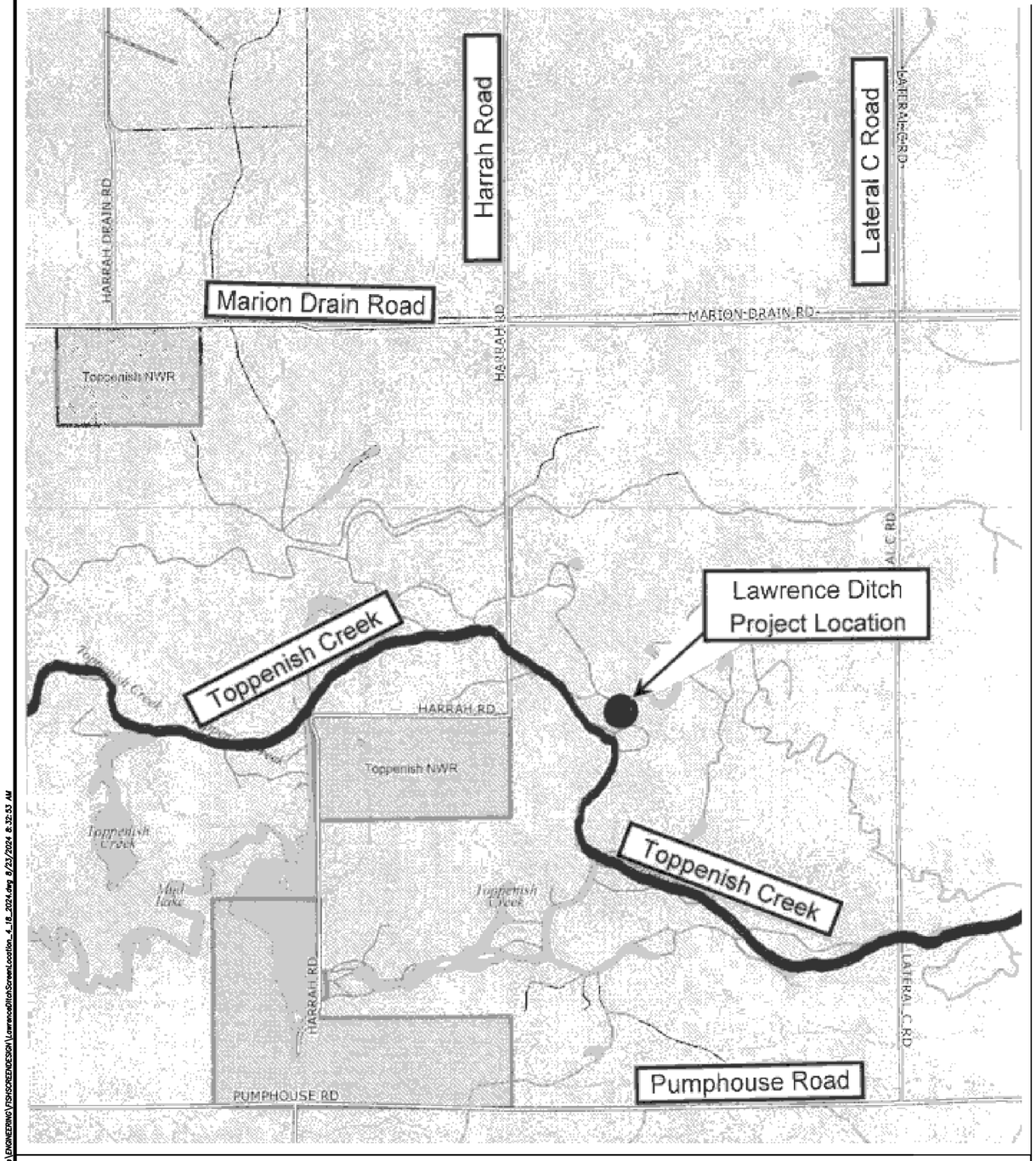
LAWRENCE DITCH FISH SCREEN PROJECT



Vicinity Map. Project location for Lawrence Ditch Fish Screen Project about 10 miles southwest of Toppenish and 5 miles south of Harrah, Washington, in Yakama County. In south ½ of Section 23, T 10 N, R 18 E. Latitude 46.3318º, Longitude 120.5375º. Map scale: 1" = 2,000'.

Lawrence Ditch Fish Screen Project

Yakama Nation Fisheries
P.O. Box 151/401 Fort Road
Toppenish, WA 98948

Kelsey Martin Harbick, Project Manager
509-506-5026 cell
hark@yakamafish-nsn.gov

Drawing List

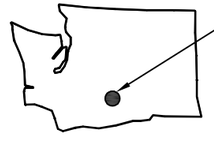
Reference Drawings (by Aqua Systems 2000)

Five sheets show screen & cleaner assembly, plus the solar panel stand. Both of these assemblies manufactured by Aqua Systems will be attached to the concrete structure with stainless steel anchor bolts.

Summary of Fish Screen Project

Lawrence Ditch diverts water from Toppenish Creek. PIT tag data from an antenna installed at the mouth of Lawrence Ditch shows that out migrating juvenile steelhead become entrained in the ditch and are never detected again. A fish screen and water control structure will be installed to prevent fish entrainment while managing the flow to wetlands currently fed by the ditch.

The structure will include a trashrack, vertical plate screen with wiper, and slide gates. A bypass channel will send all aquatic species that enter the ditch back to Toppenish Creek.



PROJECT LOCATION IS ABOUT
10 MILES SOUTHWEST OF TOPPENISH
AND 5 MILES SOUTH OF HARRAH, WA

REVISIONS

DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
PROJECT LOCATION & DRAWING LIST

Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 393-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	C1

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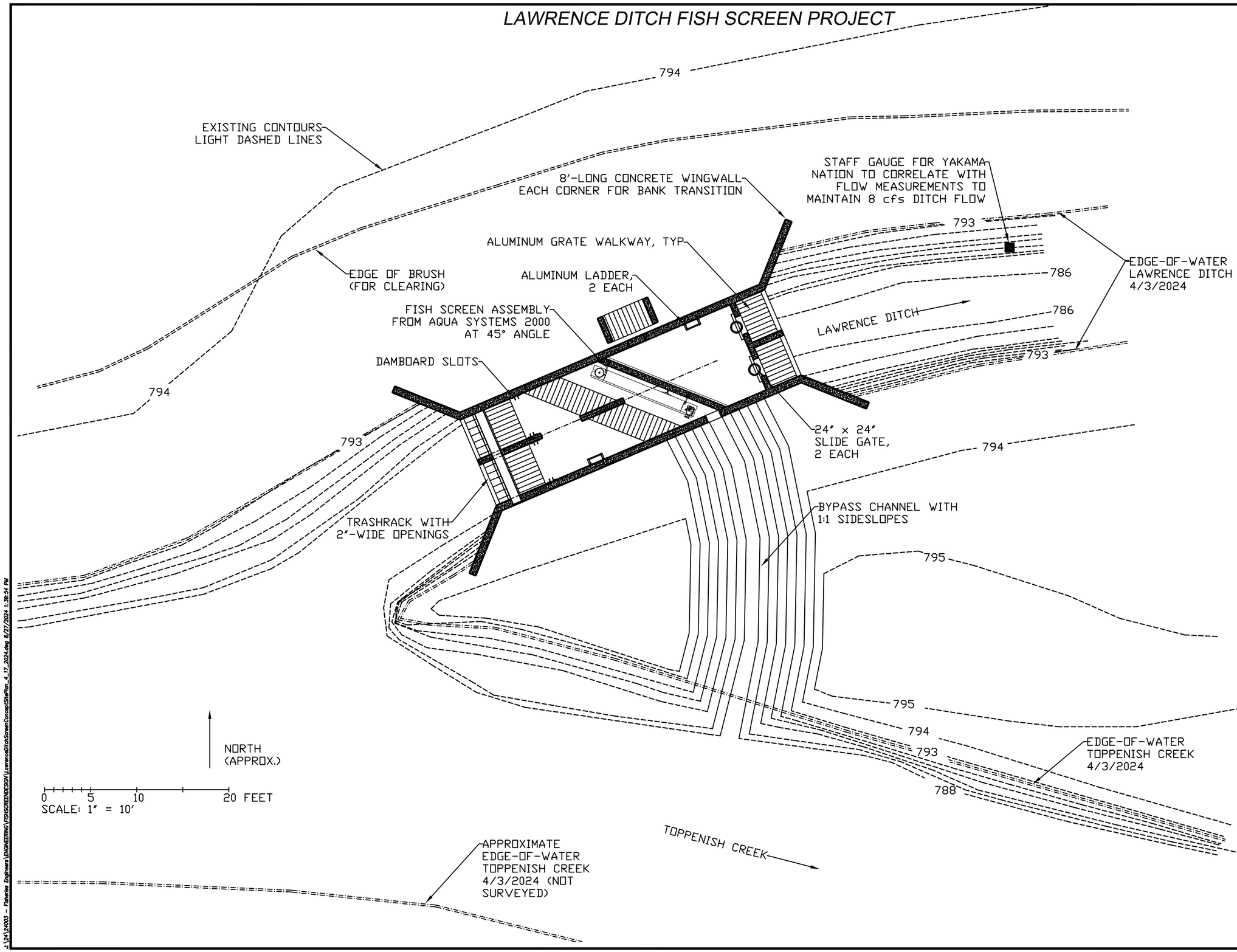
LAWRENCE DITCH FISH SCREEN PROJECT



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REVISIONS		
DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT

YAKAMA NATION

FISH SCREEN SITE PLAN

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APPROVED	BT
SHEET	C2

Basis Of Design

Fish Screen Functional Design

Lawrence Ditch Fish Screen Drawings C1 to C6, including these technical notes, comprise a functional design (NMFS 2023) for the subject fish screen and flow control structure. This functional design is intended for review by fisheries agencies, funding entities, and/or others interested in this fish screen project. Paramount design variables such as downstream control in ditch, hydraulic design for screen including approach velocity (V_a) and sweeping velocity (V_s), screen material and cleaning system, fish bypass, and flow control for the ditch are described herein, and shown on drawings.

Lawrence Ditch is a 15' to 20'-wide ditch (x 5' to 7'-deep) excavated during the 1970's from Toppenish Creek to private lands within Yakama Nation, for support and enhancement of multiple duck hunting ponds. Water is conveyed through this ditch without any flow control, and the ditch has never had a fish screen. A site survey and flow measurement (for the ditch) were completed in April 2024 at the proposed fish screen location, by the design engineers and Yakama Nation staff. Flow measurement by YN staff April 10, 2024 summed to 75 cubic feet per second (cfs) unscreened diversion of water (and fish) from Toppenish Creek.

The Yakama Nation Fisheries Department has decided that existing conditions at Lawrence Ditch are unacceptable, including entrainment and mortality adverse to the entire native fish community. YN has decided that the maximum diversion of water from Toppenish Creek into Lawrence Ditch will be 8 cfs, regardless of flow rate in Toppenish Creek, and this diverted flow shall be screened in conformance with NMFS (2023) fish screen criteria.

Downstream Control in Ditch

Lawrence Ditch extends from Toppenish Creek to about 1,100' east before diverted water spills towards multiple pond areas. Near the downstream end of this ditch, a relatively shallow reach of the ditch serves as a "downstream control" for all hydraulic design variables relevant to fish screen design. Two cross-section transects surveyed at this downstream control verified ditch bottom Elevation 788.7' and higher will result in "zero flow" in the ditch whenever Toppenish Creek water level drops to Elevation 788.7'. Based on this surveyed downstream control, Elevation 788.5' was set for the bottom of trashrack, fish screen, and slide gate elements to be built near the ditch junction with Toppenish Creek. There will be zero ditch flow below Elevation 788.5' (nominal 788.7') and no reason to extend screen or flow control any lower.

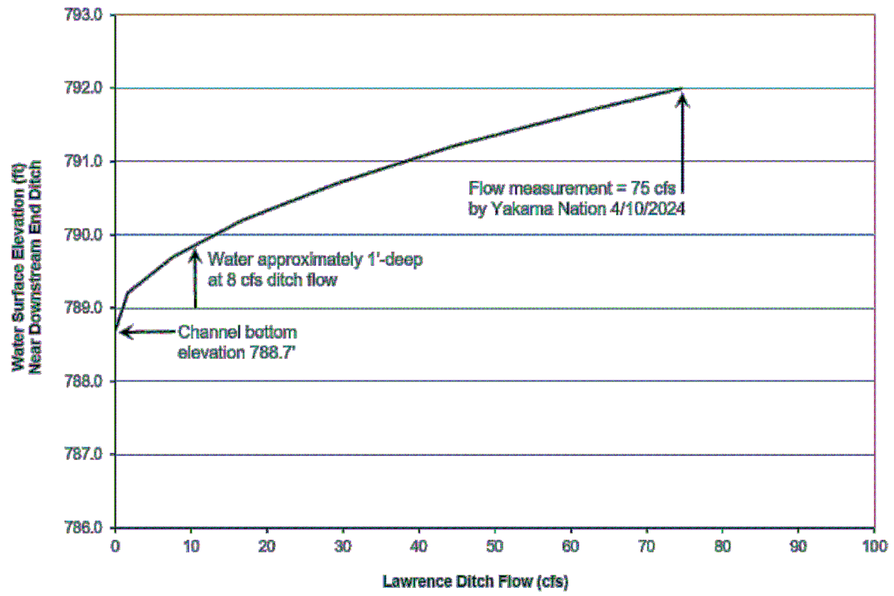
Fish Screen and Flow Control Arrangement

Drawing C2 shows the proposed layout and alignment of trashrack, fish screen, and slide gate elements all supported in a single reinforced concrete structure (cast-in-place). Two proposed slide gates are necessarily downstream of the proposed screen, to maintain upstream water surface elevations for gravity-flow bypass directly back to Toppenish Creek. If slide gates were placed upstream of the screen structure, water level drop (head loss) through the slide gates would preclude gravity flow of bypass water back to Toppenish Creek.

Large ground areas Elevation 793.5' (+/-) surrounding the proposed screen location are overtopped by peak flows and floods of Toppenish Creek. Widespread flooding above this elevation indicated that it would be impractical to design any fish screen or flow control elements above Elevation 793.5'; this is the proposed top elevation for all fish screen structures.

Hydraulic Design for Fish Screen

The first step for hydraulic design was to determine the lowest water level for Toppenish Creek that could deliver 8 cfs flow into Lawrence Ditch. A rating curve was developed for the downstream control in the existing ditch, using data from surveyed ditch transects, and YN's flow measurement = 75 cfs on 4/10/2024. Manning's equation (Chow 1959) with n-value = 0.035 and the surveyed gradient of the ditch (0.09%) resulted in an excellent correlation of measured flow rate with the rating curve predicted using Manning's equation. The ditch rating curve shown below formed the starting point for hydraulic design for the proposed screen, as outlined herein.



Rating curve for Lawrence Ditch near downstream end ditch.

Estimated water surface Elevation 789.8' (+/-) for 8 cfs flow rate at the downstream control (see rating curve) extended upstream to the screen site at 0.09% ditch slope resulted in water Elevation 790.5' at the proposed screen location; this is the lowest creek elevation that could deliver 8 cfs into Lawrence Ditch. Water depth = 2.0' above the bottom of fish screen, at maximum ditch flow (8 cfs) is the controlling variable for determination of fish screen length.

With V_a required to be 0.4 feet per second (fps) or less (NMFS 2023), a screen length = 10' was calculated. At creek water levels higher than Elevation 790.5', the screen will be increasingly submerged with corresponding reductions in V_a. Multiple profile and section views of the proposed screen and flow control facility are shown on drawings following this Basis-Of-Design narrative. These drawings are integrated into the following technical evaluations by reference, for comprehensive understanding of the screen's functional design (per NMFS 2023).

Hydraulic assumptions and calculations for the proposed screen are moderately complicated due to the following:

- Lawrence Ditch is a substantially larger channel than required to convey 8 cfs from Toppenish Creek to private land with ponds. For example, a flow = 75 cfs was measured in the ditch by YN staff in April 2024. During low creek flows with water elevation less than 790' (+/-), water in the large ditch channel will be almost "flat water" from Toppenish Creek to the ditch downstream control location.
- Water surface slope within the ditch will vary from 0% (flat water) at very low flows, to 0.09% as measured in April 2024 for a relatively high ditch flow (75 cfs). Variable slope of the ditch's water surface depending on flow rate introduces a minor uncertainty into all hydraulic calculations, but this variable was not considered significant for presentation of the range of fish screen and bypass flow rates.
- The proposed bypass channel will be an excavated channel with 18"-wide bottom at Elevation 787.5' (same as bypass opening bottom), with 1:1 sideslopes as shown on Drawing C2.
- From Toppenish Creek water surface elevations 788.5' (zero flow into Lawrence Ditch) to about 790.5' (+/-), flow into the ditch and through the screen will be entirely regulated by the existing ditch downstream control. The flow rate through the screen will vary from 0 to 8 cfs if creek water elevations are less than 790.5'.
- When creek water surface elevation rises above 790.5', YN will be operating the proposed slide gates to limit ditch flow to 8 cfs; this will be the maximum flow rate through the fish screen.

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
FISH SCREEN BASIS-OF-DESIGN

Encompass
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JOB NO.	24003
DATE	SEP 2024
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DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	C3

- The bypass channel (Drawing C2) will be similar to a low-flow backwater channel along the creek; bypass flow will be regulated by the 18"-wide bypass opening in the screen structure exterior wall (see profile view drawing).

All notes listed above, hydraulic design calculations, backwater conditions, Manning's equation (Chow 1959), and the downstream control rating curve were integrated into an Excel spreadsheet to estimate flow rates through the proposed screen, V_a, V_s, and bypass flow rates for creek water elevations from 788.5' (zero flow in ditch) to 793.5' (overtop of screen structure by flooding). Table 1 summarizes calculations in 0.5' intervals from this spreadsheet, to present the entire range of screen and bypass flow rates depending on Toppenish Creek water levels. As shown in Table 1, screen flow will be entirely regulated by the ditch downstream control up to Elevation 790.5' (nominal), then regulation of ditch flow rate will be controlled by YN operation of slide gates.

Table 1. Hydraulic design data for fish screen proposed for Lawrence Ditch.

Toppenish Creek Water Elevation (feet)	Downstream Control or Slide Gates Regulation	Lawrence Ditch Flow (cfs)	Approach Velocity for Screen (fps)	Sweeping Velocity for Screen (fps)	Bypass Flow Rate (cfs)
788.5	Downstream	0	0	0	0
789.0	Downstream	1	0.2	0.2 to 1.0	2
789.5	Downstream	3	0.3	0.3 to 1.5	4
790.0	Downstream	6	0.4	0.4 to 2.0	7
790.5	Downstream	8	0.4	0.4 to 2.0	9
791.0	Slide Gates	8	0.3	0.3 to 2.0	10
791.5	Slide Gates	8	0.3	0.3 to 2.0	12
792.0	Slide Gates	8	0.2	0.2 to 2.0	13
792.5	Slide Gates	8	0.2	0.2 to 2.0	15
793.0	Slide Gates	8	0.2	0.2 to 2.0	16
793.5	Slide Gates	8	0.2	0.2 to 2.0	18

Functional design conclusions are as follows (from hydraulic calculations, Table 1):

- At low creek flows with water surface elevation up to 790.5', slide gates would be wide open, and flow into the ditch would be regulated by the downstream control. Increases in Toppenish Creek flow would result in increased flow into Lawrence Ditch, with V_a reaching a maximum = 0.4 fps for the minimum creek flow that could deliver 8 cfs into the ditch.
- For all creek flows with water surface elevation higher than 790.5', YN will operate slide gates to maintain ditch flow at 8 cfs (+/-). As water level at the screen increases above Elevation 790.5', V_a will gradually decrease to 0.2 fps.
- Bypass flow rate will more-or-less equal ditch flow rate when creek water level is less than Elevation 790.5'. This is due to the 45° angle of the vertical screen (i.e. V_a = minimum V_s), and head loss calculations for the 18"-wide bypass opening (i.e. minor losses thru hydraulic orifice).
- Sweeping velocity (V_s) will be equal to V_a at the upstream end of the screen due to the 45° angle, then will gradually increase in downstream direction along the screen surface as listed in Table 1. Maximum V_s = 2.0 fps will be equal to the water velocity entering the 18"-wide bypass opening, for all bypass flow rates above 6 cfs.

