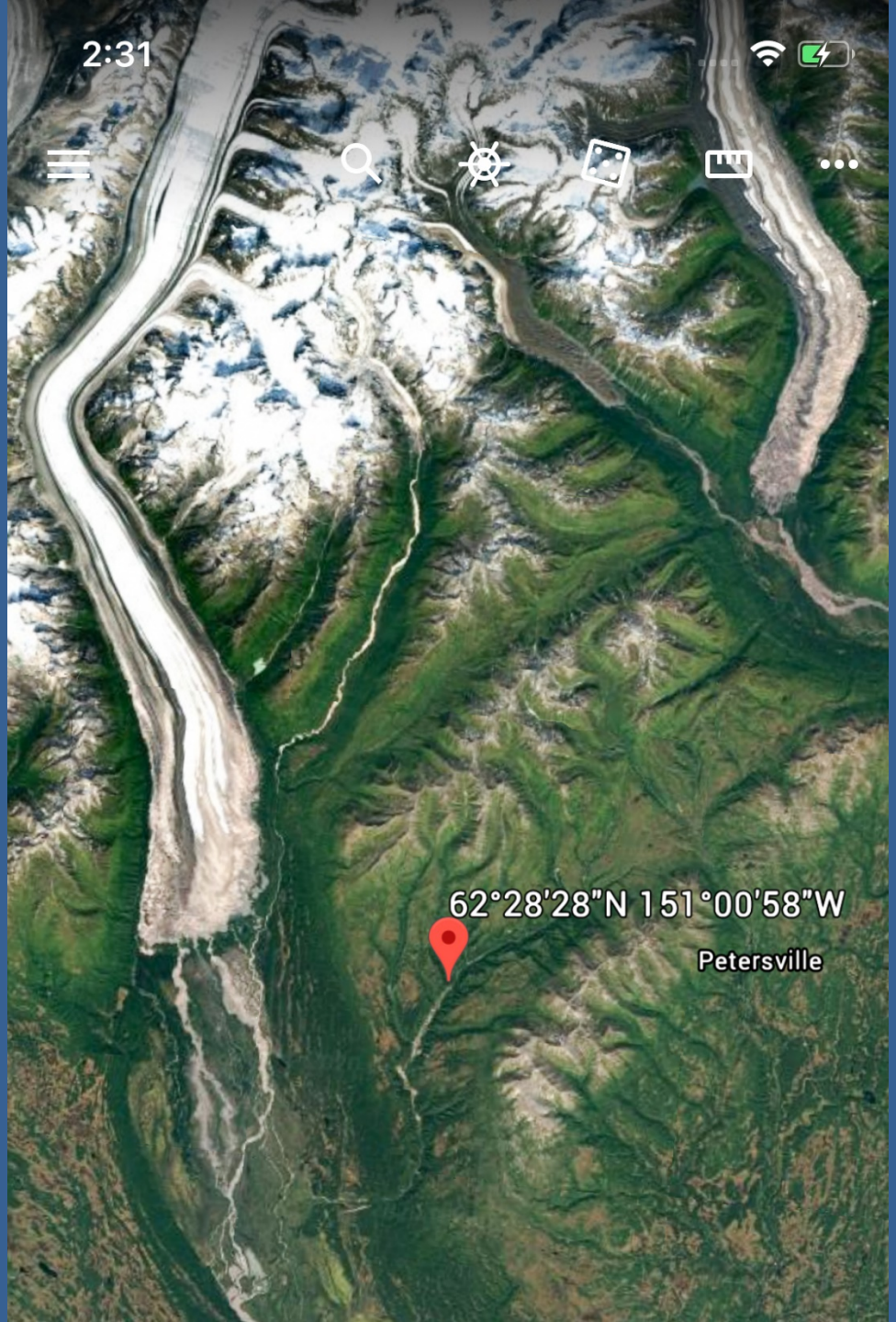
Falls Creek Restoration Project

Corinne Marzullo, Howard Carbone, and Ed O'Connor November 15, 2022


2:31
62°28'28"N 151°00'58"W
Petersville


12:49
Winter
Cache Creek Trail
Cache Creek Trail
Creek
3D
Google
62.474491°N 151.017429°W 3,574 ft


Hamwits Photo Shop
Anchorage
31
Hydraulic Mining - Cache Creek, Alaska

FIGURE 4.—Low-level Quaternary bench gravels in C. P. Morgan's placer workings on Cache Creek at the mouth of Falls Creek.


