR RELOCATE TRAIL INTO HILLSIDE	PULL DOWN FILL AND TREES, MOVE TO LAKE SIDE OF TRAIL AS SACRIFICE (EST 200 LIN FT, 20 FT VERT, 5 FT HORIZ = 750CY)
E7a	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	1089	ABANDON LOWER TRAIL AND RELOCATE TRAIL UPHILL OR RELOCATE TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 1000 LIN FT, 10 FT VERT, 8 FT HORIZ = 3,000CY)
E7b	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	100	ABANDON LOWER TRAIL AND RELOCATE TRAIL UPHILL OR RELOCATE TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 100 LIN FT, 10 FT VERT, 8 FT HORIZ = 300CY)
E8	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	10	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC, ADD/UPSIZE CROSS DRAINS, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 50 LIN FT, 10 FT VERT, 8 FT HORIZ = 3,000 CY), INSTALL (2) 18" X 12FT CPP
E9	MAIN TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	555	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 500 LIN FT, 10 FT VERT, 8 FT HORIZ = 1,500 CY), INSTALL 18" X 12FT CPP
E9a	MAIN TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	568	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 500 LIN FT, 10 FT VERT, 8 FT HORIZ = 1,500 CY), INSTALL (2) 18" X 12FT CPP
E9b	MAIN TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	565	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 500 LIN FT, 10 FT VERT, 8 FT HORIZ = 1,500 CY), INSTALL (2) 18" X 12FT CPP
E9c	MAIN TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	317	CONSTRUCT FENCE, PLACE LOGS, SIGNAGE TO RESTRICT ACCESS, CONSTRUCT ACCESS TRAIL TO CONCENTRATE FOOT TRAFFIC, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 300 LIN FT, 10 FT VERT, 8 FT HORIZ = 900 CY), INSTALL (2) 18" X 12FT CPP
E10	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	155	SIGNS TO INDICATE NARROW TRAIL CONDITIONS	BENCH TRAIL INTO HILLSIDE (EST 150 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E11	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	154	SIGNS TO INDICATE NARROW TRAIL CONDITIONS, CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS	BENCH TRAIL INTO HILLSIDE (EST 150 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E12	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	292	LAY BACK SLOPE AND REVEGETATE, INSTALL WATTLES TO HOLD BANK IN PLACE, CONSTRUCT BREAKWATER, CONSTRUCT ACCESS TRAIL	BENCH TRAIL INTO HILLSIDE (EST 300 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E13	SIDE TRAIL	RESERVOIR FLUCTUATIONS	SLUMPING	61	LAY BACK SLOPE AND REVEGETATE, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 100 LIN FT, 10 FT VERT, 8 FT HORIZ = 300CY)
E14	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	297	DRAINAGE STRUCTURES AND EROSION CONTROL AT BASE OF SLOPE	BENCH TRAIL INTO HILLSIDE (EST 300 LIN FT, 10 FT VERT, 8 FT HORIZ = 1900 CY), INSTALL (2) 18" X 12FT CPP
E15	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	890	ABANDON AND RELOCATE TRAIL UPHILL	BENCH TRAIL INTO HILLSIDE (EST 1000 LIN FT, 10 FT VERT, 8 FT HORIZ = 3,000 CY), INSTALL (2) 18" X 12FT CPP
E16	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	60	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL/UPSIZE CROSS DRAINS	60 LIN FT DITCH
E16a	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	25	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	25 LIN FT DITCH
E17a	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	976	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	1,000 LIN FT DITCH, INSTALL (4) 18" X 12FT CPP