Trashrack

The proposed trashrack will have $^3/_8$"-thick stainless steel flat bars with 2" openings for interception of floating and submerged debris. The rack will be inclined 10° from vertical, a stainless steel rake with tines at 2½" on-center spacing will be provided to YN, an access walkway is included in the design just downstream of the rack, and all small debris (e.g. leaves) will be directly transferred with the rake, from the trashrack surface into a 12"-wide trough to be pushed downstream (see profile and section drawings).

Fish Screen

Screen surface will be stainless steel sheet (16 gauge) with $^3/_{32}$" holes punched in a staggered pattern; screen open area will be 33%. Overall screen size will be 10'-long x 4'-high as described above, and to meet V_a requirements (NMFS 2023).

Screen Cleaning System

A brush system for continuous screen cleaning is included in design for the fish screen. Electrical power for the screen cleaning system will be provided by an off-grid solar power system.

Slide Gates

Slide gates will be stainless steel bottom-opening gates fabricated by a commercial supplier, e.g. Waterman. A walkway across the screen structure will be included for YN access to the handwheel operators. Handwheels will be locked (with chains) to stainless steel brackets to limit operation to YN staff. Two slide gates are proposed to spread water flow across the screen structure, which will balance V_a through all screen surfaces better than a single slide gate.

References

Chow, V.T. 1959. Open Channel Hydraulics. McGraw-Hill Book Company, New York, New York.

NMFS (National Marine Fisheries Service). 2023. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

REVISIONS

DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
FISH SCREEN BASIS-OF-DESIGN

Encompass
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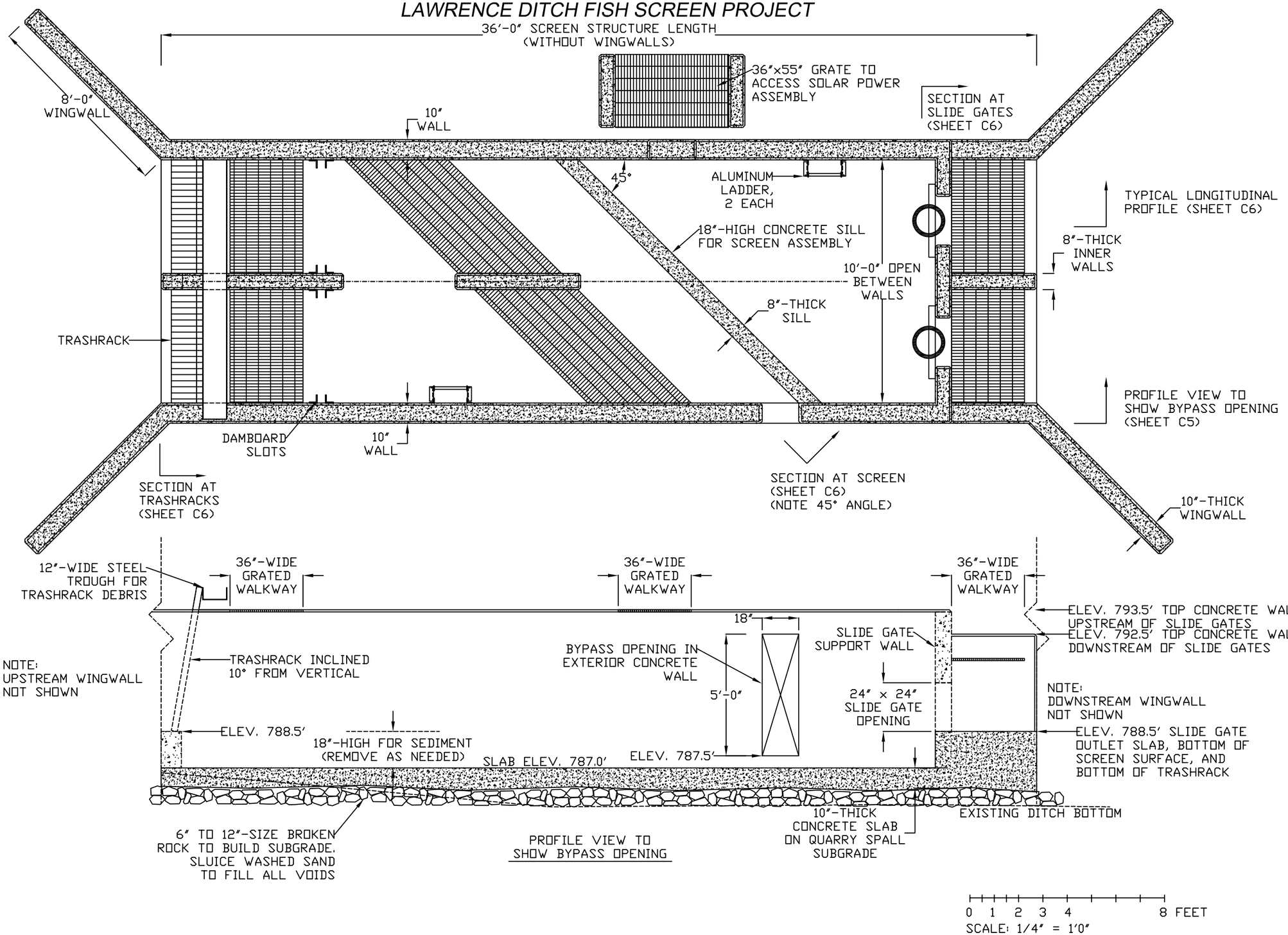
JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	C4

LAWRENCE DITCH FISH SCREEN PROJECT



REVISIONS		
DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
FISH SCREEN PLAN & PROFILE

Encompass
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Eastern Washington Division
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JOB NO.	24003
DATE	SEP 2024
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DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	C5

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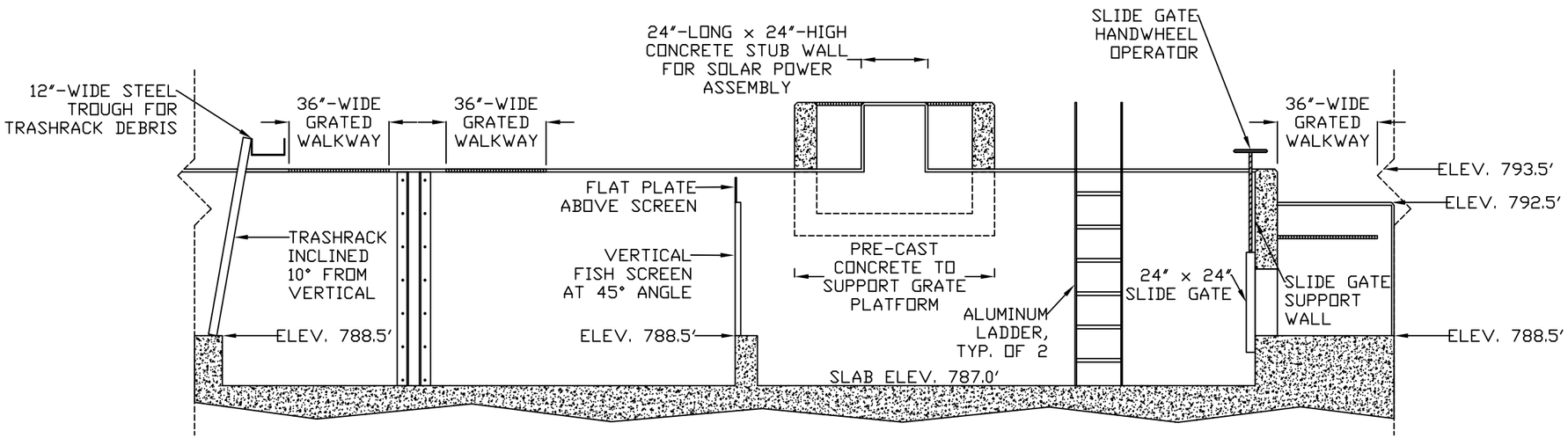
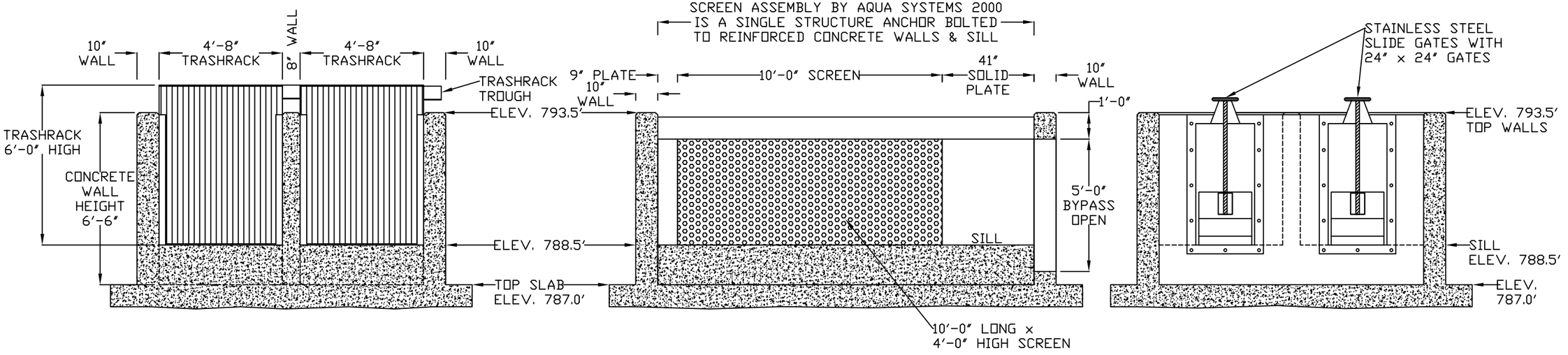
LAWRENCE DITCH FISH SCREEN PROJECT



TYPICAL LONGITUDINAL PROFILE



SECTION AT TRASHRACKS WINGWALLS NOT SHOWN

SECTION AT SCREEN (NOTE 45° ANGLE)

SECTION AT SLIDE GATES

0 1 2 3 4 8 FEET

SCALE: 1/4" = 1'0"

REVISIONS

DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL STATE OF WASHINGTON 21019228 REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT

YAKAMA NATION

FISH SCREEN PROFILE & SECTIONS

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SHEET	C6

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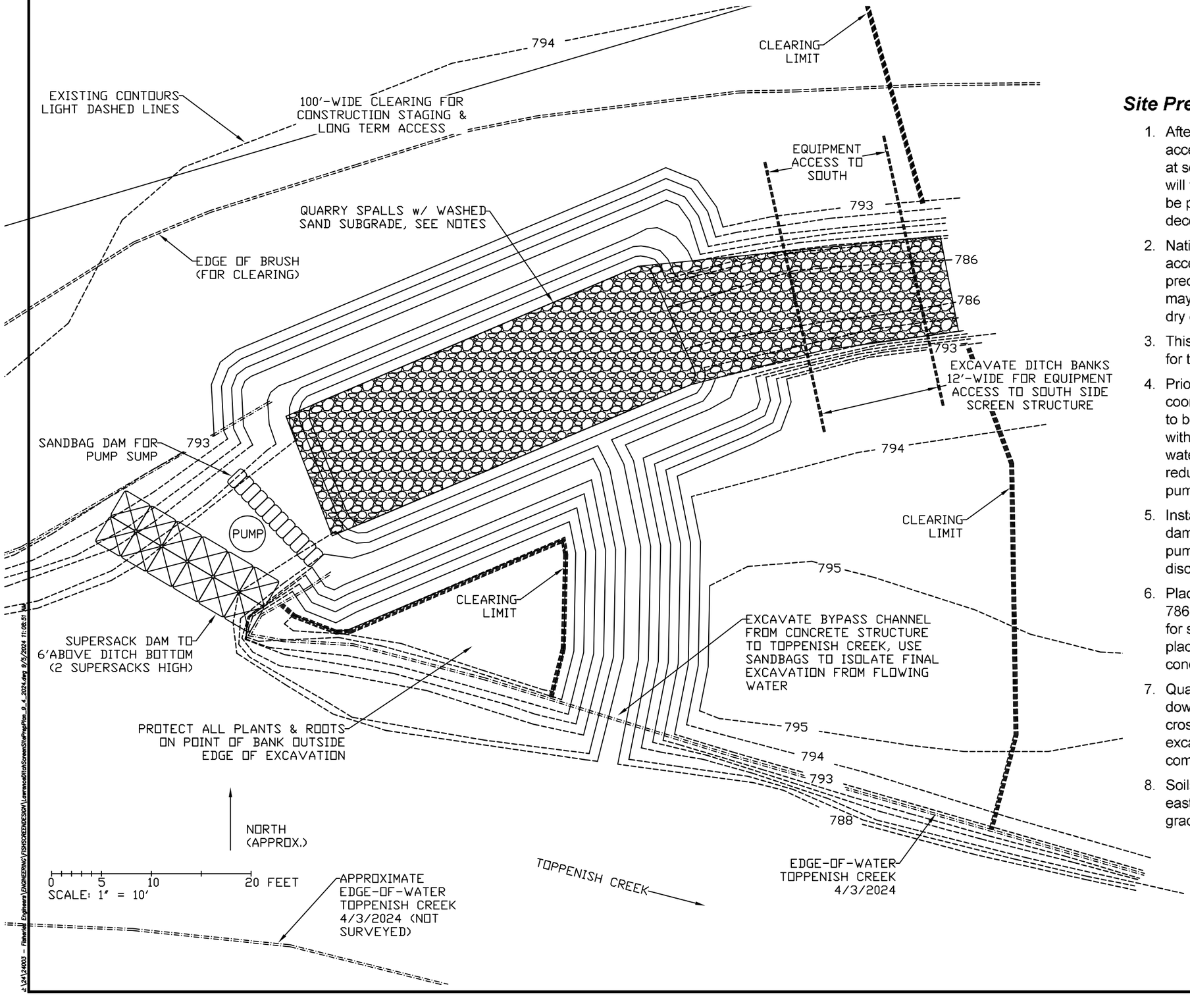
LAWRENCE DITCH FISH SCREEN PROJECT



Site Preparation & Water Control Notes:

1. After completion of clearing and minor grading of site access road (see Sheet C8), clearing to be completed at screen site, see clearing limits this sheet. Engineer will flag clearing limits on-site. All clearing debris to be piled on-site and mashed down for natural decomposition.
2. Native soils contain clay, and the site will only be accessible during dry weather. If wet weather precludes access for more than 2 weeks, the project may need to be delayed until after spring floods (i.e. dry conditions).
3. This drawing shows approximate excavation contours for the screen structure and bypass channel.
4. Prior to blocking flow with dams, Contractor to coordinate with Yakama Nation for fish salvage crew to be on-site. Place Supersack dam (primary dam) with fish salvage to start downstream in ditch. As water in ditch recedes, place small sandbags to reduce Supersack leaks to a flow rate that could be pumped with 2 submersible pumps (2"-dia. hose).
5. Install short sandbag dam downstream of Supersack dam for pump sump. Use two 2"-dia. submersible pumps with generator for 24/7 pumping, with discharge to flat ground within 100' of screen location.
6. Place quarry spalls in existing ditch bottom to Elev. 786.2' (bottom of structure slab +/-) and mash down for solid subgrade material. As quarry spalls are placed, sluice washed sand into voids to avoid loss of concrete into voids.
7. Quarry spall (w/ washed sand) subgrade extends downstream of screen structure to allow equipment crossing for construction work on south bank, and to excavate bypass channel after screen structure complete.
8. Soils excavated for bypass channel to be side-cast to east and spread 1' to 2'-deep (to clearing limit), with gradual transitions to existing soils.

REVISIONS		
DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL — STATE OF WASHINGTON — 21019228 — REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
SITE PREPARATION & WATER CONTROL

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APPROVED	BT
SHEET	C7

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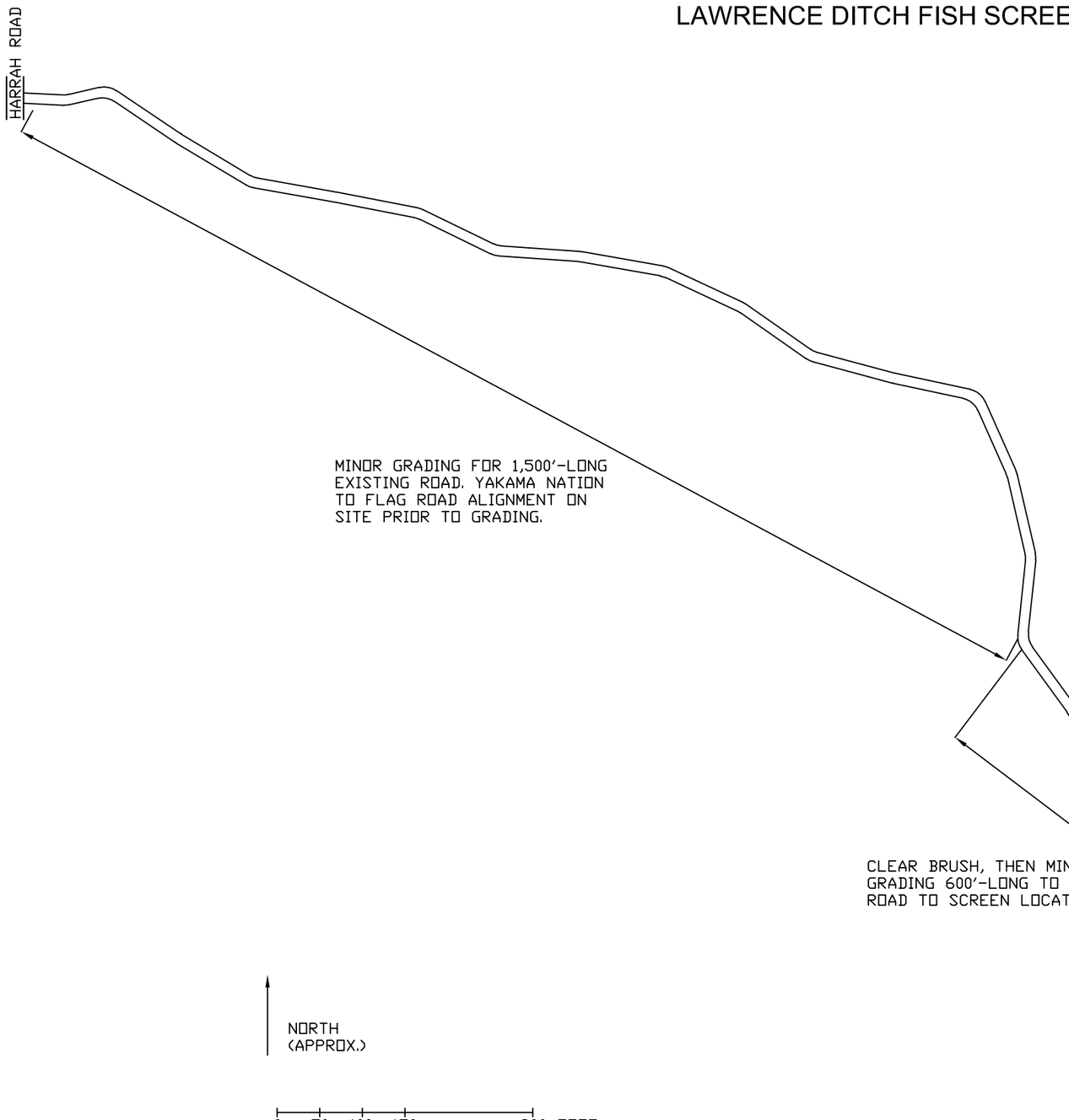
LAWRENCE DITCH FISH SCREEN PROJECT



Access Road Notes

1. Vehicle access to the screen site will be provided with minor grading of an existing $^1/_4$-mile road, then extension of this existing road approximately 600' to the screen site. Road extension will include clearing of brush thru a narrow corridor previously surveyed for cultural resources and approved for clearing. Construction of the road extension will be minimized to grading required for vehicle access during dry conditions.
2. Access road construction will not include any import of rock or crushed rock; the road surface will be native soils.
3. At the screen location an 100' x 60' area will be cleared of brush. Then minor grading will be accomplished to build a materials and equipment storage area for screen construction, then long-term parking and turnaround for Yakama Nation operation and maintenance of the fish screen facility.
4. All clearing debris shall be piled on site and mashed down for natural decomposition.