ALASKA
FILM
ARCHIVES


INDEPENDENT


My Lil' Airplane
N408BT

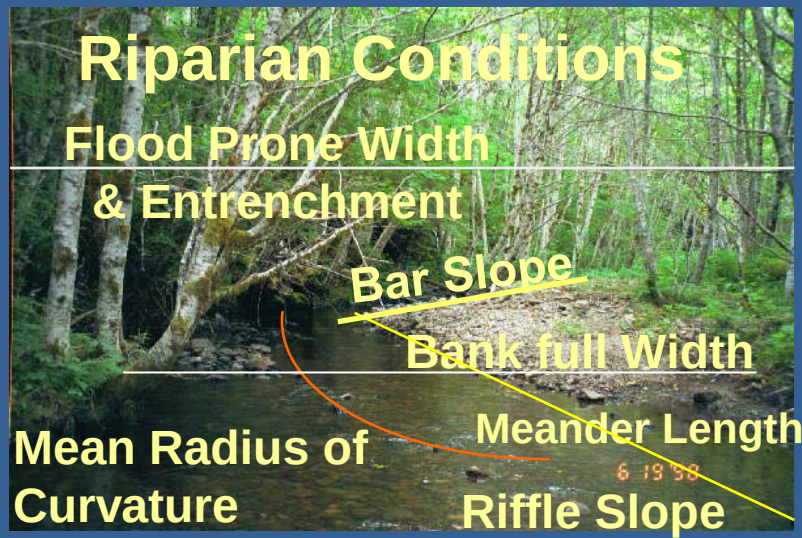
Watershed Rehabilitation, Restoration & Remediation

- Watershed & Restoration Assessment
- Survey
  - Project Reach & Reference Reaches
- Hydraulic Modeling
- Design
- Permitting
- Contracting
- Implementation

Analysis Approach

Disturbed Reference Sites..

Relic Reference Reach



Channel Geometry Equations

$W = 2.37Q^{0.50}$

$L_m = 7.5W_{bnk}^{1.12}$

$R_c = 1.5W_{1.2}^{1.12}$

$BD_m = 2.07 - 0.19 \log_e((R_c/W)-2)*(XD_b)$

Bio-geomorphology

…Engineering for Fish

Species	Spawning Gravel Diameter	Water Velocity	Stream Bed Slope	Water Depth
Chinook	1.1 - 5.9 inches (2.6 - 15.1 cm) [2]	1.2 - 3.8 ft/ sec (0.35 - 1.15 m/sec) [1]	0.004 - 0.007	0.98 - 1.9 feet (30-60 cm) [2]
Coho	3.0 - 5.9 inches (7.5 - 15.0 cm) [3]	2.9 - 3.4 ft/ sec (0.85 - 1.0 m/sec) [4]	0.002 - 0.007	0.33 - 1.2 feet (10.2 -35.6 cm) [4]

[1] Raleigh et al. 1986, [2] Riggers 2001, [3] Hassler 1987, [4] CDFG 2002b

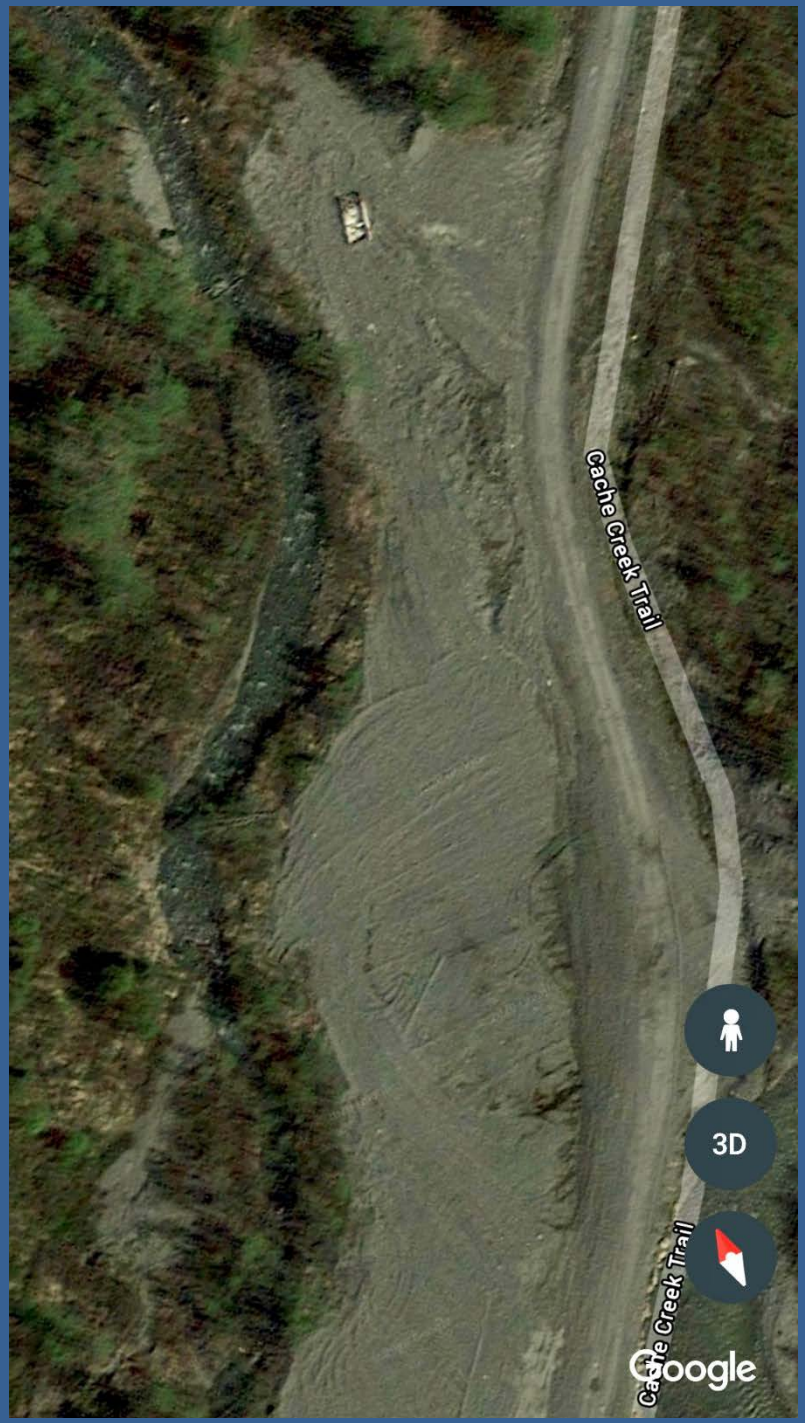
Design Templates Derived from Reference Conditions