E17b	SIDE TRAIL	WAVE ACTION	SLUMPING	120	DRIVE TIMBER PILES TO RETAIN WOOD	DRIVE 30 TIMBER PILES AND ADD 20 LOGS
E17c	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	185	LAY BACK SLOPE AND REVEGETATE, BENCH TRAIL INTO HILLSIDE	LAY BACK SLOPE AND BENCH TRAIL INTO HILLSIDE (EST 500 LIN FT, 10 FT VERT, 8 FT HORIZ = 1,500 CY), INSTALL (2) 18" X 12FT CPP
E17d	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	371	BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 300 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E17e	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	212	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	BENCH TRAIL INTO HILLSIDE (EST 200 LIN FT, 10 FT VERT, 8 FT HORIZ = 1300CY)
E18	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	134	ABANDON AND RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE, ADD CROSS DRAINS, CONSTRUCT/CLEAN DITCHES	BENCH TRAIL INTO HILLSIDE (EST 150 LIN FT, 10 FT VERT, 8 FT HORIZ = 900 CY), INSTALL (3) 18" X 12FT CPP
E19a	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	389	ABANDON AND RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 400 LIN FT, 10 FT VERT, 8 FT HORIZ = 1200 CY)
E19b	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	354	ABANDON AND RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 400 LIN FT, 10 FT VERT, 8 FT HORIZ = 1200CY)
E19c	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	335	ABANDON AND RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 400 LIN FT, 10 FT VERT, 8 FT HORIZ = 1200CY)
E20	SIDE TRAIL	WAVE ACTION	SLUMPING	412	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	BENCH TRAIL INTO HILLSIDE (EST 400 LIN FT, 10 FT VERT, 8 FT HORIZ = 1200 CY), INSTALL (2) 18" X 12FT CPP
E20a	SIDE TRAIL	WAVE ACTION	SLUMPING	60	BENCH TRAIL INTO HILLSIDE	BENCH TRAIL INTO HILLSIDE (EST 100 LIN FT, 10 FT VERT, 8 FT HORIZ = 300CY)
E21	STREAMBANK	RESERVOIR FLUCTUATIONS	RAVELING	50	CLEAN/ESTABLISH DITCH, GRADE ROAD	ESTABLISH/CLEAN DITCH AND SITE GRADING 200 LIN FT, ADD ROCK ARMOR TO PROTECT BRIDGE 10 HRS EXCAVATOR TIME
E22	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	1295	SIGNS TO INDICATE NARROW TRAIL CONDITIONS, POTENTIAL RELOCATE TRAIL UPHILL	BENCH TRAIL INTO HILLSIDE (EST 1300 LIN FT, 10 FT VERT, 8 FT HORIZ = 4,000 CY), INSTALL (2) 18" X 12FT CPP
E23	SIDE TRAIL	WAVE ACTION	SLUMPING	70	CLEAN/ESTABLISH DITCH, UPSIZE CROSS DRAINS OR REPLACE WITH FOOTBRIDGE	ESTABLISH/CLEAN DITCH AND SITE GRADING 100 LIN FT, INSTALL (2) 18" X 12FTCPP
E24	SIDE TRAIL	WAVE ACTION	SLUMPING	153	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 150 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 150 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E25a	SIDE TRAIL	WAVE ACTION	SLUMPING	295	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS, POTENTIAL RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 300 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 300 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E25b	SIDE TRAIL	WAVE ACTION	SLUMPING	140	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS, POTENTIAL RELOCATE TRAIL UPHILL, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 150 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 150 LIN FT, 10 FT VERT, 8 FT HORIZ = 900CY)
E26	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	182	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 200 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 200 LIN FT, 10 FT VERT, 8 FT HORIZ = 1300 CY), INSTALL 18" X 12FTCPP