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPA — STATE OF WASHINGTON — 21019228 — REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
ACCESS ROAD ALIGNMENT & DETAILS

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APPROVED	BT
SHEET	C8

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LAWRENCE DITCH FISH SCREEN PROJECT

HIP GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIP ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-LISTED SPECIES. THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS AND NMFS) WILL BE APPLIED TO ALL ACTIONS OF THIS PROJECT.

PROJECT DESIGN AND SITE PREPARATION.

1. STATE AND FEDERAL PERMITS.

A. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION.

B. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USACE CLEAN WATER ACT (CWA) 404 PERMITS, CWA SECTION 401 WATER QUALITY CERTIFICATIONS, AND FEMA NO-RISE ANALYSES.

2. TIMING OF IN-WATER WORK.

A. APPROPRIATE STATE (OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW), WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW), IDAHO DEPARTMENT OF FISH AND GAME (IDFG), AND MONTANA FISH WILDLIFE AND PARKS (MFWP)) GUIDELINES FOR TIMING OF IN-WATER WORK WINDOWS (IWW) WILL BE FOLLOWED.

B. CHANGES TO ESTABLISHED WORK WINDOWS WILL BE APPROVED BY REGIONAL STATE BIOLOGISTS AND BPA'S EC LEAD.

C. BULL TROUT. FOR AREAS WITH DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR AREAS KNOWN TO HAVE BULL TROUT, PROJECT PROPONENTS WILL CONTACT THE APPROPRIATE USFWS FIELD OFFICE TO INSURE THAT ALL REASONABLE IMPLEMENTATION MEASURES ARE CONSIDERED AND AN APPROPRIATE IN-WATER WORK WINDOW IS BEING USED TO MINIMIZE PROJECT EFFECTS.

D. LAMPREY. WORKING IN STREAM OR RIVER CHANNELS THAT CONTAIN PACIFIC LAMPREY WILL BE AVOIDED FROM MARCH 1 TO JULY 1 FOR REACHES <5,000 FEET IN ELEVATION AND FROM MARCH 1 TO AUGUST 1 FOR REACHES >5,000 FEET. IF EITHER TIMEFRAME IS INCOMPATIBLE WITH OTHER OBJECTIVES, THE AREA WILL BE SURVEYED FOR NESTS AND LAMPREY PRESENCE, AND AVOIDED IF POSSIBLE. IF LAMPREYS ARE KNOWN TO EXIST, THE PROJECT SPONSOR WILL UTILIZE DEWATERING AND SALVAGE PROCEDURES (SEE FISH SALVAGE AND ELECTROFISHING SECTIONS) TO MINIMIZE ADVERSE EFFECTS.

E. THE IN-WATER WORK WINDOW WILL BE PROVIDED IN THE CONSTRUCTION PLANS.

3. CONTAMINANTS.

A. EXCAVATION OF MORE THAN 20 CUBIC YARDS WILL REQUIRE A SITE VISIT AND DOCUMENTED ASSESSMENT FOR POTENTIAL CONTAMINANT SOURCES. THE SITE ASSESSMENT WILL BE STORED WITH PROJECT FILES OR AS AN APPENDIX TO THE BASIS OF DESIGN REPORT.

B. THE SITE ASSESSMENT WILL SUMMARIZE:

1. THE SITE VISIT, CONDITION OF THE PROPERTY, AND IDENTIFICATION OF ANY AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES;
2. AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;
3. INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND
4. THE TYPE, QUANTITY, AND EXTENT OF ANY POTENTIAL CONTAMINATION SOURCES.

4. SITE LAYOUT AND FLAGGING.

A. CONSTRUCTION AREAS TO BE CLEARLY FLAGGED PRIOR TO CONSTRUCTION.

B. AREAS TO BE FLAGGED WILL INCLUDE:

1. SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;
2. EQUIPMENT ENTRY AND EXIT POINTS;
3. ROAD AND STREAM CROSSING ALIGNMENTS;
4. STAGING, STORAGE, AND STOCKPILE AREAS; AND
5. NO-SPRAY AREAS AND BUFFERS.

5. TEMPORARY ACCESS ROADS AND PATHS.

A. EXISTING ACCESS ROADS AND PATHS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER AND LENGTH OF TEMPORARY ACCESS ROADS AND PATHS THROUGH RIPARIAN AREAS AND FLOODPLAINS WILL BE MINIMIZED.

B. VEHICLE USE AND HUMAN ACTIVITIES, INCLUDING WALKING, IN AREAS OCCUPIED BY TERRESTRIAL ESA-LISTED SPECIES WILL BE MINIMIZED.

C. TEMPORARY ACCESS ROADS AND PATHS WILL NOT BE BUILT ON SLOPES WHERE GRADE, SOIL, OR OTHER FEATURES SUGGEST A LIKELIHOOD OF EXCESSIVE EROSION OR FAILURE. IF SLOPES ARE STEEPER THAN 30%, THEN THE ROAD WILL BE DESIGNED BY A CIVIL ENGINEER WITH EXPERIENCE IN STEEP ROAD DESIGN.

D. THE REMOVAL OF RIPARIAN VEGETATION DURING CONSTRUCTION OF TEMPORARY ACCESS ROADS WILL BE MINIMIZED. WHEN TEMPORARY VEGETATION REMOVAL IS REQUIRED, VEGETATION WILL BE CUT AT GROUND LEVEL (NOT GRUBBED).

E. AT PROJECT COMPLETION, ALL TEMPORARY ACCESS ROADS AND PATHS WILL BE OBLITERATED, AND THE SOIL WILL BE STABILIZED AND REVEGETATED. ROAD AND PATH OBLITERATION REFERS TO THE MOST COMPREHENSIVE DEGREE OF DECOMMISSIONING AND INVOLVES DECOMPACTING THE SURFACE AND DITCH, PULLING THE FILL MATERIAL ONTO THE RUNNING SURFACE, AND RESHAPING TO MATCH THE ORIGINAL CONTOUR.

F. HELICOPTER FLIGHT PATTERNS WILL BE ESTABLISHED IN ADVANCE AND LOCATED TO AVOID TERRESTRIAL ESA-LISTED SPECIES AND THEIR OCCUPIED HABITAT DURING SENSITIVE LIFE STAGES.

6. TEMPORARY STREAM CROSSINGS.

A. EXISTING STREAM CROSSINGS OR BEDROCK WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER OF TEMPORARY STREAM CROSSINGS WILL BE MINIMIZED.

B. TEMPORARY BRIDGES AND CULVERTS WILL BE INSTALLED TO ALLOW FOR EQUIPMENT AND VEHICLE CROSSING OVER PERENNIAL STREAMS DURING CONSTRUCTION. TREATED WOOD SHALL NOT BE USED ON TEMPORARY BRIDGE CROSSINGS OR IN LOCATIONS IN CONTACT WITH OR DIRECTLY OVER WATER.

C. FOR PROJECTS THAT REQUIRE EQUIPMENT AND VEHICLES TO CROSS IN THE WET:

1. THE LOCATION AND NUMBER OF ALL WET CROSSINGS SHALL BE APPROVED BY THE BPA EC LEAD AND DOCUMENTED IN THE CONSTRUCTION PLANS;
2. VEHICLES AND MACHINERY SHALL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHENEVER POSSIBLE;
3. NO STREAM CROSSINGS WILL OCCUR 300 FEET UPSTREAM OR 100 FEET DOWNSTREAM OF AN EXISTING REDD OR SPAWNING FISH; AND
4. AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND BANKS RESTORED.

7. STAGING, STORAGE, AND STOCKPILE AREAS.

A. STAGING AREAS (USED FOR CONSTRUCTION EQUIPMENT STORAGE, VEHICLE STORAGE, FUELING, SERVICING, AND HAZARDOUS MATERIAL STORAGE) WILL BE 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND. STAGING AREAS CLOSER THAN 150 FEET WILL BE APPROVED BY THE EC LEAD.

B. NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN 150 FEET IF CLEARLY INDICATED IN THE PLANS THAT AREA IS FOR NATURAL MATERIALS ONLY.

C. ANY LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL DISPLACED BY CONSTRUCTION WILL BE STOCKPILED FOR USE DURING SITE RESTORATION AT A SPECIFICALLY IDENTIFIED AND FLAGGED AREA.

D. ANY MATERIAL NOT USED IN RESTORATION, AND NOT NATIVE TO THE FLOODPLAIN, WILL BE DISPOSED OF OUTSIDE THE 100-YEAR FLOODPLAIN.

8. EQUIPMENT.

A. MECHANIZED EQUIPMENT AND VEHICLES WILL BE SELECTED, OPERATED, AND MAINTAINED IN A MANNER THAT MINIMIZES ADVERSE EFFECTS ON THE ENVIRONMENT (E.G., MINIMALLY-SIZED, LOW PRESSURE TIRES; MINIMAL HARD-TURN PATHS FOR TRACKED VEHICLES; TEMPORARY MATS OR PLATES WITHIN WET AREAS OR ON SENSITIVE SOILS).

B. EQUIPMENT WILL BE STORED, FUELED, AND MAINTAINED IN AN CLEARLY IDENTIFIED STAGING AREA THAT MEETS STAGING AREA CONSERVATION MEASURES.

C. EQUIPMENT WILL BE REFUELED IN A VEHICLE STAGING AREA OR IN AN ISOLATED HARD ZONE, SUCH AS A PAVED PARKING LOT OR ADJACENT, ESTABLISHED ROAD (THIS MEASURE APPLIES ONLY TO GAS-POWERED EQUIPMENT WITH TANKS LARGER THAN 5 GALLONS).

D. BIODEGRADABLE LUBRICANTS AND FLUIDS WILL BE USED ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER.

E. EQUIPMENT WILL BE INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND.

F. EQUIPMENT WILL BE THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

9. EROSION CONTROL.

A. TEMPORARY EROSION CONTROL MEASURES INCLUDE:

1. TEMPORARY EROSION CONTROLS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE;
2. IF THERE IS A POTENTIAL FOR ERODED SEDIMENT TO ENTER THE STREAM, SEDIMENT BARRIERS WILL BE INSTALLED AND MAINTAINED FOR THE DURATION OF PROJECT IMPLEMENTATION;
3. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE SEDGE MATS, FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC;
4. SOIL STABILIZATION UTILIZING WOOD FIBER MULCH AND TACKIFIER (HYDRO-APPLIED) MAY BE USED TO REDUCE EROSION OF BARE SOIL IF THE MATERIALS ARE NOXIOUS WEED FREE AND NONTOXIC TO AQUATIC AND TERRESTRIAL ANIMALS, SOIL MICROORGANISMS, AND VEGETATION;
5. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL; AND
6. ONCE THE SITE IS STABILIZED AFTER CONSTRUCTION, TEMPORARY EROSION CONTROL MEASURES WILL BE REMOVED.

B. EMERGENCY EROSION CONTROLS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:

1. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND
2. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10. DUST ABATEMENT.

A. THE PROJECT SPONSOR WILL DETERMINE THE APPROPRIATE DUST CONTROL MEASURES BY CONSIDERING SOIL TYPE, EQUIPMENT USAGE, PREVAILING WIND DIRECTION, AND THE EFFECTS CAUSED BY OTHER EROSION AND SEDIMENT CONTROL MEASURES.

B. WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.

C. DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS (TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET OF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING MIXED 50:50 WITH WATER.

D. APPLICATION OF DUST ABATEMENT CHEMICALS WILL BE AVOIDED DURING OR JUST BEFORE WET WEATHER, AND AT STREAM CROSSINGS OR OTHER AREAS THAT COULD RESULT IN UNFILTERED DELIVERY OF THE DUST ABATEMENT MATERIALS TO A WATERBODY (TYPICALLY THESE WOULD BE AREAS WITHIN 25 FEET OF A WATERBODY OR STREAM CHANNEL; DISTANCES MAY BE GREATER WHERE VEGETATION IS SPARSE OR SLOPES ARE STEEP).

E. SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION OF DUST ABATEMENT CHEMICALS.

F. PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

REVISIONS			
DESCRIPTION	BY	DATE	

BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
HIP CONSERVATION MEASURES

Encompass
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SCALE	AS SHOWN
DESIGNED	PT
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LAWRENCE DITCH FISH SCREEN PROJECT

PROJECT DESIGN AND SITE PREPARATION (CONTINUED).

11. SPILL PREVENTION, CONTROL, AND COUNTER MEASURES.

A. A DESCRIPTION OF HAZARDOUS MATERIALS THAT WILL BE USED, INCLUDING INVENTORY, STORAGE, AND HANDLING PROCEDURES WILL BE AVAILABLE ON-SITE.

B. WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.

C. SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIALS USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.

D. WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.

E. ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.

F. PUMPS USED ADJACENT TO WATER SHALL USE SPILL CONTAINMENT SYSTEMS.

12. INVASIVE SPECIES CONTROL.

A. PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.

B. WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES.

C. WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES UNLESS DECONTAMINATION PROCEDURES HAVE BEEN APPROVED BY THE EC LEAD.

WORK AREA ISOLATION AND FISH SALVAGE.

1. WORK AREA ISOLATION.

A. ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT, OR IF THE WORK AREA IS LESS THAN 300-FEET UPSTREAM FROM KNOWN SPAWNING HABITATS.

B. WORK AREA ISOLATION AND FISH SALVAGE ACTIVITIES WILL COMPLY WITH THE IN-WATER WORK WINDOW.

C. DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS AND AREAS (COFFER DAMS, PUMPS, DISCHARGE AREAS, FISH SCREENS, FISH RELEASE AREAS, ETC.).

D. WORK AREA ISOLATION AND FISH CAPTURE ACTIVITIES WILL OCCUR DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE, NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS AND DEATH OF SPECIES PRESENT.

2. FISH SALVAGE.

A. MONITORING AND RECORDING WILL TAKE PLACE FOR DURATION OF SALVAGE. THE SALVAGE REPORT WILL BE COMMUNICATED TO AGENCIES VIA THE PROJECT COMPLETION FORM (PCF).

B. SALVAGE ACTIVITIES SHOULD TAKE PLACE DURING CONDITIONS TO MINIMIZE STRESS TO FISH SPECIES, TYPICALLY PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES WHICH OCCUR IN THE MORNING VERSUS LATE IN THE DAY.

C. SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODS, AND CONSERVATION MEASURES SPECIFIED BELOW:

1. SLOWLY REDUCE WATER FROM THE WORK AREA TO ALLOW SOME FISH TO LEAVE VOLITIONALLY.
2. BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.
3. BLOCK NETS WILL BE SECURED TO THE STREAM CHANNEL BED AND BANKS UNTIL FISH CAPTURE AND TRANSPORT ACTIVITIES ARE COMPLETE. BLOCK NETS MAY BE LEFT IN PLACE FOR THE DURATION OF THE PROJECT TO EXCLUDE FISH AS LONG AS PASSAGE REQUIREMENTS ARE MET.
4. NETS WILL BE MONITORED HOURLY DURING IN-STREAM DISTURBANCE.
5. IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED AND FREE OF ORGANIC ACCUMULATION. IF BULL TROUT ARE PRESENT, NETS ARE TO BE CHECKED EVERY 4 HOURS FOR FISH IMPINGEMENT.
6. CAPTURE FISH THROUGH SEINING AND RELOCATE TO STREAMS.
7. WHILE DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
8. SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
9. MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
10. ELECTROFISH TO CAPTURE AND RELOCATED FISH NOT CAUGHT DURING SEINING PER ELECTROFISH CONSERVATION MEASURES.
11. CONTINUE TO SLOWLY DEWATER STREAM REACH.
12. COLLECT ANY REMAINING FISH IN COLD-WATER BUCKETS AND RELOCATED TO THE STREAM.
13. LIMIT THE TIME FISH ARE IN A TRANSPORT BUCKET.
14. MINIMIZE PREDATION BY TRANSPORTING COMPARABLE SIZES IN BUCKETS.
15. BUCKET WATER TO BE CHANGED EVERY 15 MINUTES OR AERATED.
16. BUCKETS WILL BE KEPT IN SHADED AREAS OR COVERED.
17. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.

D. SALVAGE GUIDELINES FOR BULL TROUT, LAMPREY, MUSSELS, AND NATIVE FISH.

1. CONDUCT SITE SURVEY TO ESTIMATE SALVAGE NUMBERS.
2. PRE-SELECT SITE(S) FOR RELEASE AND/OR MUSSEL BED RELOCATION.
3. SALVAGE OF BULL TROUT WILL NOT TAKE PLACE WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.
4. IF DRAWDOWN LESS THAN 48 HOURS, SALVAGE OF LAMPREY AND MUSSELS MAY NOT BE NECESSARY IF TEMPERATURES SUPPORT SURVIVAL IN SEDIMENTS.
5. SALVAGE MUSSELS BY HAND, LOCATING BY SNORKELING OR WADING.
6. SALVAGE LAMPREY BY ELECTROFISHING (SEE ELECTROFISHING FOR LARVAL LAMPREY SETTINGS AND LARVAL LAMPREY DRY SHOCKING SETTINGS).
7. SALVAGE BONY FISH AFTER LAMPREY WITH NETS OR ELECTROFISHING (SEE ELECTROFISHING FOR APPROPRIATE SETTINGS).
8. REGULARLY INSPECT DEWATERED SITE SINCE LAMPREY LIKELY TO EMERGE AFTER DEWATERING AND MUSSELS MAY BECOME VISIBLE.
9. MUSSELS MAY BE TRANSFERRED IN COOLERS.
10. MUSSELS WILL BE PLACED INDIVIDUALLY TO ENSURE ABILITY TO BURROW INTO NEW HABITAT.