Verified with Hydraulic Equations and Models

CHANNEL MORPHOMETRY	
Thalweg Slope	.018 (1.8%)
Mean Depth	11.8 inches
Mean Velocity	1.6 cfs
Spawning Glide Slopes	0.004 - 0.008
Banfull Cross Sectional Area	44 sq. ft.
Bankfull Discharge	191.7 cfs
Riffle Bankfull Widths	25 - 34 feet
Riffle Bankfull Depths	1.4 – 1.8 feet
Riffle Slopes	3.6% - 4.2%
Pool Max Bankfull Widths	26 - 34 feet
Pool Max Bankfull Depths	2.5 - 5.0 feet
D16	28 mm
D50	102 mm
D84	254 mm
Key Pieces	256 - 512 mm

DEVELOP QUANTITATIVE RESTORATION / DESIGN OBJECTIVES

- Decrease channel slope from 2.5% to 1.8%
- Increase sinuosity from 1.0 to 1.3
- Increase channel length by 30%
- Increase flood prone to bankfull width ratio from 2:1 to ≥3:1.



Restore fish habitat by increasing:

- Pools within the reach from 0 to 3
- Side channel flow from <1% to 35%.
- Large in-stream wood from <5 to >155 pieces within the project reach
- Spawning glides from <1% to >34% channel length within the project reach

NOTES:
1. COORDINATE SYSTEM IS NAD83 ALASKA STATE PLANE, ZONE 4, US FEET.
2. PROJECT COORDINATES: 62.474765, −151.016522.
3. PROJECT AREA IS 3.75 ACRES.