E26a	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	20	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 50 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 50 LIN FT, 10 FT VERT, 8 FT HORIZ = 150 CY), INSTALL 18" X 12FTCPP
E26b	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	102	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 100 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 100 LIN FT, 10 FT VERT, 8 FT HORIZ = 300 CY), INSTALL 18" X 12FTCPP
E26c	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	120	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION, BENCH TRAIL INTO HILLSIDE	ESTABLISH/CLEAN DITCH 100 LIN FT, BENCH TRAIL INTO HILLSIDE (EST 100 LIN FT, 10 FT VERT, 8 FT HORIZ = 300 CY), INSTALL 18" X 12FT CPP
E27	SIDE TRAIL	RESERVOIR FLUCTUATIONS	UNDERCUT BANK	524	SIGNS TO INDICATE NARROW TRAIL CONDITIONS, CLEAN OUT CROSS DRAINS, INSTALL OR UPSIZE ADDITIONAL CROSS DRAINS, AND EROSION CONTROL AT BASE OF SLOPE	BENCH TRAIL INTO HILLSIDE (EST 500 LIN FT, 10 FT VERT, 8 FT HORIZ = 1,500 CY), INSTALL (2) 18" X 12FT CPP
E28	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	390	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 400 LIN FT, INSTALL (2) 18" X 12FTCPP
E29	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	377	CLEAN/ESTABLISH DITCH, INSTALL ADDITIONAL CROSS DRAINS, ARMOR CULVERT OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 400 LIN FT, INSTALL (2) 18" X 12FTCPP
E30	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	383	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 400 LIN FT, INSTALL (2) 18" X 12FTCPP
E31	SIDE TRAIL	WAVE ACTION	RILLS/GULLIES	40	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 40LIN FT
E32	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	114	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 100 LIN FT, INSTALL 18" X 12FTCPP
E33	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	65	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 100 LIN FT, INSTALL 18" X 12FTCPP
E34	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	105	CLEAN OUT CROSS DRAIN	CLEAN OUT CROSS DRAIN, ESTABLISH/CLEAN DITCH 100 LIN FT
E35	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	404	CLEAN/ESTABLISH DITCH, CLEAN OUT CROSS DRAIN, INSTALL ADDITIONAL CROSS DRAINS, ARMOR OUTFALL TO SLOW FLOWS AND REDUCE EROSION	ESTABLISH/CLEAN DITCH 400 LIN FT, CLEAN OUT CROSS DRAIN, INSTALL (2) 18" X 12FTCPP
E36	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	140	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	ESTABLISH/CLEAN DITCH 150 LIN FT, CLEAN OUT CROSS DRAIN, INSTALL 18" X 12FTCPP
E37	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	300	CLEAN/ESTABLISH DITCH, INSTALL CROSS DRAINS	ESTABLISH/CLEAN DITCH 300 LIN FT, CLEAN OUT CROSS DRAIN, INSTALL 18" X 12FTCPP
E38	MAIN TRAIL	WAVE ACTION	UNDERCUT BANK	366	CLEAN OUT CROSS DRAINS, CONTROL TRAIL RUNOFF, INSTALL ADDITIONAL/UPSIZE CROSS DRAINS	ESTABLISH/CLEAN DITCH 400 LIN FT, CLEAN OUT CROSS DRAIN, INSTALL (2) 18" X 24FTCPP
E39	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	199	CLEAN OUT CROSS DRAINS, CONTROL TRAIL RUNOFF, INSTALL ADDITIONAL/UPSIZE CROSS DRAINS	ESTABLISH/CLEAN DITCH 200 LIN FT, CLEAN OUT CROSS DRAIN, INSTALL (2) 18" X 12FT CPP
E40	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	185	CLEAN OUT CROSS DRAINS, INSTALL ADDITIONAL CROSS DRAINS	CLEAN OUT CROSS DRAIN, ESTABLISH/CLEAN DITCH 200 LIN FT
E40a	SIDE TRAIL	WAVE ACTION	UNDERCUT BANK	110	CLEAN OUT CROSS DRAINS, INSTALL ADDITIONAL CROSS DRAINS	CLEAN OUT CROSS DRAIN, ESTABLISH/CLEAN DITCH 100 LIN FT