3. ELECTROFISHING.

A. INITIAL SITE SURVEY AND INITIAL SETTINGS.

1. IDENTIFY SPAWNING ADULTS AND ACTIVE REDDS TO AVOID.
2. RECORD WATER TEMPERATURE. ELECTROFISHING WILL NOT OCCUR WHEN WATER TEMPERATURES ARE ABOVE 18 DEGREES CELSIUS.
3. IF POSSIBLE, A BLOCK NET WILL BE PLACED DOWNSTREAM AND CHECKED REGULARLY TO CAPTURE STUNNED FISH THAT DRIFT DOWNSTREAM.
4. INITIAL SETTINGS WILL BE 100 VOLTS, PULSE WIDTH OF 500 MICRO SECONDS, AND PULSE RATE OF 30 HERTZ.
5. RECORDS FOR CONDUCTIVITY, WATER TEMPERATURE, AIR TEMPERATURE, ELECTROFISHING SETTINGS, ELECTROFISHER MODEL, ELECTROFISHER CALIBRATION, FISH CONDITIONS, FISH MORTALITIES, AND TOTAL CAPTURE RATES WILL BE INCLUDED IN THE SALVAGE LOG BOOK.

B. ELECTROFISHING TECHNIQUE.

1. SAMPLING WILL BEGIN USING STRAIGHT DC. POWER WILL REMAIN ON UNTIL THE FISH IS NETTED WHEN USING STRAIGHT DC. GRADUALLY INCREASE VOLTAGE WHILE REMAINING BELOW MAXIMUM LEVELS.
2. MAXIMUM VOLTAGE WILL BE 1100 VOLTS WHEN CONDUCTIVITY IS <100 MILLISECONDS, 800 VOLTS WHEN CONDUCTIVITY IS BETWEEN 100 AND 300 MILLISECONDS, AND 400 VOLTS WHEN CONDUCTIVITY IS >300 MILLISECONDS.
3. IF FISH CAPTURE IS NOT SUCCESSFUL USING STRAIGHT DC, THE ELECTROFISHER WILL BE SET TO INITIAL VOLTAGE FOR PDC. VOLTAGE, PULSE WIDTH, AND PULSE FREQUENCY WILL BE GRADUALLY INCREASED WITHIN MAXIMUM VALUES UNTIL CAPTURE IS SUCCESSFUL.
4. MAXIMUM PULSE WIDTH IS 5 MILLISECONDS. MAXIMUM PULSE RATE IS 70 HERTZ
5. ELECTROFISHING WILL NOT OCCUR IN ONE AREA FOR AN EXTENDED PERIOD.
6. THE ANODE WILL NOT INTENTIONALLY COME INTO CONTACT WITH FISH. THE ZONE FOR POTENTIAL INJURY OF 0.5 M FROM THE ANODE WILL BE AVOIDED.
7. SETTINGS WILL BE LOWERED IN SHALLOWER WATER SINCE VOLTAGE GRADIENTS LIKELY TO INCREASE.
8. ELECTROFISHING WILL NOT OCCUR IN TURBID WATER WHERE VISIBILITY IS POOR (I.E. UNABLE TO SEE THE BED OF THE STREAM).
9. OPERATIONS WILL IMMEDIATELY STOP IF MORTALITY OR OBVIOUS FISH INJURY IS OBSERVED. ELECTROFISHING SETTINGS WILL BE REEVALUATED.

C. SAMPLE PROCESSING.

1. FISH SHALL BE SORTED BY SIZE TO AVOID PREDATION DURING CONTAINMENT.
2. SAMPLERS WILL REGULARLY CHECK CONDITIONS OF FISH HOLDING CONTAINERS, AIR PUMPS, WATER TRANSFERS, ETC.
3. FISH WILL BE OBSERVED FOR GENERAL CONDITIONS AND INJURIES
4. EACH FISH WILL BE COMPLETELY REVIVED BEFORE RELEASE. ESA-LISTED SPECIES WILL BE PRIORITIZED FOR SUCCESSFUL RELEASE.

D. BULL TROUT ELECTROFISHING.

1. ELECTROFISHING FOR BULL TROUT WILL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. IN FMO HABITATS ELECTROFISHING MAY OCCUR ANY TIME.
2. ELECTROFISHING OF BULL TROUT WILL NOT OCCUR WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.

E. LARVAL LAMPREY ELECTROFISHING.

1. PERMISSION FROM EC LEAD WILL BE OBTAINED IF LARVAL LAMPREY ELECTROFISHER IS NOT ONE OF FOLLOWING PRE-APPROVED MODELS: ABP-2 'WISCONSIN', SMITH-ROOT LR-24, OR SMITH-ROOT APEX BACKPACK.
2. LARVAL LAMPREY SAMPLING WILL INCORPORATE 2-STAGE METHOD: 'TICKLE' AND 'STUN'.
3. FIRST STAGE: USE 125 VOLT DC WITH A 25 PERCENT DUTY CYCLE APPLIED AT A SLOW RATE OF 3 PULSES PER SECOND. IF TEMPERATURES ARE BELOW 10 DEGREES CELSIUS, VOLTAGE MAY BE INCREASED GRADUALLY (NOT TO EXCEED 200 VOLTS). BURSTED PULSES (THREE SLOW AND ONE SKIPPED) RECOMMENDED TO INCREASE EMERGENCE.
4. SECOND STAGE (OPTIONAL FOR EXPERIENCED NETTERS): IMMEDIATELY AFTER LAMPREY EMERGE, USE A FAST PULSE SETTING OF 30 PULSES PER SECOND.
5. USE DIP NETS FOR VISIBLE LAMPREY. SIENES AND FINE MESH NET SWEEPS MAY BE USED IN POOR VISIBILITY.
6. SAMPLING WILL OCCUR SLOWLY (>60 SECONDS PER METER) STARTING AT UPSTREAM AND WORKING DOWNSTREAM.
7. MULTIPLE SWEEPS TO OCCUR WITH 15 MINUTES BETWEEN SWEEPS.
8. POST-DRAWDOWN 'DRY-SHOCKING' WILL BE APPLIED IF LARVAL LAMPREY CONTINUE TO EMERGE. ANODES TO BE PLACED ONE METER APART TO SAMPLE ONE SQUARE METER AT A TIME FOR AT LEAST 60 SECONDS. FOR TEMPERATURES LESS THAN 10 DEGREES CELSIUS, MAXIMUM VOLTAGE MAY BE GRADUALLY INCREASED TO 400 VOLTS (DRY-SHOCKING ONLY).

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL — STATE OF WASHINGTON — 21019228 — REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
HIP CONSERVATION MEASURES

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WORK AREA ISOLATION AND FISH SALVAGE (CONTINUED).

4. DEWATERING.

A. DEWATERING WILL OCCUR AT A RATE SLOW ENOUGH TO ALLOW SPECIES TO NATURALLY MIGRATE OUT OF THE WORK AREA.

B. WHERE A GRAVITY FEED DIVERSION IS NOT POSSIBLE, A PUMP MAY BE USED. PUMPS WILL BE INSTALLED TO AVOID REPETIVE DEWATERING AND REWATERING.

C. WHEN FISH ARE PRESENT, PUMPS WILL BE SCREENED IN ACCORDANCE WITH NMFS FISH SCREEN CRITERIA. NMFS ENGINEERING REVIEW AND APPROVAL WILL BE OBTAINED FOR PUMPS EXCEEDING 3 CUBIC FEET PER SECOND.

D. DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO THE STREAM CHANNEL AND RIPARIAN VEGETATION.

E. SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE OF INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL AND VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

CONSTRUCTION AND POST CONSTRUCTION CONSERVATION MEASURES.

1. FISH PASSAGE.

A. FISH PASSAGE WILL BE PROVIDED FOR ADULT AND JUVENILE FISH LIKELY TO BE PRESENT DURING CONSTRUCTION UNLESS PASSAGE DID NOT EXIST BEFORE CONSTRUCTION, THE STREAM IS NATURALLY IMPASSABLE, OR PASSAGE WILL NEGATIVELY IMPACT ESA-LISTED SPECIES OR THEIR HABITAT.

B. FISH PASSAGE ALTERNATIVES WILL BE APPROVED BY THE BPA EC LEAD UNDER ADVISEMENT BY THE NMFS HABITAT BIOLOGIST.

2. CONSTRUCTION AND DISCHARGE WATER.

A. SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.

B. DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.

C. CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS, AND OTHER POLLUTANTS.

3. TIME AND EXTENT OF DISTURBANCE.

A. EARTHWORK REQUIRING IN-STREAM MECHANIZED EQUIPMENT (INCLUDING DRILLING, EXCAVATION, DREDGING, FILLING, AND COMPACTING) WILL BE COMPLETED AS QUICKLY AS POSSIBLE.

B. MECHANIZED EQUIPMENT WILL WORK FROM TOP OF BANK UNLESS WORK FROM ANOTHER LOCATION WILL RESULT IN LESS HABITAT DISTURBANCE (TURBIDITY, VEGETATION DISTURBANCE, ETC.).

4. CESSATION OF WORK.

A. PROJECT OPERATIONS WILL CEASE WHEN HIGH FLOW CONDITIONS MAY RESULT IN INUNDATION OF THE PROJECT AREA (FLOOD EFFORTS TO DECREASE DAMAGES TO NATURAL RESOURCES PERMITTED).

B. WATER QUALITY LEVELS EXCEEDED. SEE CWA SECTION 401 WATER QUALITY CERTIFICATION AND TURBIDITY MEASURES.

5. SITE RESTORATION.

A. DISTURBED AREAS, STREAM BANKS, SOILS, AND VEGETATION WILL BE CLEANED UP AND RESTORED TO IMPROVED OR PRE-PROJECT CONDITIONS.

B. PROJECT-RELATED WASTE WILL BE REMOVED.

C. TEMPORARY ACCESS ROADS AND STAGING WILL BE DECOMPACTED AND RESTORED. SOILS WILL BE LOOSENED IF NEEDED FOR REVEGETATION OR WATER INFILTRATION.

D. THE PROJECT SPONSOR WILL RETAIN THE RIGHT OF REASONABLE ACCESS TO THE SITE TO MONITOR AND MAINTAIN THE SITE OVER THE LIFE OF THE PROJECT.

6. REVEGETATION.

A. PLANTING AND SEEDING WILL OCCUR PRIOR TO OR AT THE BEGINNING OF THE FIRST GROWING SEASON AFTER CONSTRUCTION.

B. A MIX OF NATIVE SPECIES (INVASIVE SPECIES NOT ALLOWED) APPROPRIATE TO THE SITE WILL BE USED TO REESTABLISH VEGETATION, PROVIDE SHADE, AND REDUCE EROSION. REESTABLISHED VEGETATION SHOULD BE AT LEAST 70% OF PRE-PROJECT CONDITIONS WITHIN THREE YEARS.

C. VEGETATION SUCH AS WILLOWS, SEDGES, OR RUSH MATS WILL BE SALVAGED FROM DISTURBED OR ABANDONED AREAS TO BE REPLANTED.

D. SHORT-TERM STABILIZATION MEASURE MAY INCLUDE THE USE OF NON-NATIVE STERILE SEED MIX (WHEN NATIVE NOT AVAILABLE), WEED-FREE CERTIFIED STRAW, OR OTHER SIMILAR TECHNIQUES.

E. SURFACE FERTILIZER WILL NOT BE APPLIED WITHIN 50 FEET OF ANY STREAM, WATE BODY, OR WETLAND.

F. FENCING WILL BE INSTALLED AS NECESSARY TO PREVENT ACCESS TO REVEGETATED SITES BY LIVESTOCK OR UNAUTHORIZED PERSONS.

G. INVASIVE PLANTS WILL BE REMOVED OR CONTROLLED UNTIL NATIVE PLANT SPECIES ARE WELL ESTABLISHED (TYPICALLY THREE YEARS POST-CONSTRUCTION).

7. SITE ACCESS AND IMPLEMENTATION MONITORING.

A. THE PROJECT SPONSOR WILL PROVIDE CONSTRUCTION MONITORING DURING IMPLEMENTATION TO ENSURE ALL CONSERVATION MEASURES ARE ADEQUATELY FOLLOWED, EFFECTS TO LISTED SPECIES ARE NOT GREATER THAN PREDICTED, AND INCIDENTAL TAKE LIMITATIONS ARE NOT EXCEEDED.

B. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL SUBMIT THE PROJECT COMPLETION FORM (PCF) WITHIN 30 DAYS OF PROJECT COMPLETION.

8. CWA SECTION 401 WATER QUALITY CERTIFICATION.

A. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL COMPLETE AND RECORD WATER QUALITY OBSERVATIONS (SEE TURBIDITY MONITORING) TO ENSURE IN-WATER WORK IS NOT DEGRADING WATER QUALITY.

B. DURING CONSTRUCTION, WATER QUALITY PROVISIONS PROVIDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WASHINGTON DEPARTMENT OF ECOLOGY, IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY WILL BE FOLLOWED.

STAGED REWATERING PLAN.

A. WHEN REINTRODUCING WATER TO DEWATERED AREAS AND NEWLY CONSTRUCTED CHANNELS, A STAGED REWATERING PLAN WILL BE APPLIED.

B. THE FOLLLOWING WILL BE APPLIED TO ALL REWATERING EFFORTS. COMPLEX REWATERING EFFORTS MAY REQUIRE ADDITIONAL NOTES OR A DEDICATED SHEET IN THE CONSTRUCTION DETAILS.

1. TURBIDITY MONITORING PROTOCOL WILL BE APPLIED TO REWATERING EFFORTS.
2. PRE-WASH THE AREA BEFORE REWATERING. TURBID WASH WATER WILL BE DETAINED AND PUMPED TO THE FLOODPLAIN OR SEDIMENT CAPTURE AREAS RATHER THAN DISCHARGING TO FISH-BEARING STREAMS.
3. INSTALL SEINE NETS AT UPSTREAM END TO PREVENT FISH FROM MOVING DOWNSTREAM UNTIL 2/3 OF TOTAL FLOW IS RESTORED TO THE CHANNEL.
4. STARTING IN EARLY MORNING INTRODUCE 1/3 OF NEW CHANNEL FLOW OVER PERIOD OF 1-2 HOURS.
5. INTRODUCE SECOND THIRD OF FLOW OVER NEXT 1 TO 2 HOURS AND BEGIN FISH SALVAGE OF BYPASS CHANNEL IF FISH ARE PRESENT.
6. REMOVE UPSTREAM SEINE NETS ONCE 2/3 FLOW IN REWATERED CHANNEL AND DOWNSTREAM TURBIDITY IS WITHIN ACCEPTABLE RANGE (LESS THAN 40 NTU OR LESS THAN 10% BACKGROUND).
7. INTRODUCE FINAL THIRD OF FLOW ONCE FISH SALVAGE EFFORTS ARE COMPLETE AND DOWNSTREAM TURBIDITY VERIFIED TO BE WITHIN ACCEPTABLE RANGE.
8. INSTALL PLUG TO BLOCK FLOW INTO OLD CHANNEL OR BYPASS. REMOVE ANY REMAINING SEINE NETS.
9. IN LAMPREY SYSTEMS, LAMPREY SALVAGE AND DRY SHOCKING MAY BE NECESSARY.

TURBIDITY MONITORING.

A. RECORD THE READING, LOCATION, AND TIME FOR THE BACKGROUND READING APPROXIMATELY 100 FEET UPSTREAM OF THE PROJECT AREA USING A RECENTLY CALIBRATED TURBIDIMETER OR VIA VISUAL OBSERVATION (SEE THE HIP HANDBOOK TURBIDITY MONITORING SECTION FOR A VISUAL OBSERVATION KEY).

B. RECORD THE TURBIDITY READING, LOCATION, AND TIME AT THE MEASUREMENT COMPLIANCE LOCATION POINT.

1. 50 FEET DOWNSTREAM FOR STREAMS LESS THAN 30 FEET WIDE.
2. 100 FEET DOWNSTREAM FOR STREAMS BETWEEN 30 AND 100 FEET WIDE.
3. 200 FEET DOWNSTREAM FOR STREAMS GREATER THAN 100 FEET WIDE.
4. 300 FEET FROM THE DISCHARGE POINT OR NONPOINT SOURCE FOR LOCATIONS SUBJECT TO TIDAL OR COASTAL SCOUR.

C. TURBIDITY SHALL BE MEASURED (BACKGROUND LOCATION AND COMPLIANCE POINTS) EVERY 4 HOURS WHILE WORK IS BEING IMPLEMENTED.

D. IF THERE IS A VISIBLE DIFFERENCE BETWEEN A COMPLIANCE POINT AND THE BACKGROUND, THE EXCEEDANCE WILL BE NOTED IN THE PROJECT COMPLETION FORM (PCF). ADJUSTMENTS OR CORRECTIVE MEASURES WILL BE TAKEN IN ORDER TO REDUCE TURBIDITY.

E. IF EXCEEDANCES OCCUR FOR MORE THAN TWO CONSECUTIVE MONITORING INTERVALS (AFTER 8 HOURS), THE ACTIVITY WILL STOP UNTIL THE TURBIDITY LEVEL RETURNS TO BACKGROUND. THE BPA EC LEAD WILL BE NOTIFIED OF ALL EXCEEDANCES AND CORRECTIVE ACTIONS AT PROJECT COMPLETION.

F. IF TURBIDITY CONTROLS (COFFER DAMS, WADDLES, FENCING, ETC.) ARE DETERMINED INEFFECTIVE, CREWS WILL BE MOBILIZED TO MODIFY AS NECESSARY. OCCURRENCES WILL BE DOCUMENTED IN THE PROJECT COMPLETION FORM (PCF).

G. FINAL TURBIDITY READINGS, EXCEEDANCES, AND CONTROL FAILURES WILL BE SUBMITTED TO THE BPA EC LEAD USING THE PROJECT COMPLETION FORM (PCF).