PROJECT AREA

EXISTING BRIDGE

FALLS CREEK

ORDINARY HIGH WATER

0 200 400 Feet

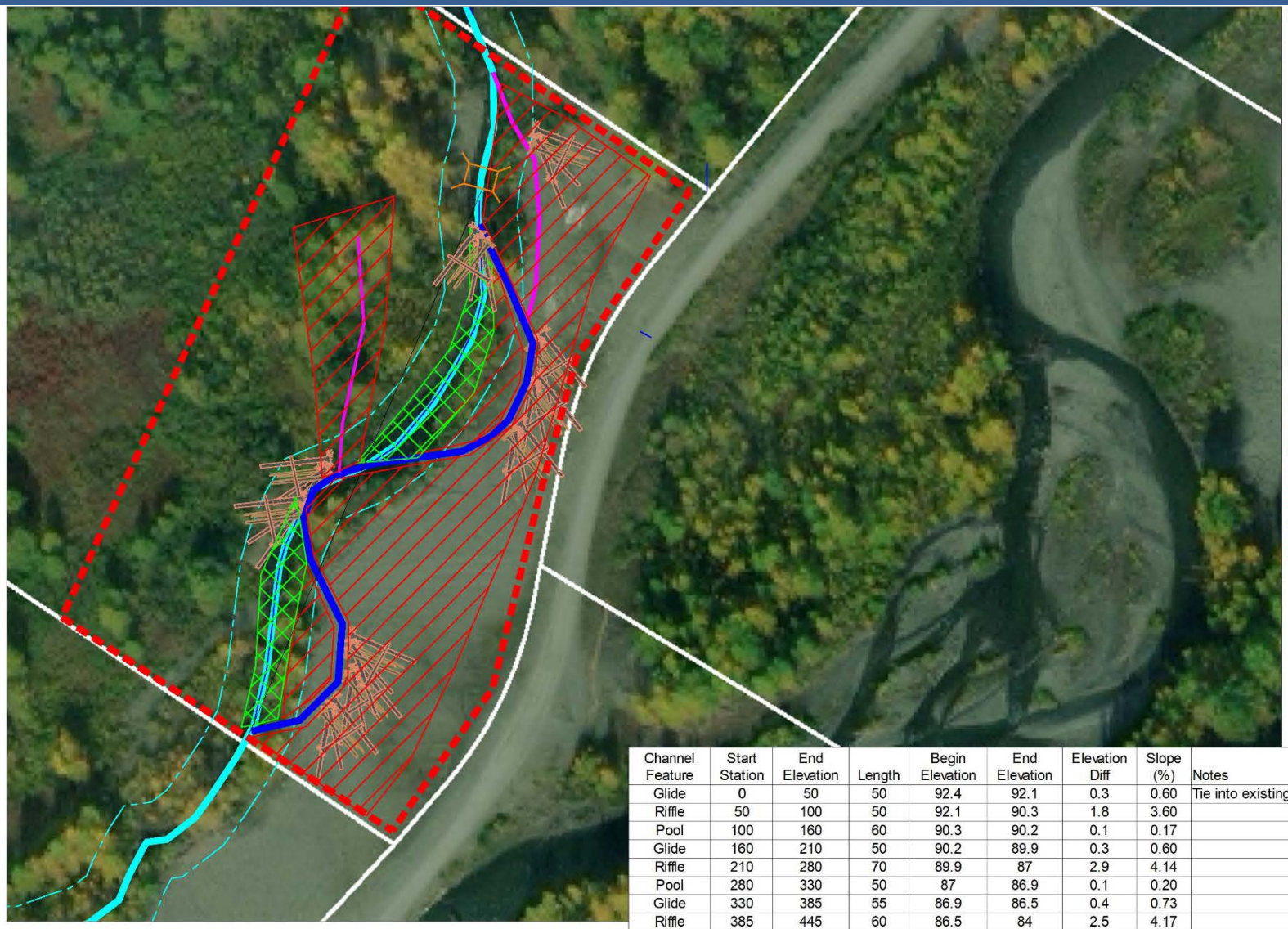
PROJECT NAME
FALLS CREEK RESTORATION PROJECT

CACHE CREEK

PETERSVILLE, AK

DRAWING TITLE
EXISTING OVERALL

DATE 5/2021
DESIGNER C. MARZULLO
SHEET 2 OF 9



NOTES:
1. EXCESS FILL WILL BE PLACED WITHIN PROPOSED PROJECT AREA. MATERIAL WILL BE PLACED IN AREAS FLAGGED BY THE ENGINEER. EXCESS EXCAVATION WILL BE PLACED ABOVE ORDINARY HIGH WATER.

PROJECT AREA

EXISTING BRIDGE

FALLS CREEK

ORDINARY HIGH WATER

FALLS CREEK PROPOSED CHANNEL

FALLS CREEK PROPOSED SIDE CHANNELS

CUT – APPROX 2,655 CY

FILL – APPROX 1,175 CY

PROPOSED LOG STRUCTURES

0 75 150 Feet

Channel Feature	Start Station	End Elevation	Length	Begin Elevation	End Elevation	Elevation Diff	Slope (%)	Notes
Glide	0	50	50	92.4	92.1	0.3	0.60	Tie into existing elevation
Riffle	50	100	50	92.1	90.3	1.8	3.60	
Pool	100	160	60	90.3	90.2	0.1	0.17	
Glide	160	210	50	90.2	89.9	0.3	0.60	
Riffle	210	280	70	89.9	87	2.9	4.14	
Pool	280	330	50	87	86.9	0.1	0.20	
Glide	330	385	55	86.9	86.5	0.4	0.73	
Riffle	385	445	60	86.5	84	2.5	4.17	
Pool	445	495	50	84	83.9	0.1	0.20	
Glide	495	540	45	83.9	83.6	0.3	0.67	
Riffle	540	590	50	83.6	81.6	2	4.00	Tie into existing elevation