PUBLIC WORKS/TRANSPORTATION/ESTABLISH/REPAIR/MAINTENANCE/STUDY/FEASIBILITY/DESIGN/CONSTRUCTION

			EKLUTNA FISH & WILDLIFE PROJECT	DESIGNED <u>S. STANLEY</u>	DRAWING P-4
			ENGINEERING FEASIBILITY STUDY	DRAWN <u>R. GUERRERO</u>	
			LAKESIDE TRAIL IMPROVEMENTS TRAIL EROSION AND REPAIR INVENTORY	CHECKED <u>S. ELLENSON</u>	
				PROJECT DATE <u>12/23/22</u>	

JOB NO. 000000

Cost Estimate – Lakeside Trail Improvements

Capital Costs

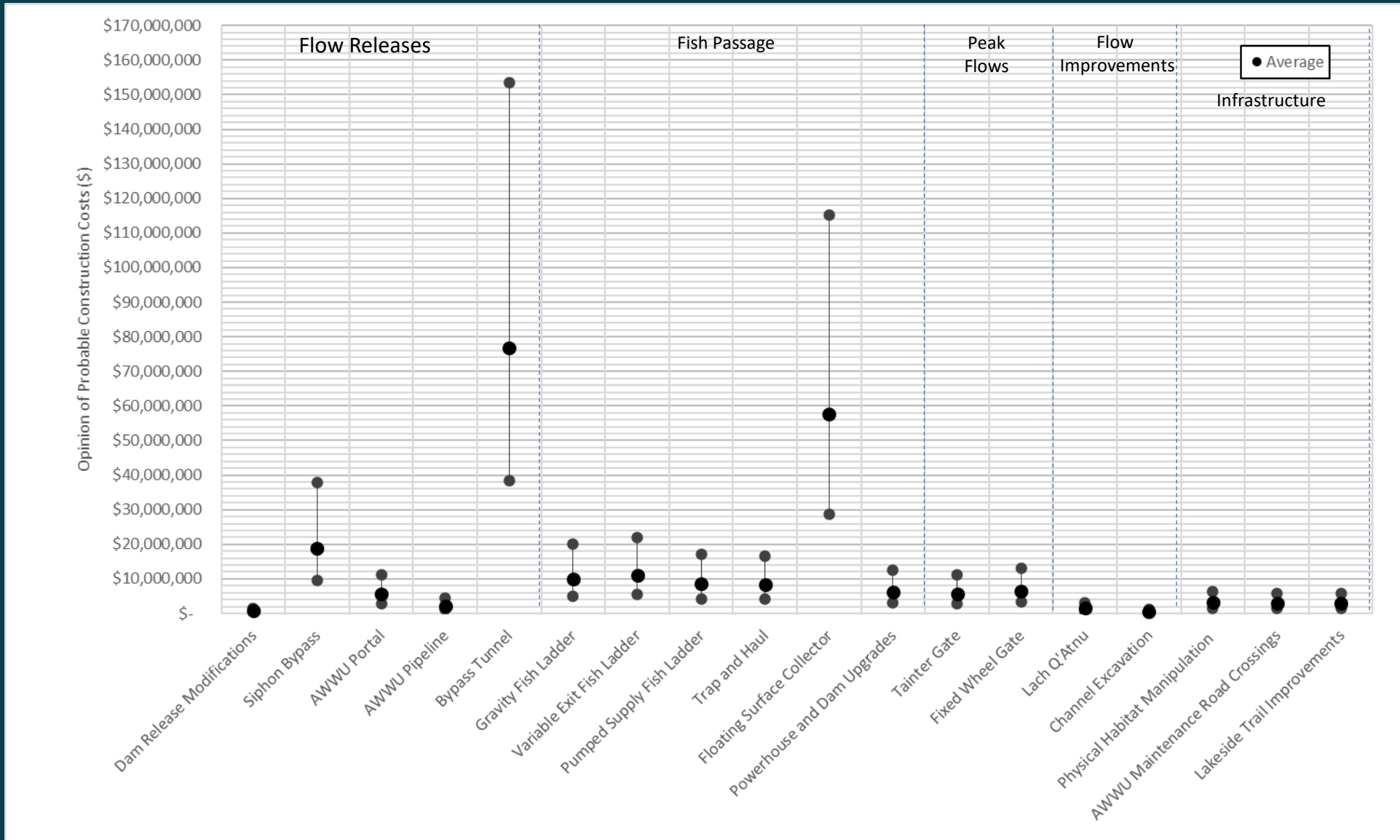
Indirects:	\$247,000
Site Construction/Access:	\$40,000
Reach 1 Improvements:	\$67,000
Reach 2 Improvements:	\$149,000
Reach 3 Improvements:	\$459,000
Reach 4 Improvements:	\$195,000
Reach 7 Improvements:	\$23,000
Reach 8 Improvements:	\$3,000
OH&P:	\$194,000
Contingency:	\$344,000
Total:	\$1,700,000
Range (-50% - +100%):	\$860,000 - \$3,400,000