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED
PROFESSIONAL ENGINEER

9/6/24

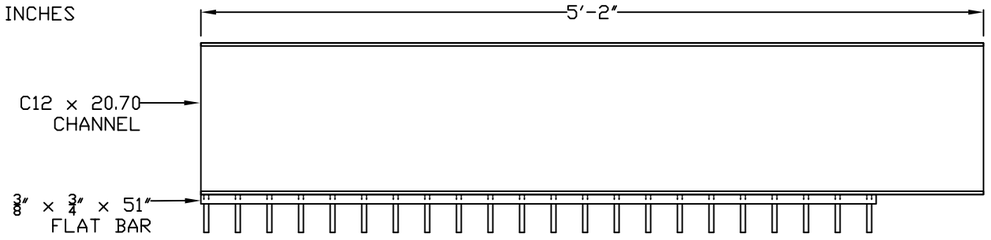
LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
HIP CONSERVATION MEASURES

Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Ellensburg, WA 98922 • Phone: (509) 674-7433

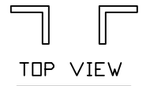
JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	C11

LAWRENCE DITCH FISH SCREEN PROJECT

0 6 12 24 INCHES
SCALE: 1" = 1'0"

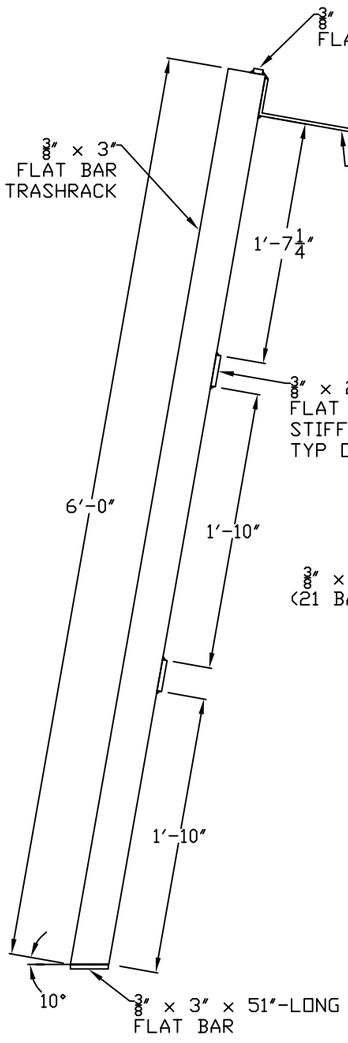


TOP VIEW

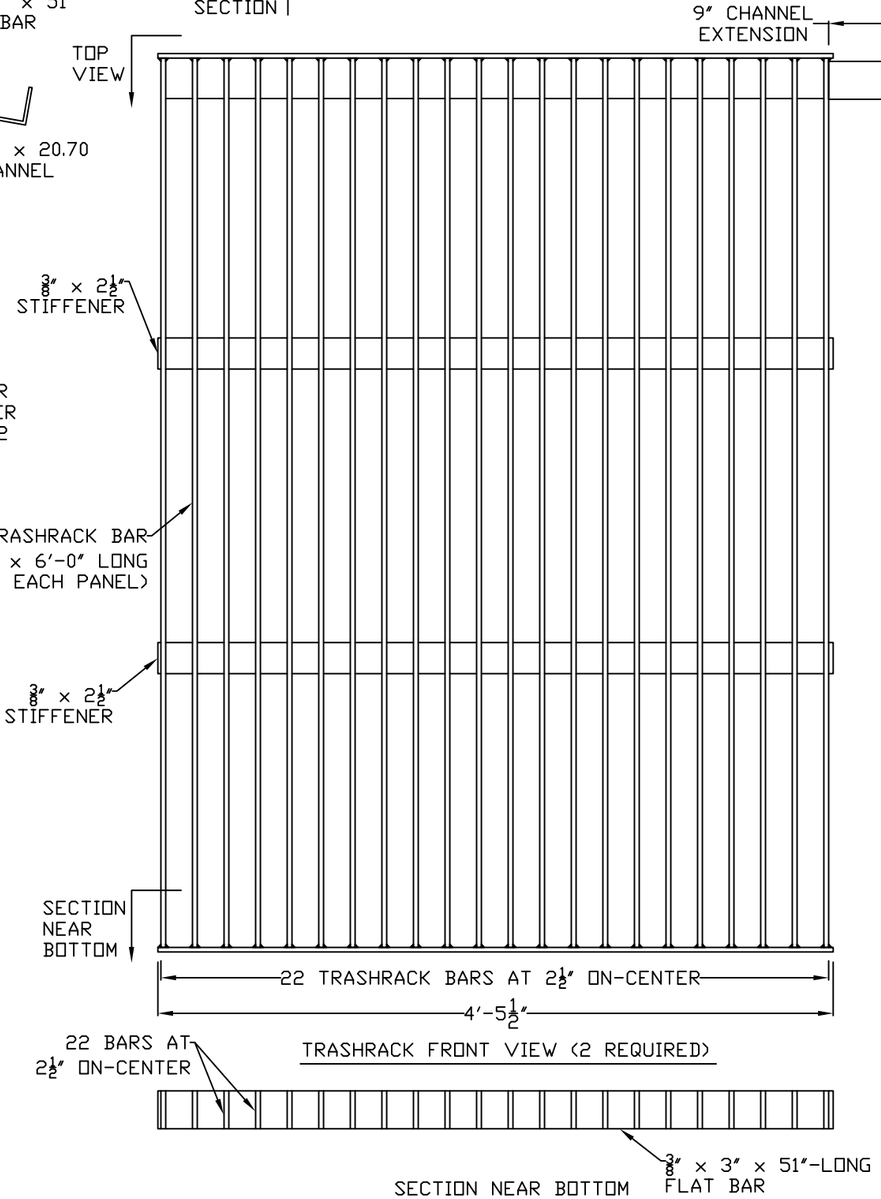


TOP VIEW

TYPICAL SECTION

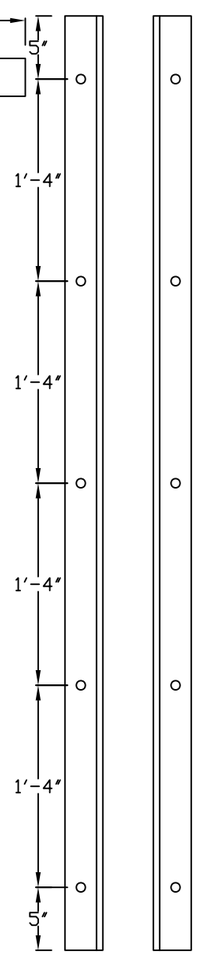


TYPICAL SECTION



TRASHRACK FRONT VIEW (2 REQUIRED)

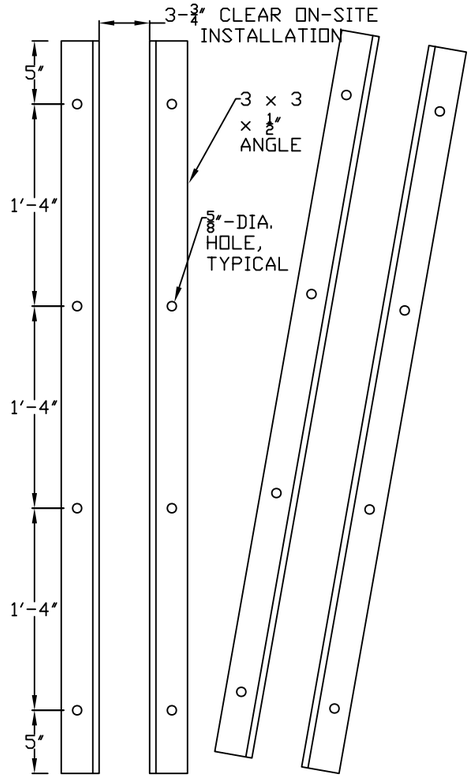
SECTION NEAR BOTTOM



DAMBOARD SLOT FRONT VIEW (4 PAIR REQUIRED) (INSTALL DAMBOARD SLOTS VERTICAL)

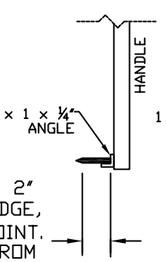
Trashrack & Damboard Notes

1. All metal for trashrack slots, damboard slots, & rake stainless steel alloy 304.
2. Assemble all pieces with 1/8" continuous fillet welds at each joint between pieces.
3. Two trashrack assemblies required as shown, including rack and top channel.
4. Eight stainless steel angles required for trashrack slots, see details this sheet. Stainless steel anchor bolts to be 1/2"-diameter x 5"-long (32 required).
5. Eight stainless steel angles required for damboard slots, see details this sheet. Stainless steel anchor bolts to be 1/2"-diameter x 5"-long (40 required).



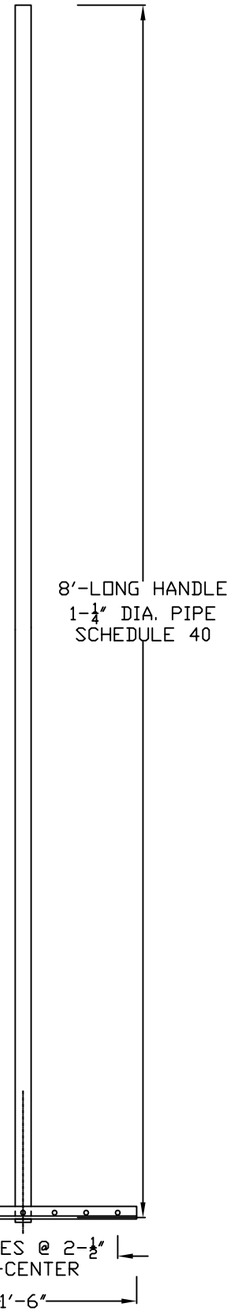
TRASHRACK SLOT FRONT VIEW (4 PAIR REQUIRED)

TRASHRACK SLOT INSTALLED AT 10° (REFERENCE)



TINES EXTEND 2" PAST ANGLE EDGE, w/ 1/2"-LONG POINT. TINES MADE FROM 3/8" DIA. STAINLESS STEEL ROUND STOCK.

CONTRACTOR TO SUPPLY 20 DAMBOARDS, EACH 4x8 LUMBER CUT TO 4'-7" LONG



STAINLESS STEEL RAKE (ONE REQ'D)

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL — STATE OF WASHINGTON — 21019228 — REGISTERED PROFESSIONAL ENGINEER

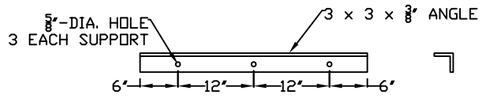
9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
TRASHRACK & RAKE DETAILS

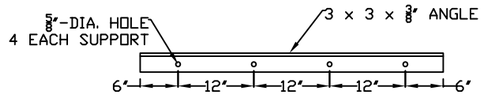
Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street., Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	F1

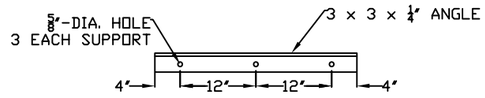
LAWRENCE DITCH FISH SCREEN PROJECT



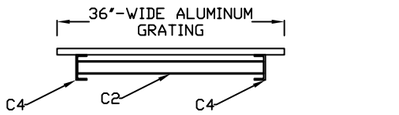
ALUMINUM ANGLE TO HOLD WALKWAY SUPPORT AT 90° ANGLE (10 REQ'D). ATTACH TO CONCRETE WALLS w/ ½"-DIA. x 5"-LONG STAINLESS STEEL ANCHOR BOLTS (30 REQ'D)



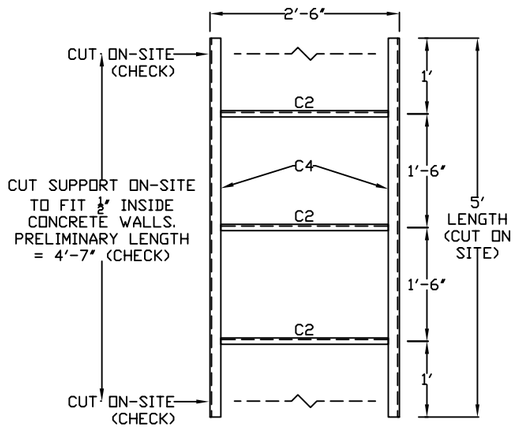
ALUMINUM ANGLE TO HOLD WALKWAY SUPPORTS AT 45° ANGLE (4 REQ'D). ATTACH TO CONCRETE WALLS w/ ½"-DIA. x 5"-LONG STAINLESS STEEL ANCHOR BOLTS (16 REQ'D)



ALUMINUM ANGLE TO SUPPORT BEARING BARS CUT AT 45° ANGLE (4 REQ'D). ATTACH TO CONCRETE WALLS w/ ½"-DIA. x 5"-LONG STAINLESS STEEL ANCHOR BOLTS (12 REQ'D)



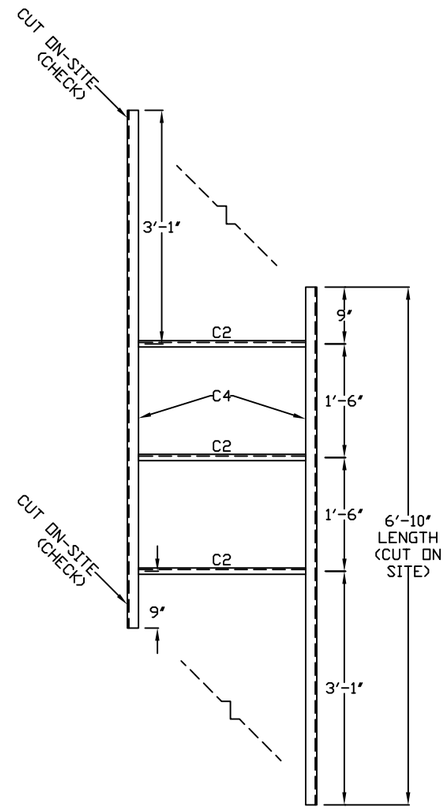
TYPICAL SECTION (SAME FOR ALL SUPPORTS)



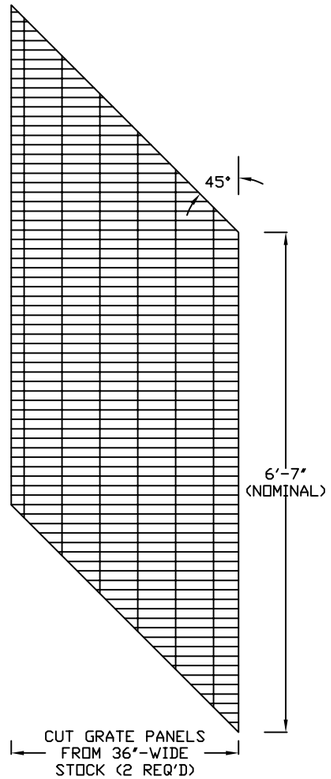
ALUMINUM CHANNEL SUPPORT FOR WALKWAYS AT 90° ANGLE (5 SUPPORTS REQUIRED)

C2 = 2"-WIDE CHANNEL x ⅛"-THICK WEB (NOMINAL)

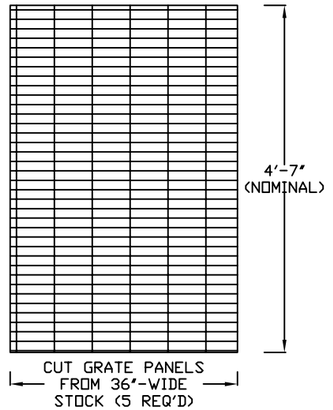
C4 = 4"-WIDE CHANNEL x ¼"-THICK WEB (NOMINAL)



ALUMINUM CHANNEL SUPPORT FOR WALKWAY AT 45° ANGLE (2 SUPPORTS REQUIRED)



CUT GRATE PANELS FROM 36"-WIDE STOCK (2 REQ'D)



CUT GRATE PANELS FROM 36"-WIDE STOCK (5 REQ'D)

Aluminum Walkway Notes

1. All metal for walkways aluminum alloy 6061 or 6063.
2. Connect all pieces of walkway support channels with continuous ¼"-thick fillet welds. Support channels will be cut and bolted on site to aluminum angles attached to concrete walls.
3. Top of all grating to be at same elevation as top of concrete walls.
4. Ends of walkway channel supports and tops of aluminum angles at concrete walls to be drilled on site for bolt connections. Attach channel supports to aluminum angles with two ⅜"-dia. x 1½"-long stainless steel bolts (24 bolts required, with nut and two washers each bolt).
5. Grating to be installed on aluminum frames to be 36"-wide serrated aluminum grating cut from stock lengths. Cut grating stock to fit with ½"-gap to each concrete wall. Bearing bars 1"-high x ⅛"-wide, with cross-bars at 4" on-center.
6. Stainless steel saddle clips to be supplied by grating company. Use 6 saddle clips each grating piece, with ¼"-dia. stainless steel bolts to attach grating to aluminum channel walkway supports. Drill channel on site for saddle clip attachments.

0 1 2 4 FEET

SCALE: 1/2" = 1'0"

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL — STATE OF WASHINGTON — 21019228 — REGISTERED PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT

YAKAMA NATION

WALKWAY DETAILS

Encompass ENGINEERING & SURVEYING
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Eastern Washington Division
110 South Oakes Ave. #250 • Ellensburg, WA 98926 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	F2

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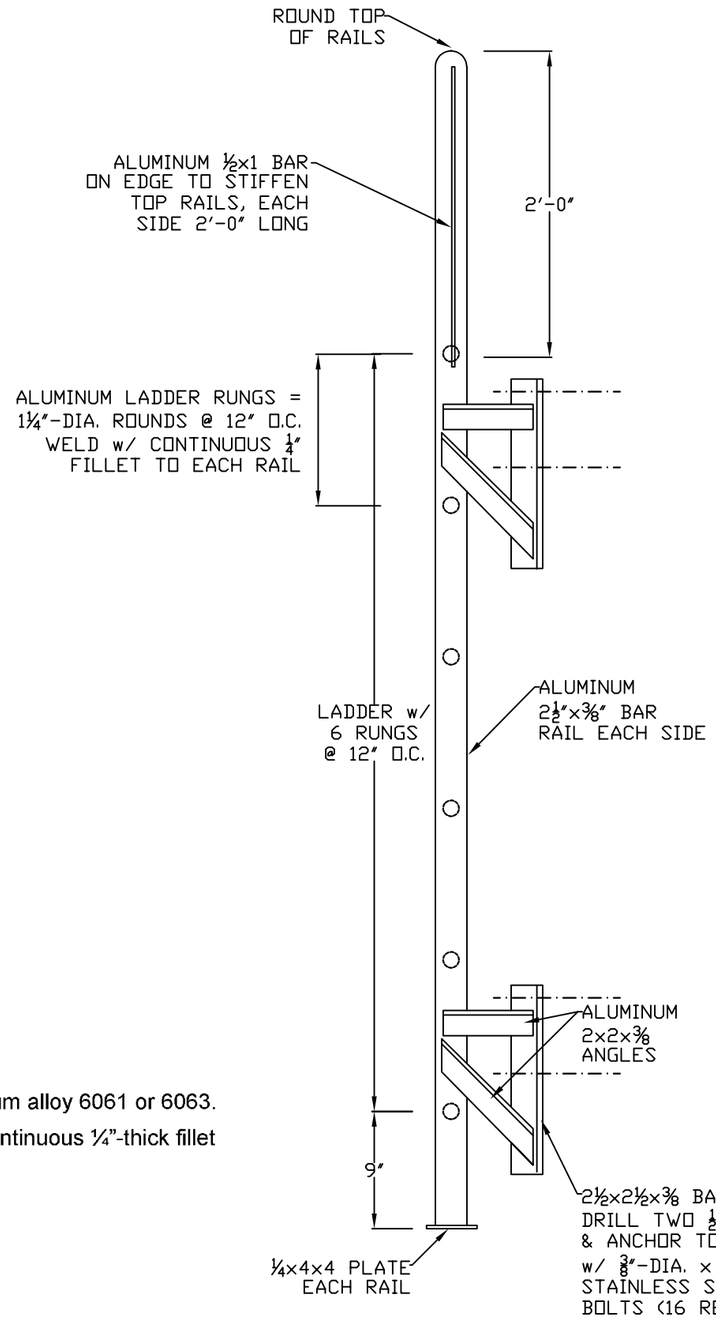
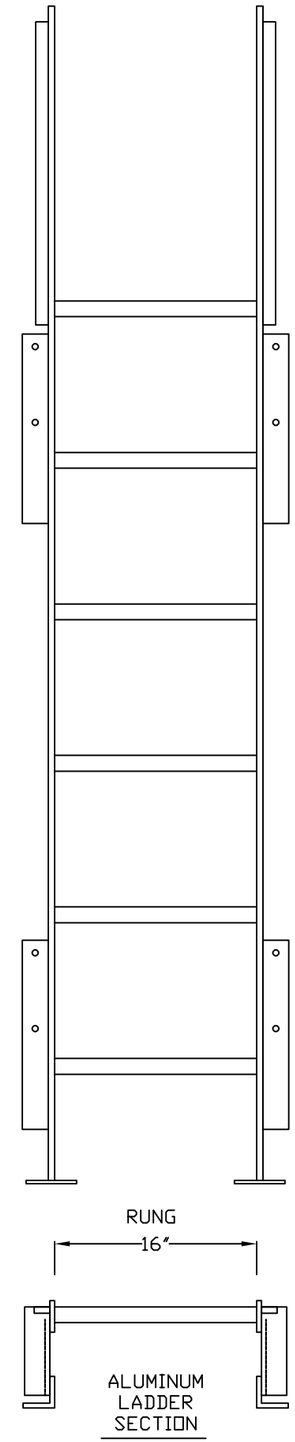
LAWRENCE DITCH FISH SCREEN PROJECT



ALUMINUM LADDER w/ 6 RUNGS (2 REQ'D)



ALUMINUM LADDER SECTION

Aluminum Ladder Notes

1. All metal for ladders shall be aluminum alloy 6061 or 6063.
2. Connect all pieces of ladders with continuous ¼"-thick fillet welds.