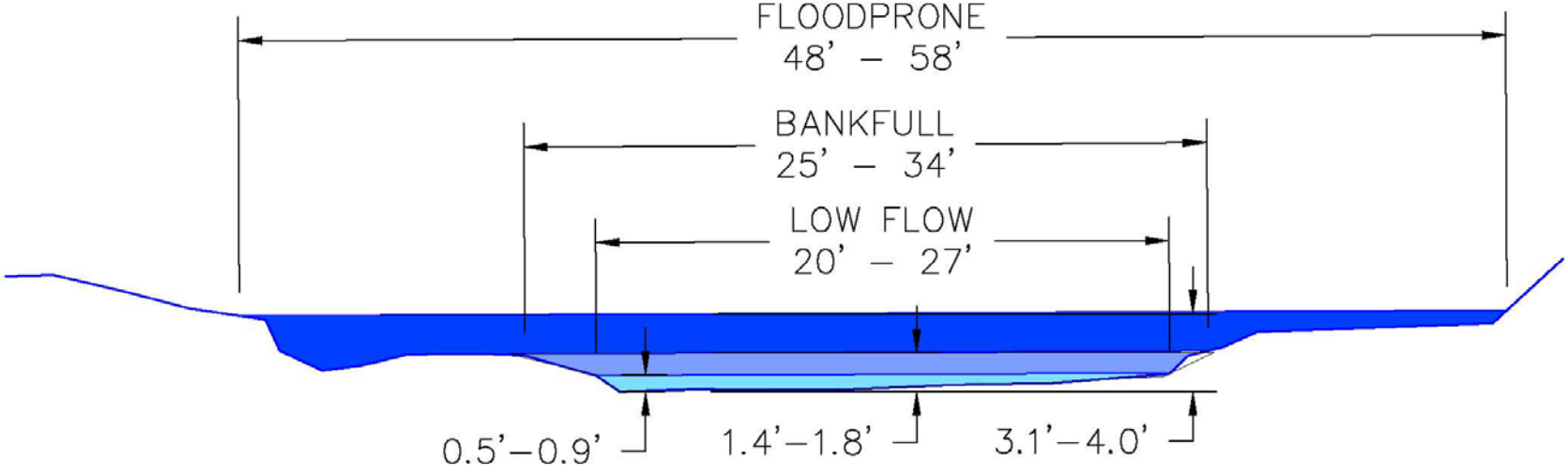
PROJECT NAME
FALLS CREEK RESTORATION PROJECT

CACHE CREEK

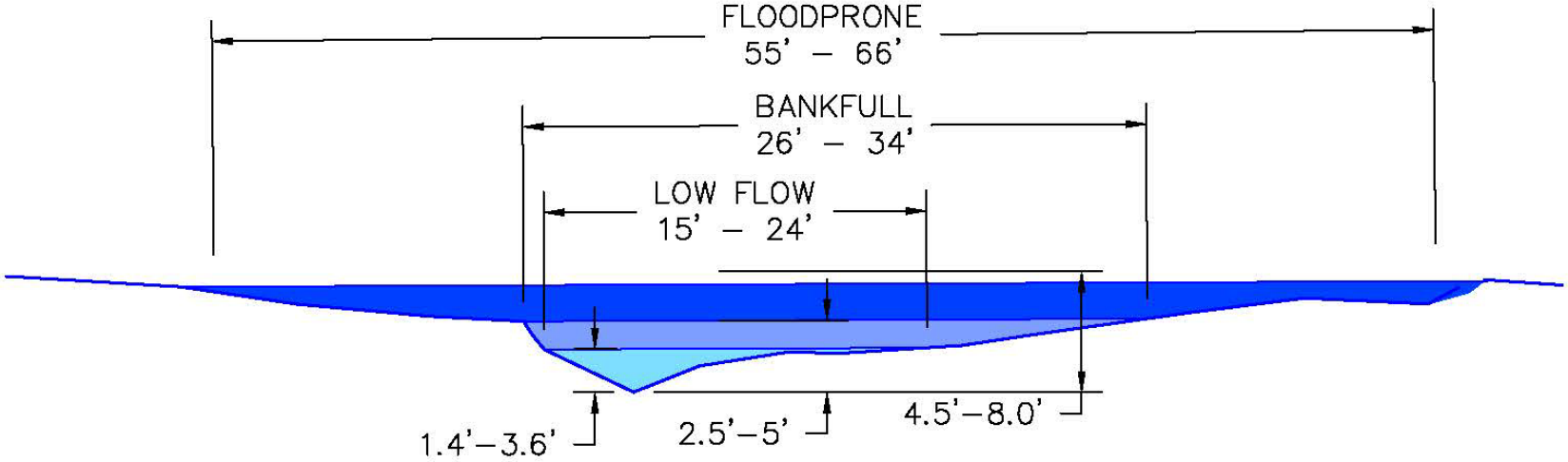
PETERSVILLE, AK

DRAWING TITLE
PROPOSED PROJECT AREA

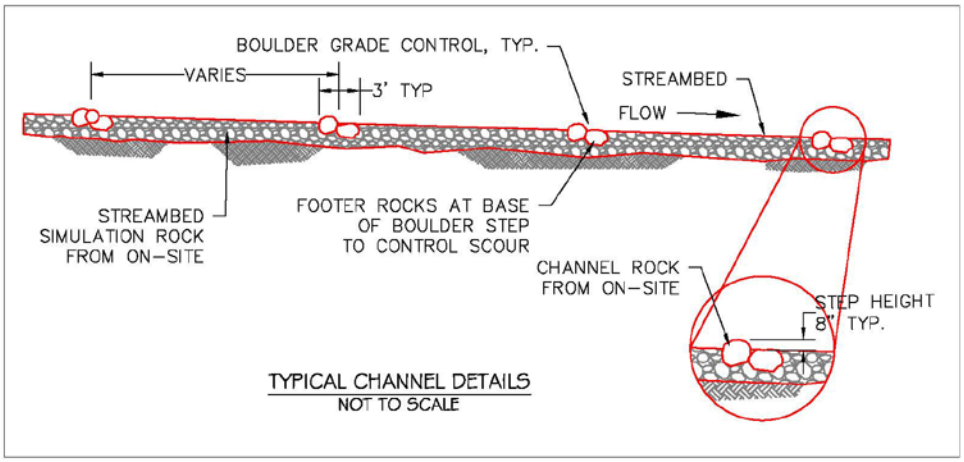
DATE 5/2021
DESIGNER C. MARZULLO
SHEET 4 OF 9