CAPEX

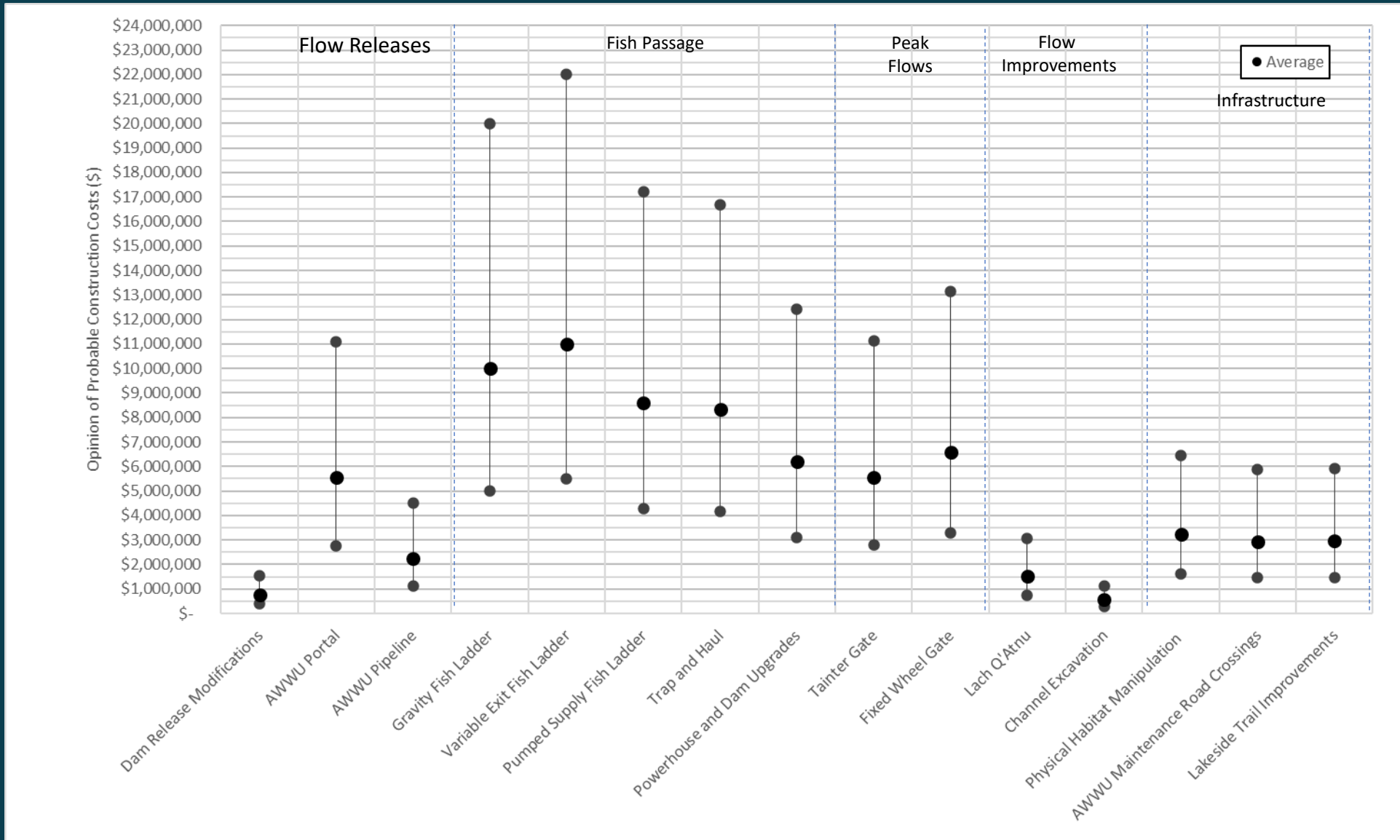


Opinion of Probable Construction Costs (Class 5)





Opinion of Probable Construction Costs (Class 5)