0 6 12 24 INCHES
SCALE: 1″ = 1′0″

REVISIONS

DESCRIPTION	BY	DATE

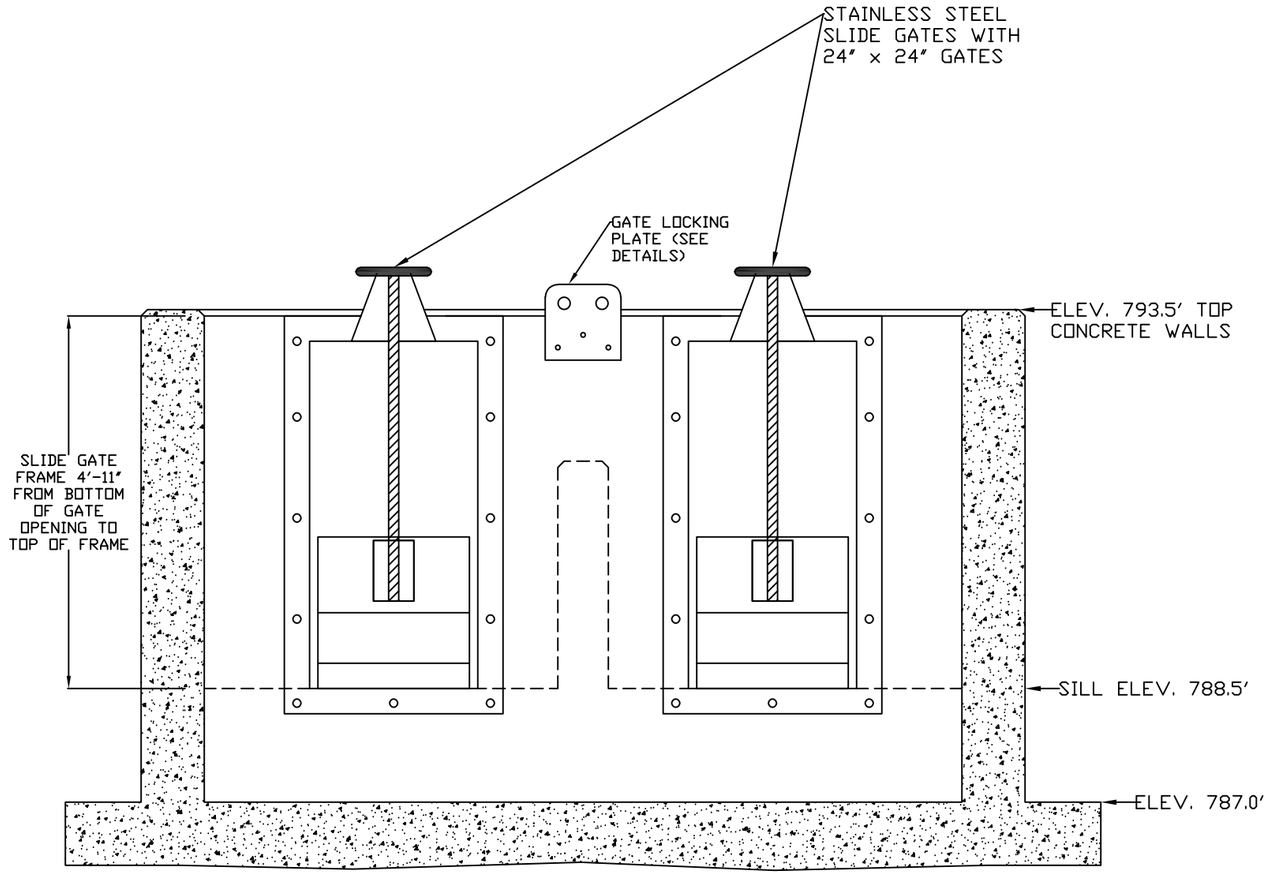
BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER

9/6/24

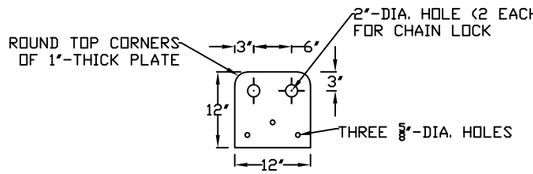
LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
ALUMINUM LADDER DETAILS

Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	F3



SECTION AT SLIDE GATES



GATE LOCKING PLATE

Gate Locking Plate

1. Build gate locking plate with 1"-thick stainless steel plate (alloy 316).
2. Install plate with bottom of 2"-diameter holes at same elevation as top of concrete wall. Attach to concrete with three ½"-dia. x 5"-long stainless steel anchor bolts. Spot weld nuts to bolts to prevent plate removal.
3. Tribe to install chains from 2"-dia. holes thru hand wheel operators with locks.

Slide Gate Requirements (shown schematically)

1. Slide gates (2 each) to be Waterman stainless steel gate No. SS-251-1-Y-24x24-10. See this drawing for overall gate dimensions.

   SS = stainless steel, alloy 316

   251 = standard (upward) opening

   1 = Series 1

   Y = self-contained gate

   24x24 = gate opening 24"x24"

   10 = 10' seating head (no unseating head)
2. UMHW guides for gate, seats and seals all around.
3. Manual wheel operator. Wheel operator to be just above top of concrete wall to minimize exposure to floating debris during floods.
4. Contractor to install each gate with $^{3}/_{8}$"-diameter x 5"-long stainless steel anchor bolts to concrete at each hole in gate flanges. Total 20 to 30 anchor bolts (approx.) required for installation of two gates. Seal between gate flanges and concrete walls with non-shrink grout (<$^{1}/_{2}$"-thick).

0 1 2 4 FEET
SCALE: 1/2" = 1'0"

REVISIONS

DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED
PROFESSIONAL ENGINEER

9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
SLIDE GATE DETAILS

Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	F4

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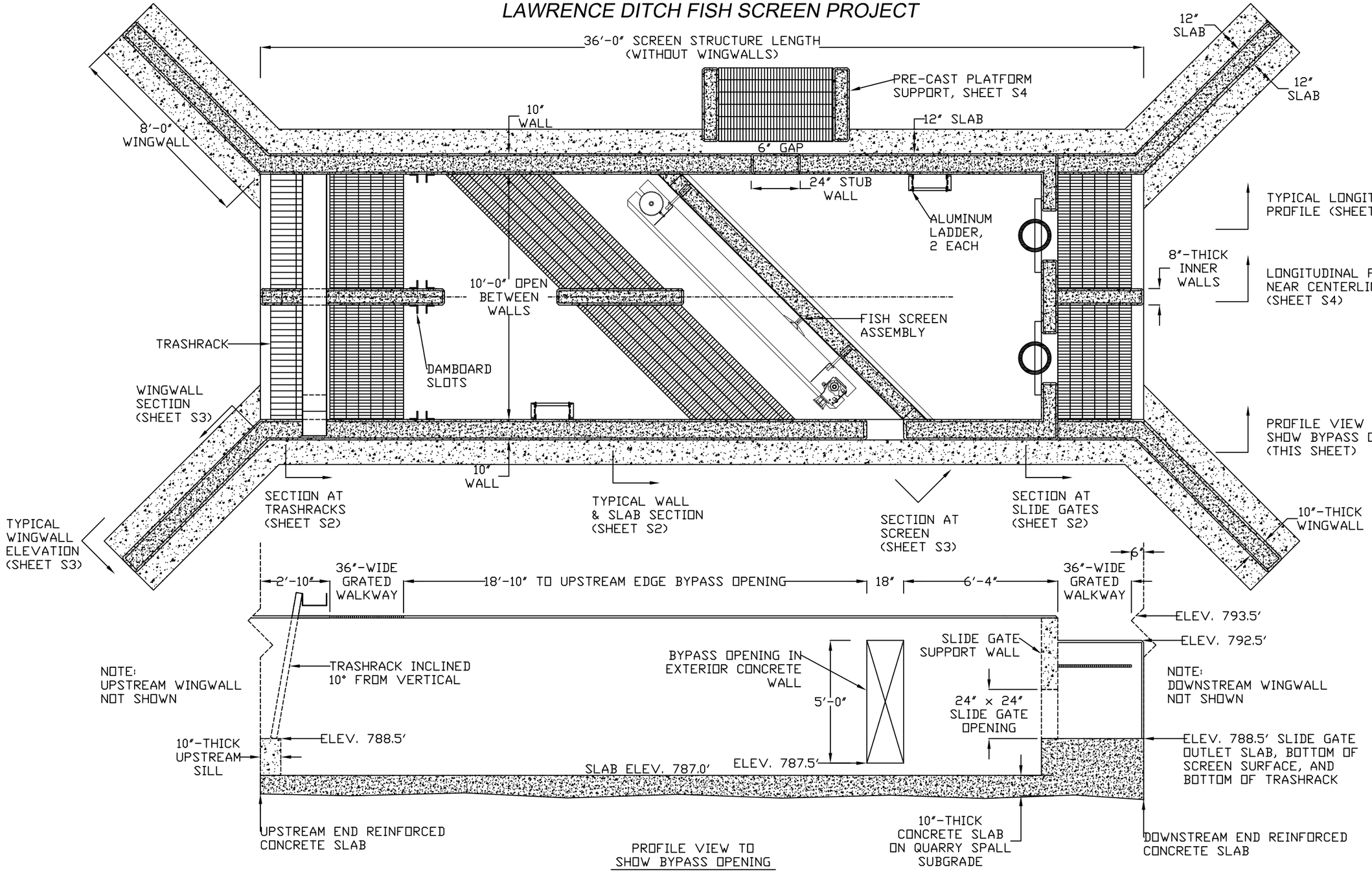
LAWRENCE DITCH FISH SCREEN PROJECT



REVISIONS		
DESCRIPTION	BY	DATE

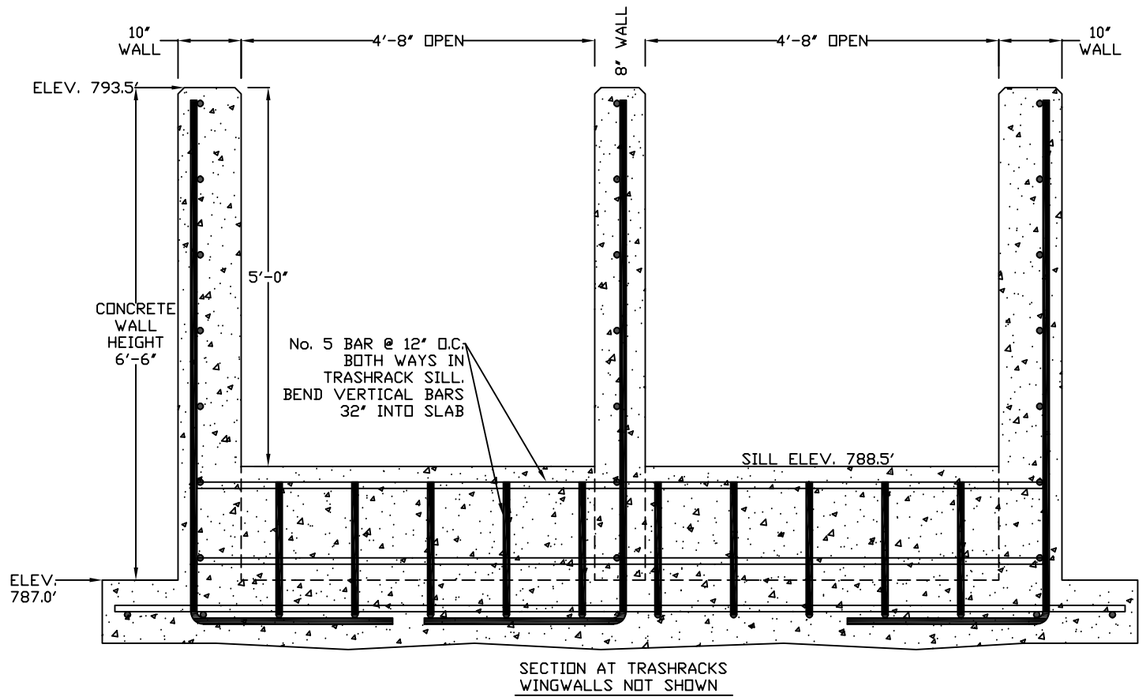
BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED
PROFESSIONAL ENGINEER
9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
CONCRETE STRUCTURE PLAN & SECTIONS

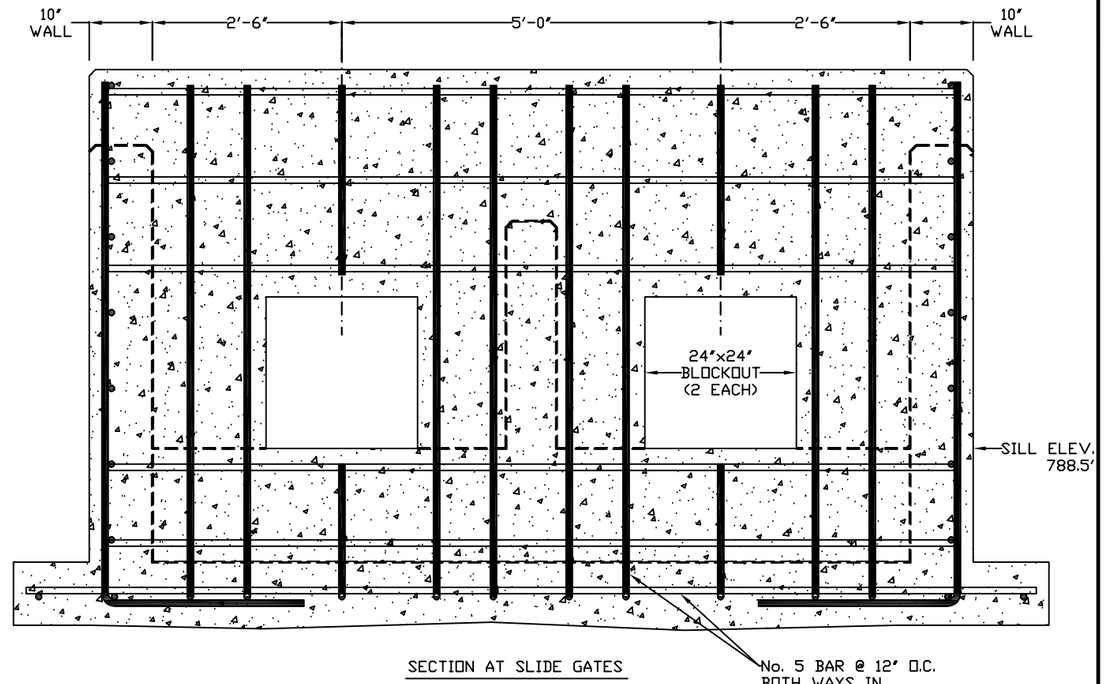
Encompass
ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	S1

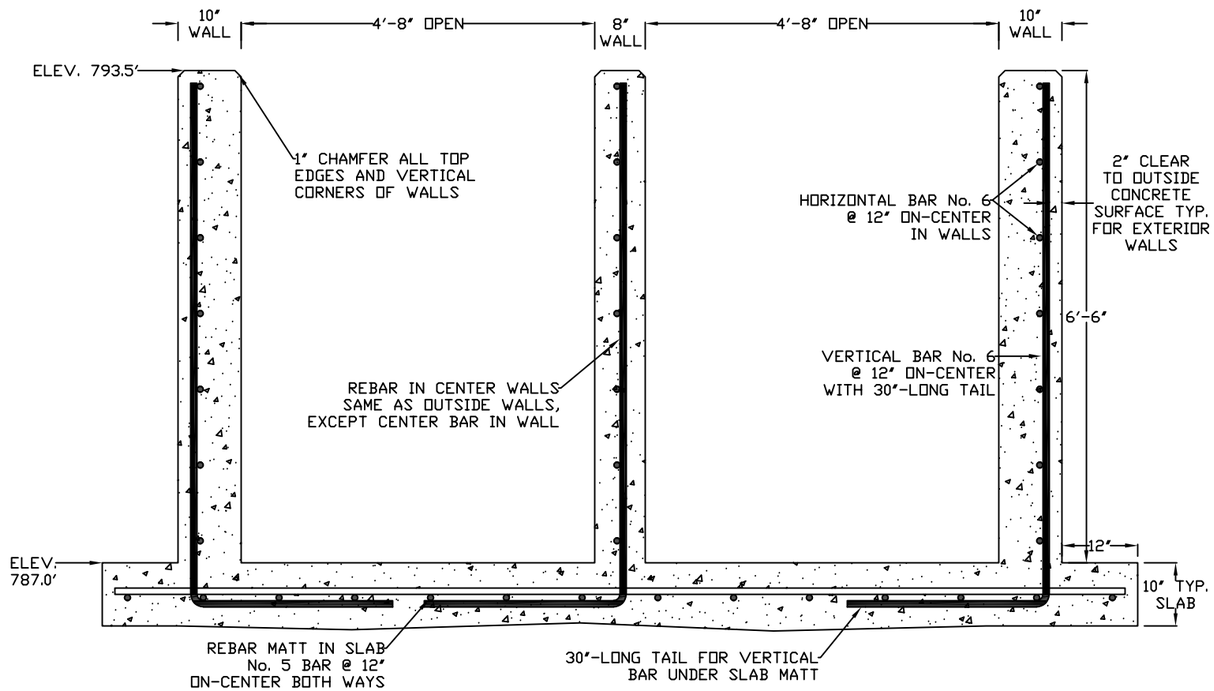
LAWRENCE DITCH FISH SCREEN PROJECT



SECTION AT TRASHRACKS
WINGWALLS NOT SHOWN



SECTION AT SLIDE GATES



TYPICAL WALL & SLAB SECTION FOR FISH SCREEN STRUCTURE

Reinforced Concrete Notes

1. All concrete to be cast-in-place Class 4000A WSDOT Spec. 6-02 with air entrainment.
2. All reinforcement to be Grade 60 deformed steel bars, WSDOT Spec. 9-07.
3. Concrete slabs may be poured monolithic, with tails for vertical bars (for walls) cast into slabs. Concrete walls to be poured in lengths not to exceed 20', with cold joints between connecting wall sections.
4. Lap splice length 36" for No. 6 bar and 32" for No. 5 bar.
5. Top of walls to have medium broom finish.