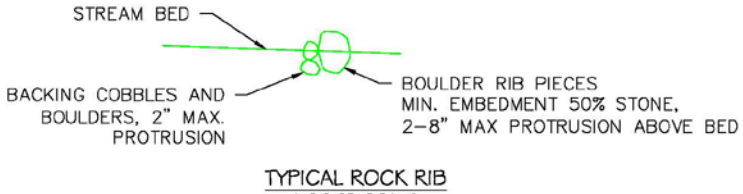
TYPICAL RIFFLE CROSS SECTION
NOT TO SCALE



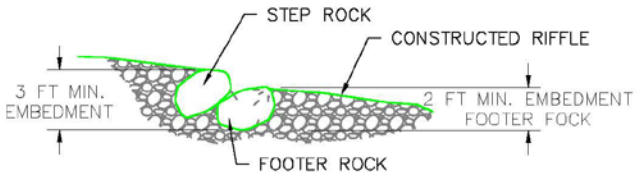
TYPICAL POOL
NOT TO SCALE



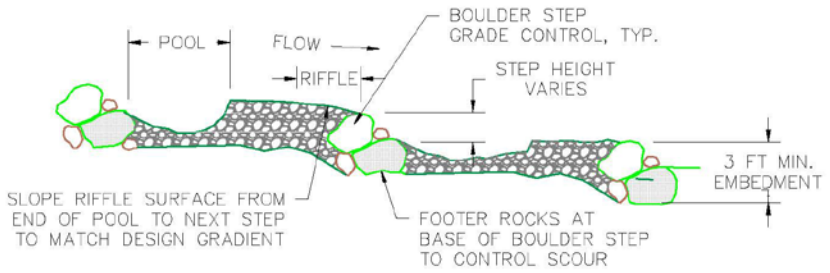
TYPICAL CHANNEL DETAILS
NOT TO SCALE



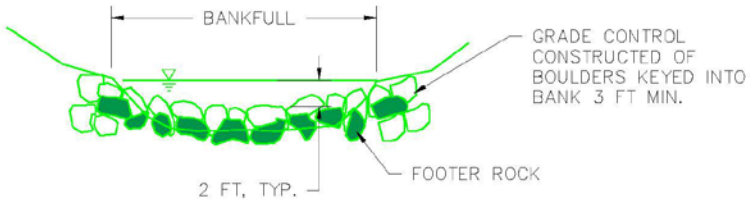
TYPICAL ROCK RIB
NOT TO SCALE



TYPICAL GRADE CONTROL
NOT TO SCALE



TYPICAL CHANNEL PROFILE
NOT TO SCALE



TYPICAL CHANNEL CROSS SECTION
NOT TO SCALE

STREAM RECONSTRUCTION NOTES:

EACH STREAMBED ELEMENT TO BE STAKED IN THE FIELD BY THE ENGINEER. ALL CHANNEL ROCK WILL COME FROM ON SITE. ROCK CLASSES WILL BE DETERMINED BY THE ENGINEER DEPENDING ON MATERIAL AVAILABLE.

ALL STREAMBED MATERIAL WILL BE PLACED AT THE GRADE AND ELEVATIONS LISTED ON THE PLANS OR STAKED IN THE FIELD BY THE ENGINEER. ALL RIB MATERIALS PROTRUDE ABOVE THE STREAMBED SURFACE.

ROCK RIBS ARE COMPOSED OF TWO ROWS OF ROCK AS FLAGGED BY THE ENGINEER. CONSTRUCT RIB WITH ALTERNATING SIZE CLASSES FOR THE DOWNSTREAM PORTION OF THE RIB. ALL ROCKS WILL BE ARRANGED IN TIGHT CONTACT WITH EACH OTHER. THE FRONT ROW OF RIB ROCKS WILL BE BURIED A MINIMUM OF 50% OF THE STONE SIZE. THIS ROW WILL PROTRUDE RANDOMLY BETWEEN 2" AND 8" ABOVE THE STREAM BED SURFACE. THE BACKING COBBLES WILL BE PLACED TWO (2) DEEP AGAINST THE DOWNSTREAM ROW WITH THE TOP ROCK PROTRUDING NO MORE THAN 3" ABOVE THE SURFACE WITH THE OTHER COBBLE BURIED UNDERNEATH. VARY THE AMOUNT OF PROTRUSION BETWEEN SUCCESSIVE ROCKS.

CONSTRUCT GRADE CONTROL RIB OUT OF TWO ROWS OF ROCKS AS FLAGGED BY THE ENGINEER. TO CONSTRUCT STEP ROCK WITH ALTERNATING SIZE FOR THE UPSTREAM PORTION OF THE RIB. ALL ROCKS WILL BE ARRANGED IN TIGHT CONTACT WITH EACH OTHER. THE FOOTER ROCKS WILL BE BURIED A MINIMUM OF 75% OF THE STONE SIZE. THE STEP ROCKS WILL BE BURIED A MINIMUM OF 50% OF THE STONE SIZE . THIS ROW WILL PROTRUDE RANDOMLY BETWEEN 2" AND 6" ABOVE THE STREAM BED SURFACE. VARY THE AMOUNT OF PROTRUSION BETWEEN SUCCESSIVE ROCKS.