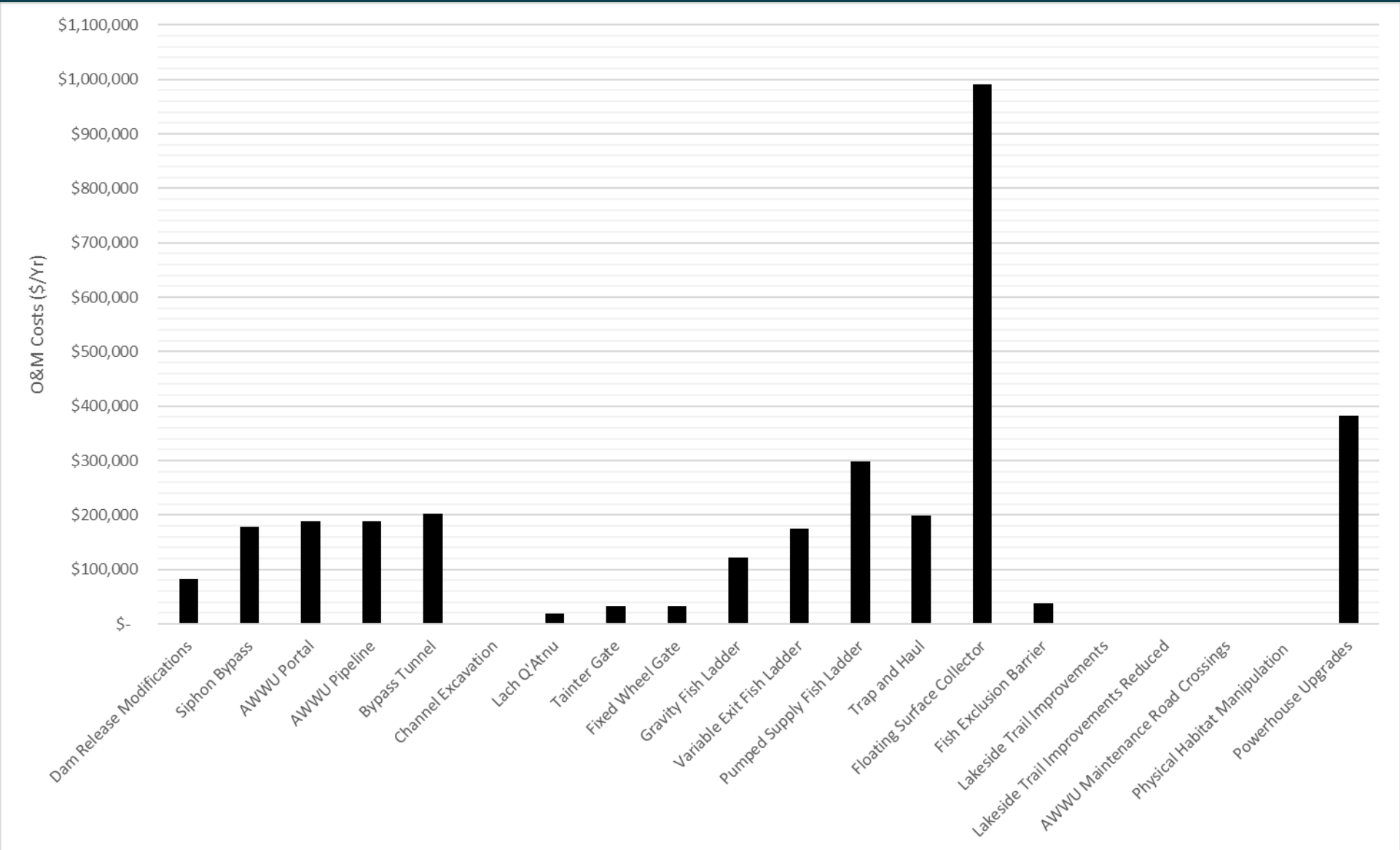




O&M Costs



O&M Costs



Ratepayer/Taxpayer Impacts

Ratepayer/Taxpayer Impacts

Cost to ratepayers considers the following:

1. Capital Costs
2. O&M Annual Costs
3. Replacement Energy Costs
4. Carbon Costs*

Matanuska Electric:

1.12% Energy Rate Increase /\$1M

Chugach Electric:

1% Energy Rate Increase /\$1M

Municipality of Anchorage:

.03 mils / \$1M

(\$3 Increased Property Tax per \$/100k Property Value)

Relative Annual Cost Breakdown:

CAPEX: \$1M - \$3M/Yr (If Amortized over 35 Years)

O&M: \$100k - \$300k/Yr

Energy: \$1M - \$7M/Yr