0 1 2 4 FEET
SCALE: 1/2" = 1'0"

REVISIONS		
DESCRIPTION	BY	DATE

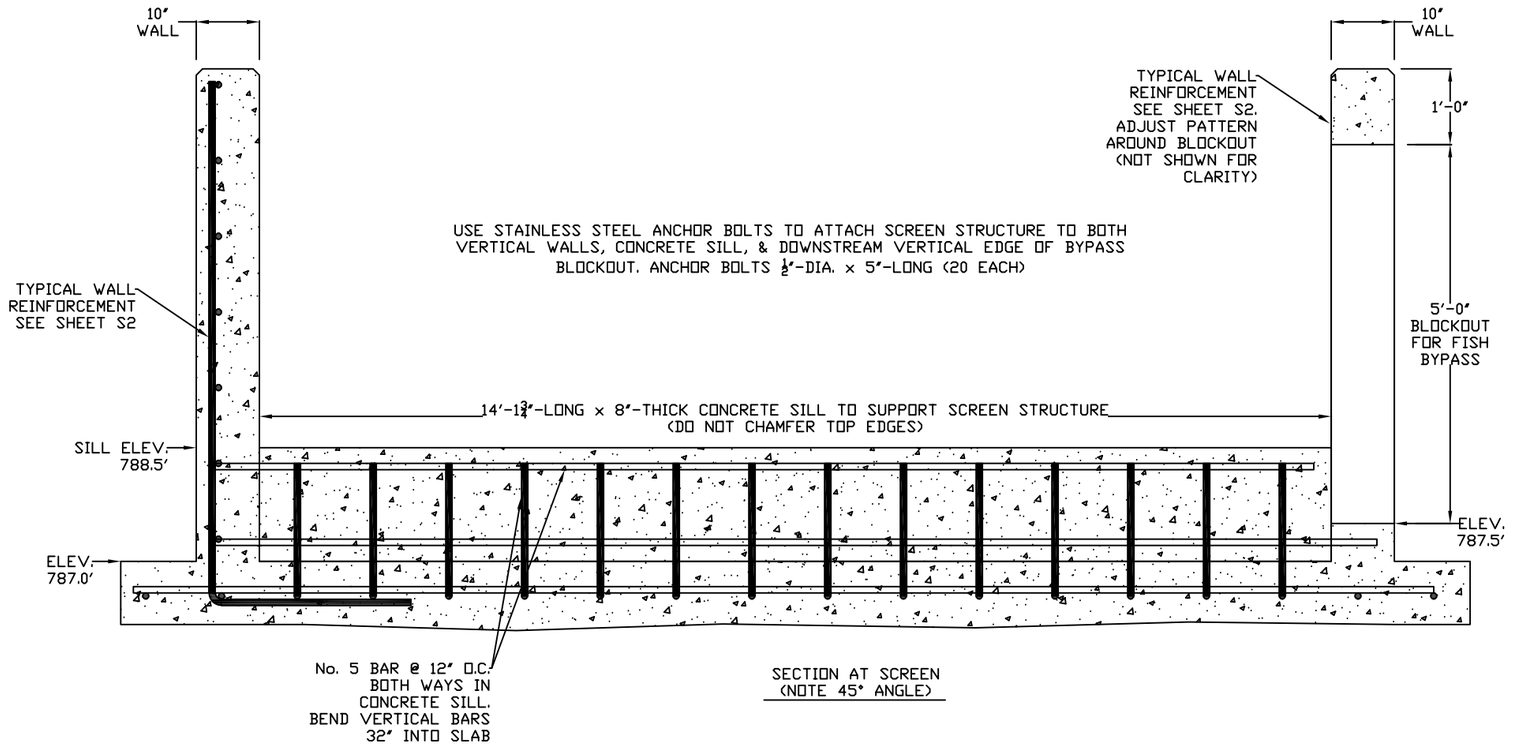
BRYAN DAVID TAPPEL
STATE OF WASHINGTON
21019228
REGISTERED PROFESSIONAL ENGINEER
9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
CONCRETE STRUCTURE SECTIONS & DETAILS

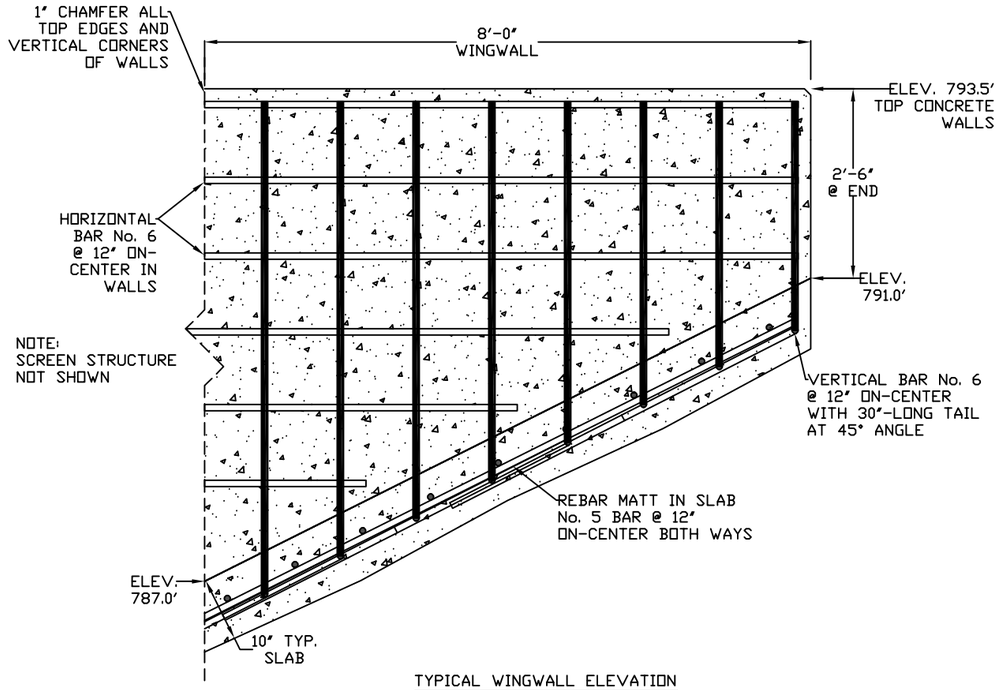
Encompass ENGINEERING & SURVEYING
Western Washington Division
165 NE Juniper Street, Suite 201 • Issaquah, WA 98027 • Phone: (425) 392-0250
Eastern Washington Division
110 South Oakes Ave. #250 • Cle Elum, WA 98922 • Phone: (509) 674-7433

JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	S2

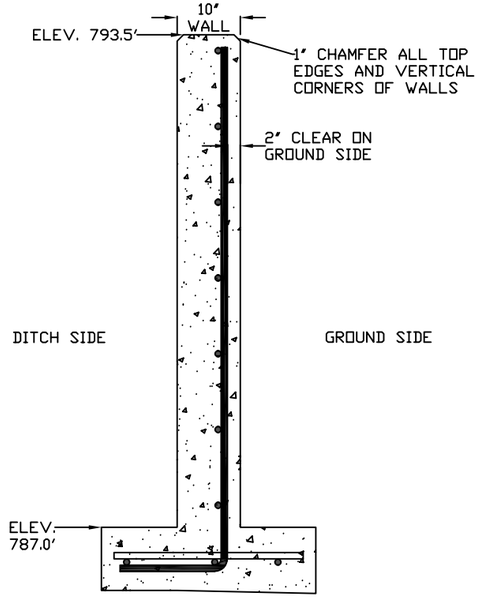
LAWRENCE DITCH FISH SCREEN PROJECT



SECTION AT SCREEN (NOTE 45° ANGLE)



TYPICAL WINGWALL ELEVATION



WINGWALL SECTION

0 1 2 4 FEET

SCALE: 1/2″ = 1′0″

REVISIONS		
DESCRIPTION	BY	DATE

BRYAN DAVID TAPPEL STATE OF WASHINGTON 21019228 REGISTERED PROFESSIONAL ENGINEER

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JOB NO.	24003
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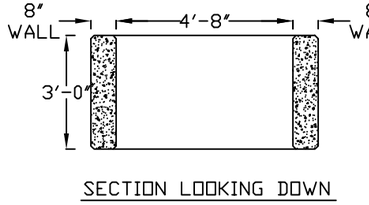
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	S3

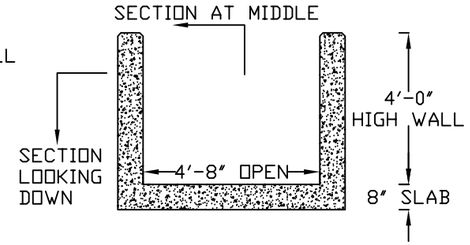
LAWRENCE DITCH FISH SCREEN PROJECT

0 1 2 3 4 8 FEET
SCALE: 1/4" = 1'0"

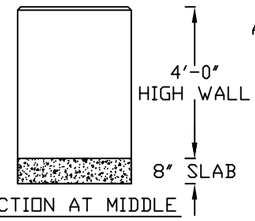
REBAR FOR PRE-CAST CONCRETE FOR PLATFORM TO BE No. 5 @ 12" O.C. BOTH WAYS. PLACE REBAR IN CENTER OF WALLS AND SLAB



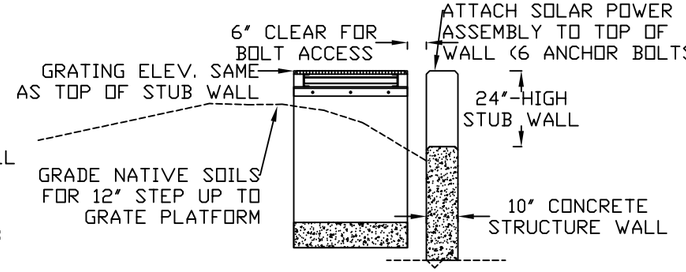
SECTION LOOKING DOWN



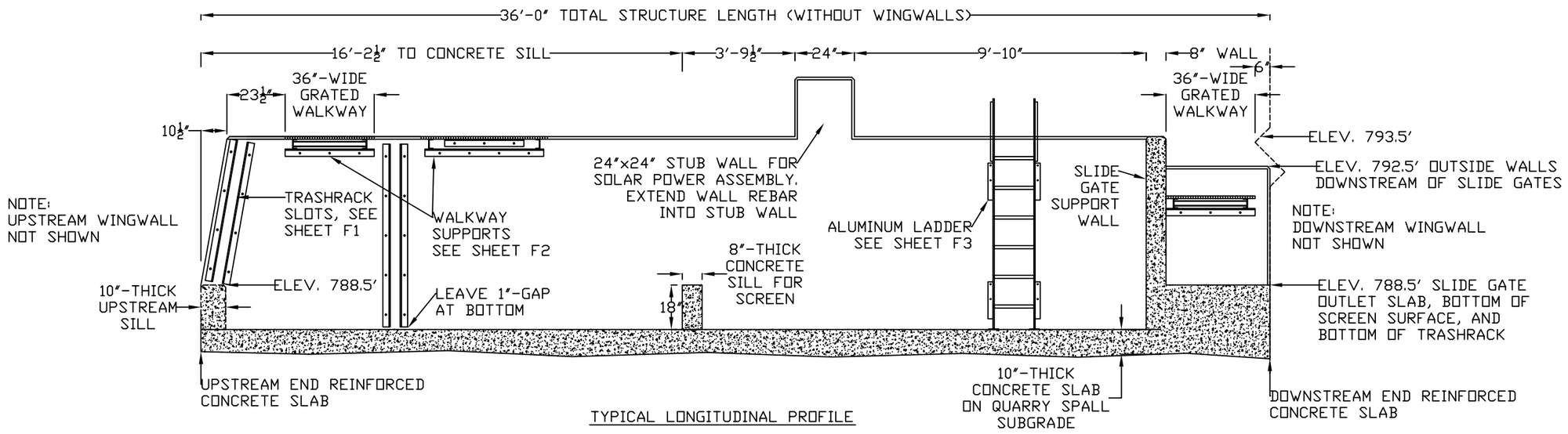
PRE-CAST CONCRETE FOR GRATE PLATFORM



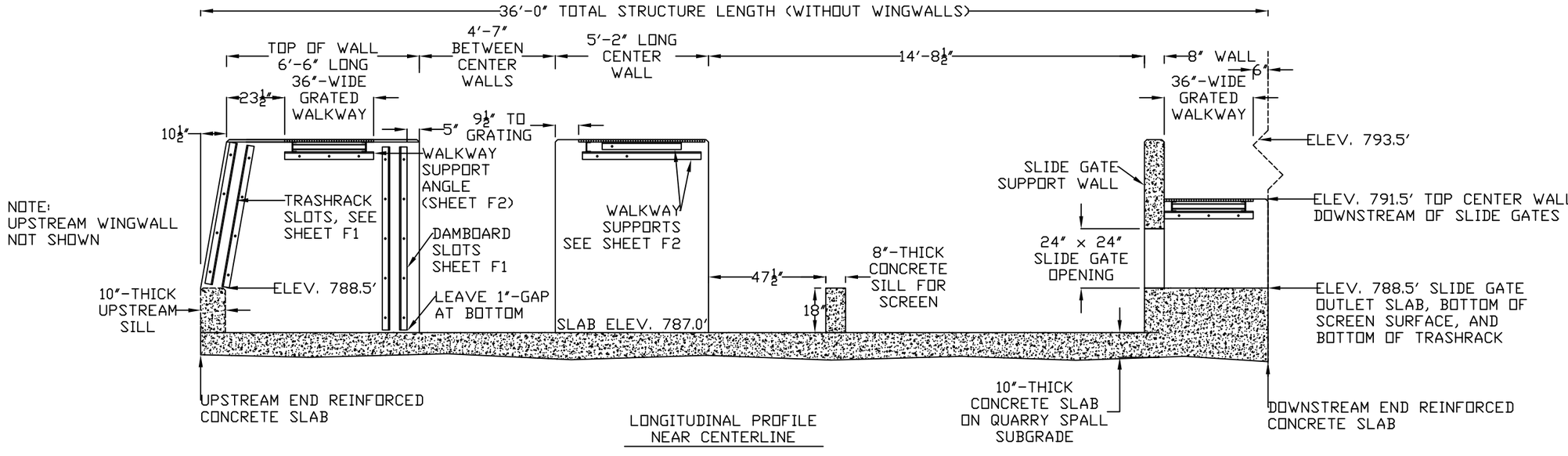
SECTION AT MIDDLE



GRATE PLATFORM AT STUB WALL



TYPICAL LONGITUDINAL PROFILE



LONGITUDINAL PROFILE NEAR CENTERLINE

REVISIONS

DESCRIPTION	BY	DATE

BRIAN DAVID TAPPEL STATE OF WASHINGTON 21019228 REGISTERED PROFESSIONAL ENGINEER
9/6/24

LAWRENCE DITCH FISH SCREEN PROJECT
YAKAMA NATION
CONCRETE STRUCTURE DETAILS

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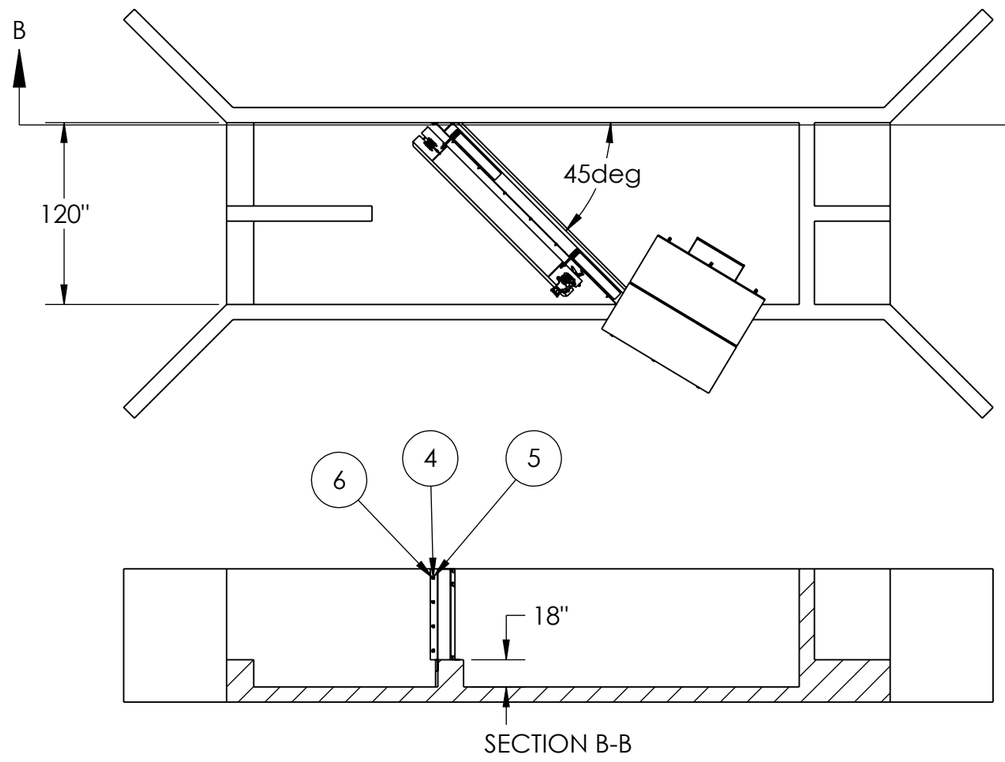
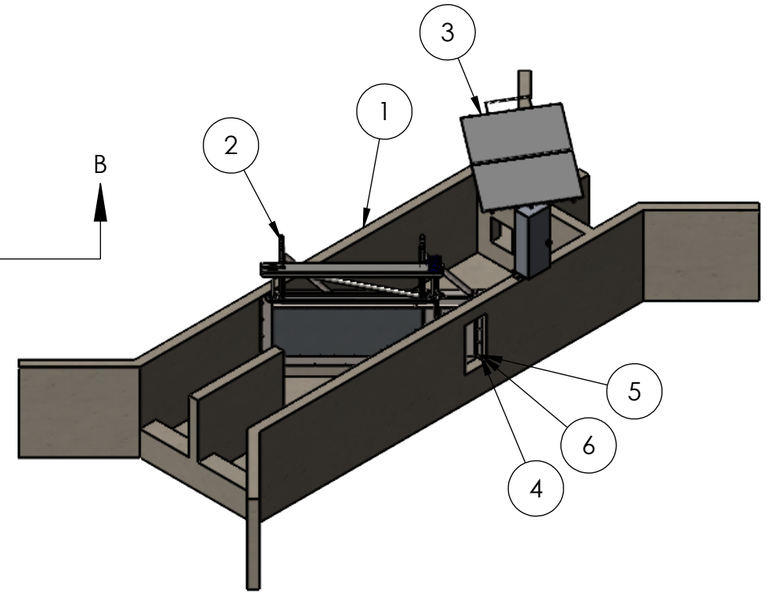
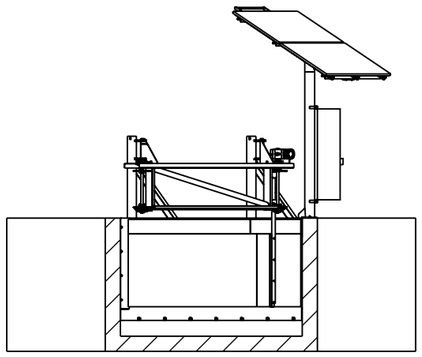
JOB NO.	24003
DATE	SEP 2024
SCALE	AS SHOWN
DESIGNED	PT
DRAWN	BT
CHECKED	PT
APPROVED	BT
SHEET	S4