ALL RIB AND STEP ROCK WILL BE PLACED WITH THE LONG AXIS PARALLEL WITH THE LONGITUDINAL DIRECTION OF THE STREAM.

FILL ALL VOIDS WITH GRAVEL AND FINER MATERIAL. IT IS ANTICIPATED ALL OF THE EXCAVATION MAY BE REUSED AS A PART OF THE STREAMBED SIMULATION MATERIAL AND CHANNEL ROCK, THEREFORE SIZE, LOCATION AND ELEVATION OF GRADE CONTROL FEATURES WILL BE APPROVED BY THE ENGINEER.

PROJECT NAME
FALLS CREEK RESTORATION PROJECT

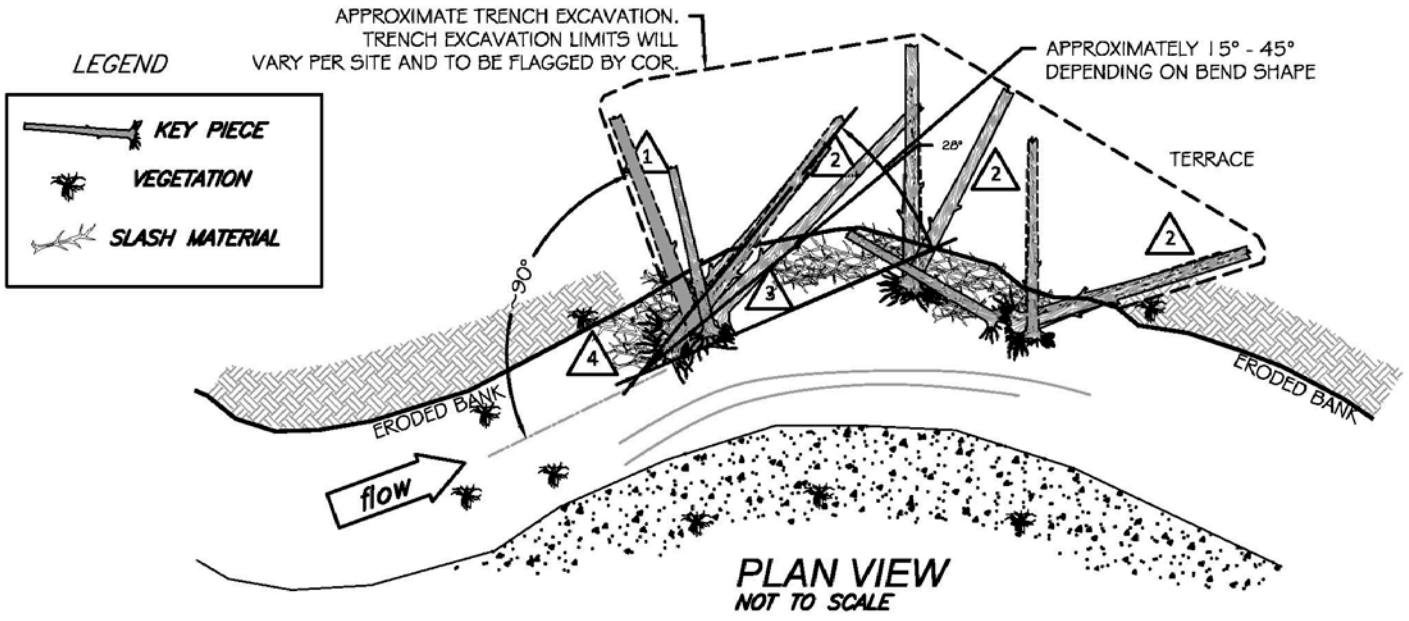
CACHE CREEK

PETERSVILLE, AK

DRAWING TITLE
CHANNEL DETAILS

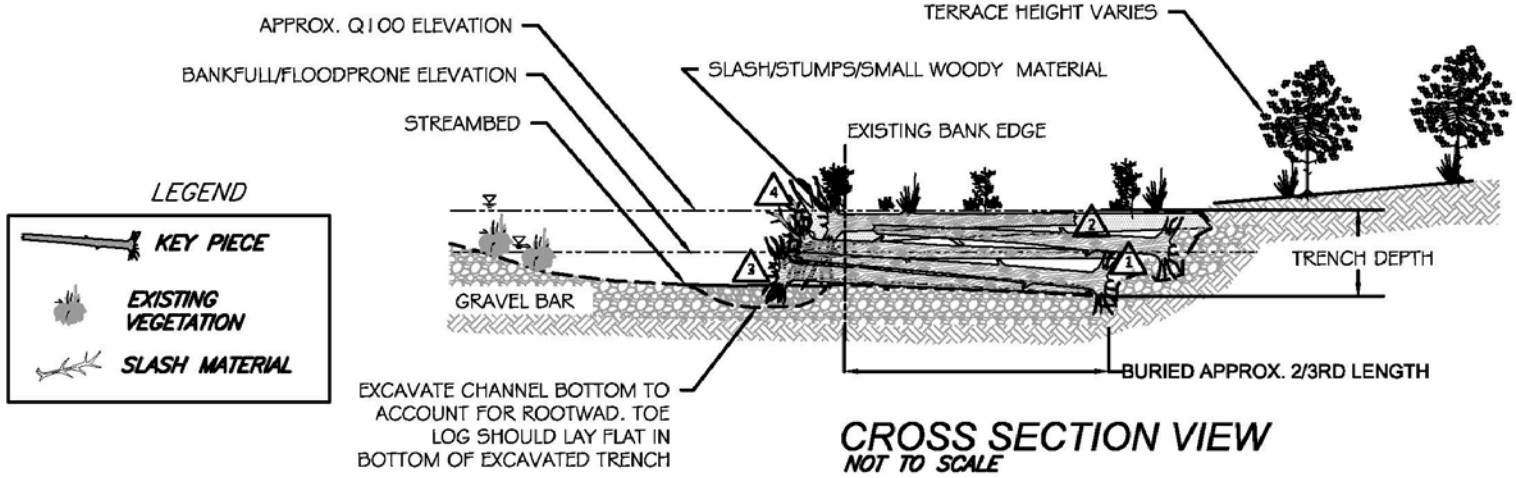
DATE 5/2021
DESIGNER C. MARZULLO
SHEET 6 OF 9

FMF STRUCTURE CONSTRUCTION SEQUENCE



FMF NOTES:

1. EXCAVATE TOE LOG TRENCHES PERPENDICULAR TO FLOW AND INTO TERRACE BELOW STREAM BED SURFACE AT EXCAVATED POOL DEPTH. TRENCH DEPTH SHALL BE TO MAXIMUM SCOUR DEPTH OR 3' BELOW LOW FLOW INDICATORS.
2. EXCAVATE TORSION LOG TRENCHES AT A 45° ANGLE TO FLOW AND TO STREAM BED SURFACE ELEVATION. TOP OF FINAL TORSION LOG ELEVATION SHOULD EXCEED 100 YEAR DISCHARGE RETURN INTERVAL OR TERRACE ELEVATION.
3. WEAVE ADDITIONAL TREES, LOGS, SLASH OR ROOT-WADS IN APEX OF STRUCTURE.
4. PLACE AMPLE SLASH AND SMALL WOODY DEBRIS ON THE UP-STREAM BANK INTERFACE OF THE STRUCTURE.
5. BOULDERS WILL BE USED FOR BALLAST AND BANK STABILIZATION.
6. ALL LOGS WILL BE PLACED AS DIRECTED BY THE ENGINEER.

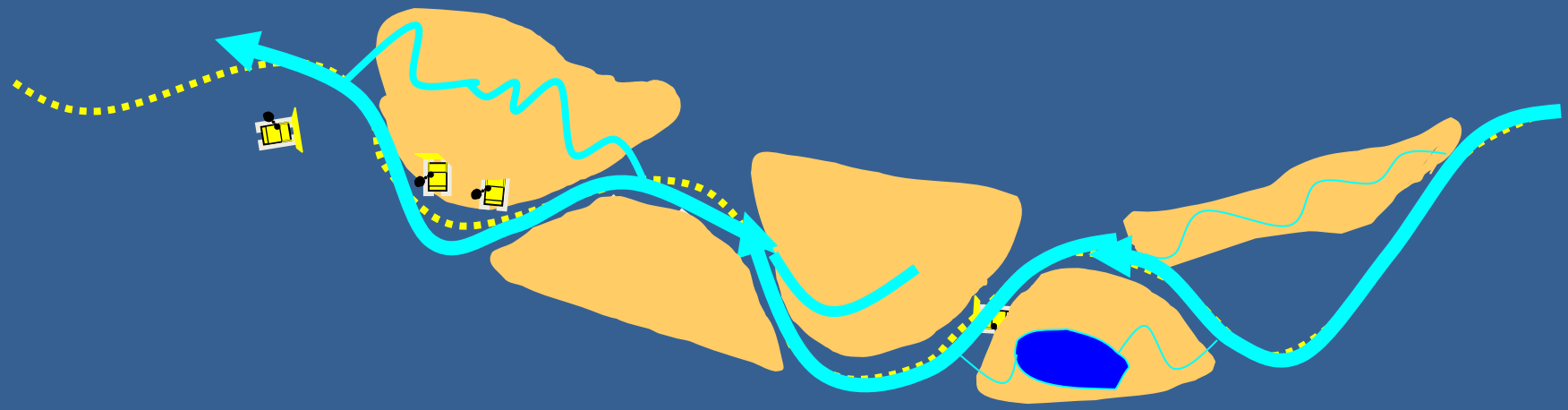


Stability Checks

- Stream power and shear stress for constructed riffles and spawning glides
- Scour calculations for LWD structures and pools
- Ballast calculations for LWD structures


PERMITTING: It's private land!
ADF&G Fish Habitat Permits:
Bridge installation
Channel Restoration Project

General Implementation Strategy




Bobcat
E85


CAT
CAT


CAT
CAT
308
NC


CAT
CAT
CAT
NC
305


CAT


45°F
07/21/2022
08:23PM
KAMARA1