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	4408R1	LAWRENCE DITCH FISH SCREEN STRUCTURE	1
2	4570R1	SCREEN AND CLEANER ASSEMBLY	1
3	SOLAR-ELECTRICAL PANEL STAND_YN	SOLAR STAND ASSEMBLY	1
4	0.625INCH X 7.5INCH ANCHOR	5/8" X 7-1/2" 304SS ALL THREAD	23
5	5/8" Washer	5/8" SS Washer	23
6	5/8" Hex Nut	5/8" SS Nylok Hex Nut	23

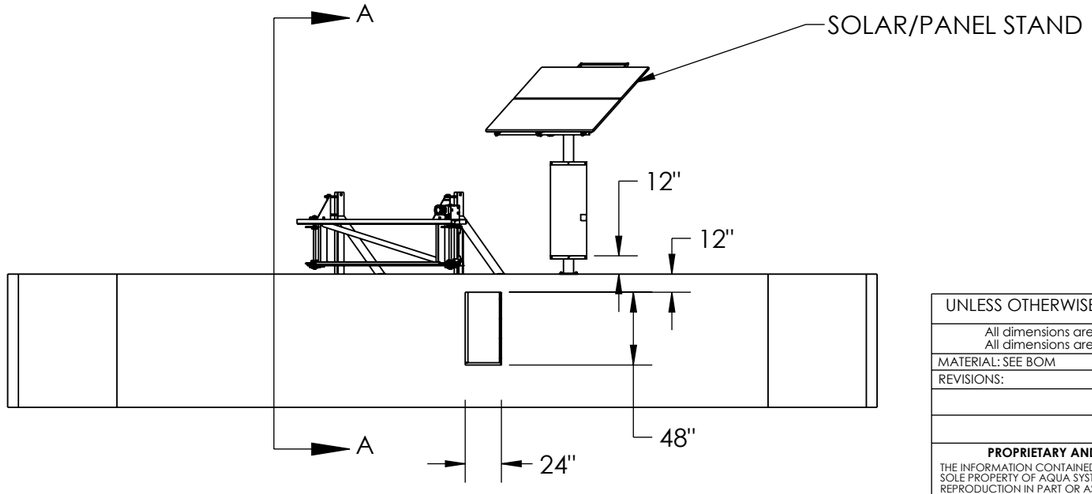


SECTION B-B

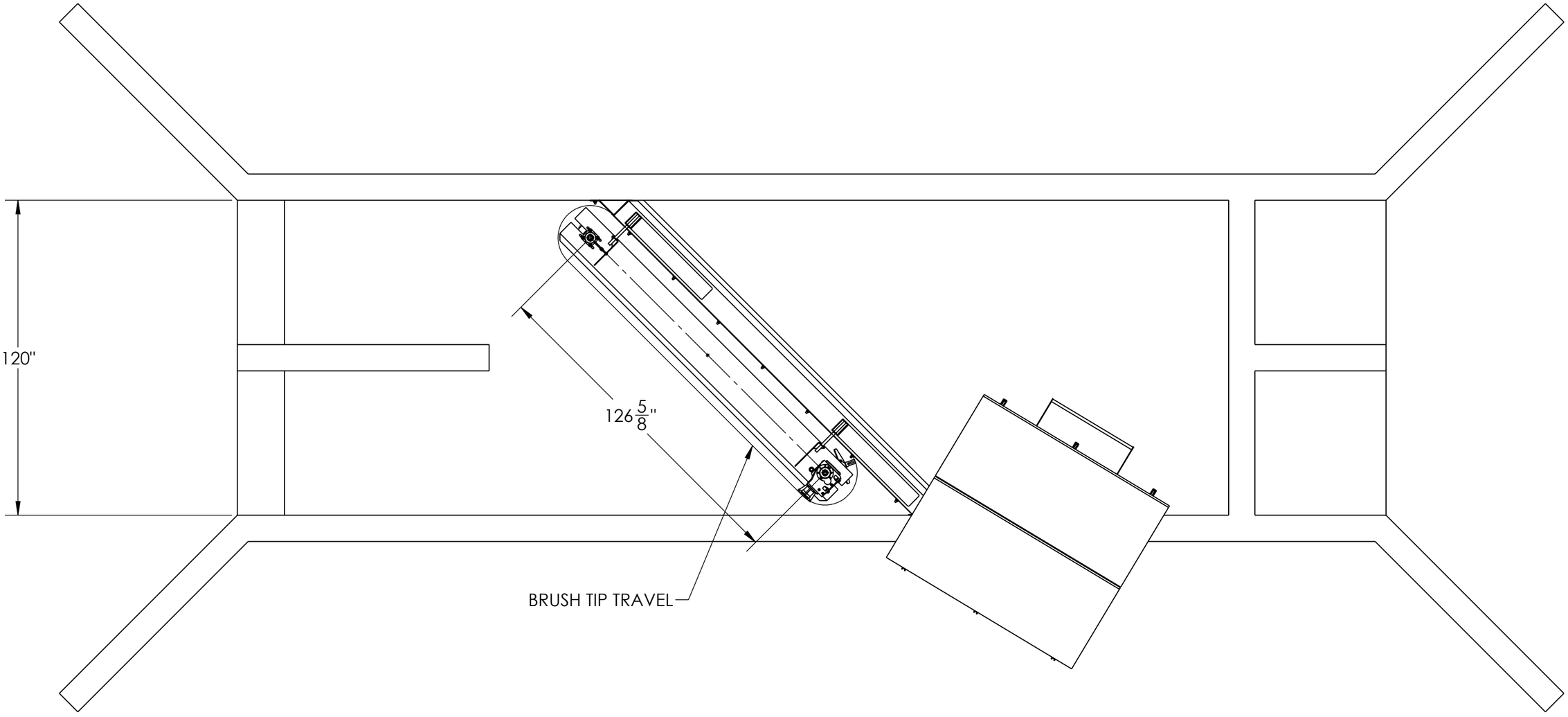




SECTION A-A



UNLESS OTHERWISE SPECIFIED:	*Aqua Systems 2000 Inc.*
All dimensions are in inches; All dimensions are to be +/- 1/32"	YAKIMA NATION LAWRENCE DITCH CLEANER INSTALLATION
MATERIAL: SEE BOM	
REVISIONS: / DATE:	DRAWN BY: CWH / DATE: 2024-08-15
	SIZE: B / PART #: 4410R2
	SCALE: 1:100 / SHEET 1 OF 3



NOTES:

-REQUIRE 10FT WIDE STRUCTURE FOR THE SIDE SWEEP CLEANER TO SWEEP 10FT OF SCREEN AT A 45 DEGREE ANGLE
-BRUSH SWEEPS 6 INCHES PAST PERFORATED PLATE AND ONTO SOLID PLATE BEFORE ROTATING OFF THE SCREEN
-BRUSH PARK POSITION CAN BE CHANGED BY ADJUSTED A TIMER ON THE PLC

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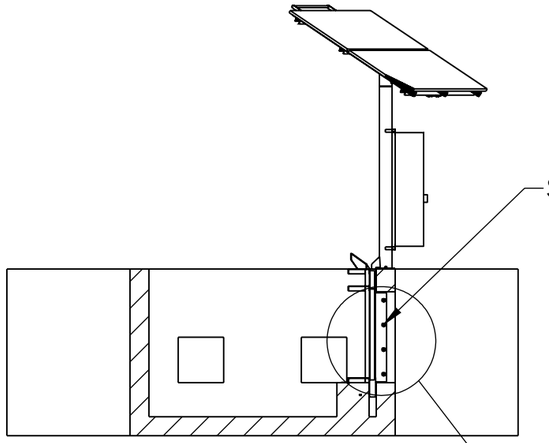
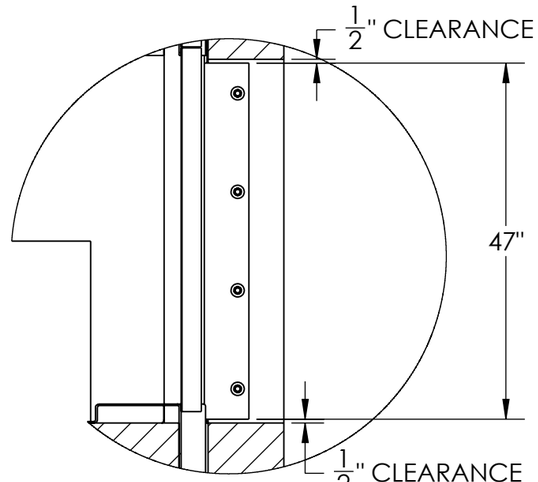
MATERIAL: SEE BOM	
REVISIONS: / DATE:	DRAWN BY: CWH / DATE: 2024-08-15
	SIZE: B / PART #: 4410R2
	SCALE: 1:40 / SHEET 2 OF 3

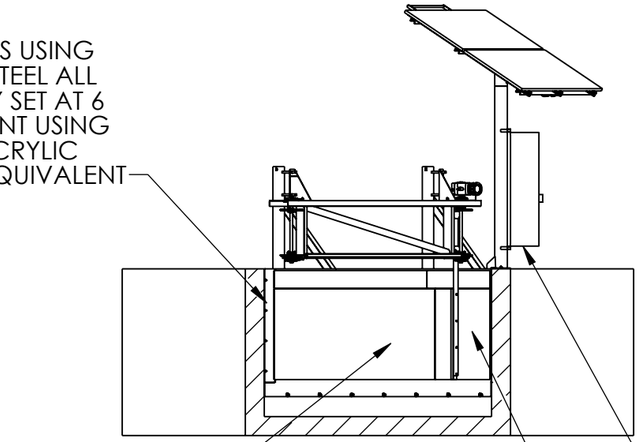


SECTION D-D

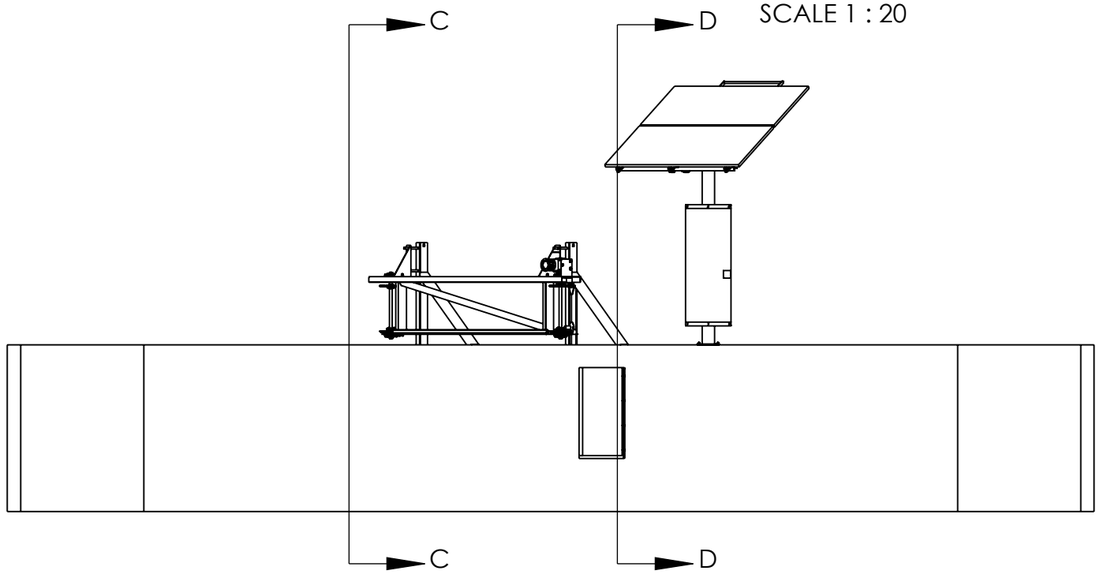


DETAIL E
SCALE 1 : 20

SCREEN INSTALLS USING 5/8" STAINLESS STEEL ALL THREADS EPOXY SET AT 6 INCH EMBEDMENT USING REDHEAD A7 ACRYLIC ADHESIVE OR EQUIVALENT



SECTION C-C



BOTTOM OF CONTROL PANEL IS 1FT ABOVE TOP OF STRUCTURE, AND THIS PLACES THE HMI AT A GOOD VIEWING HEIGHT. ALTERNATIVELY IT MAY BE INSTALLED ON A SEPARATE PILE TO GET THE PANEL UP HIGHER

UNLESS OTHERWISE SPECIFIED:	*Aqua Systems 2000 Inc.*
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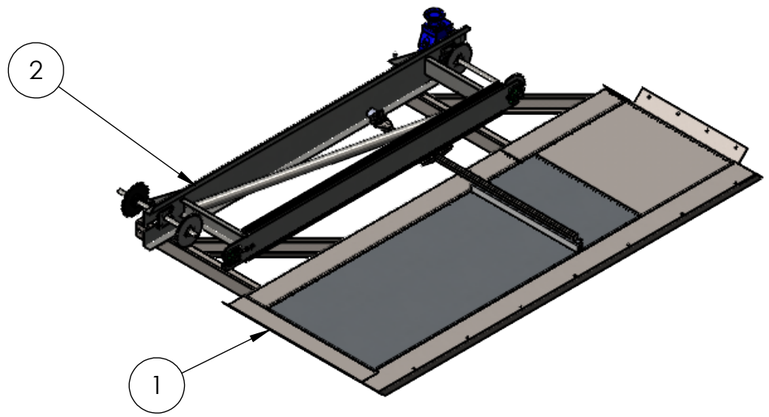
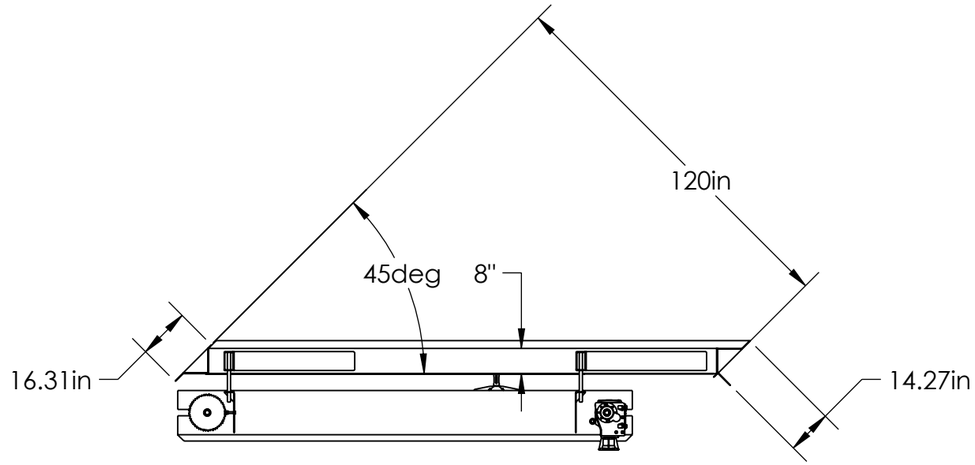
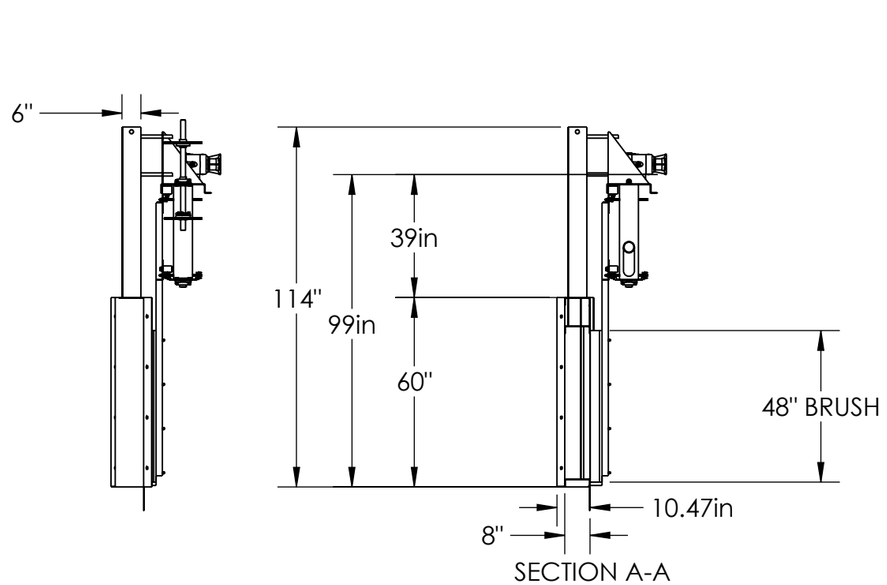
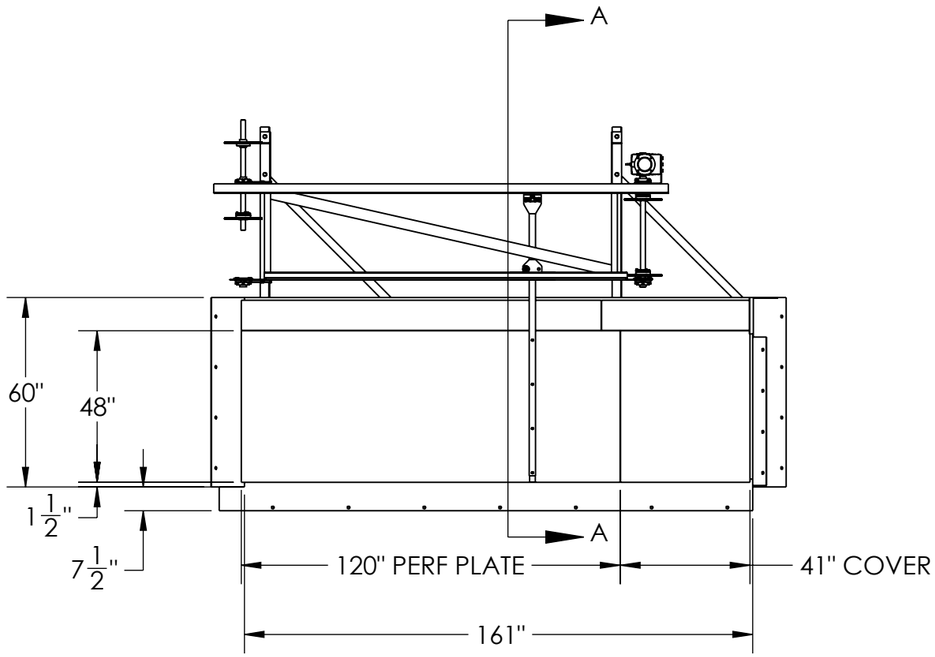
MATERIAL: SEE BOM	
REVISIONS: / DATE:	DRAWN BY: CWH / DATE: 2024-08-15
	SIZE: B / PART #: 4410R2
	SCALE: 1:80 / SHEET 3 OF 3

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	4550R1	SCREEN	1
2	SS-1705L_W_L_LD	VERTICAL SIDE SWEEP CLEANER	1



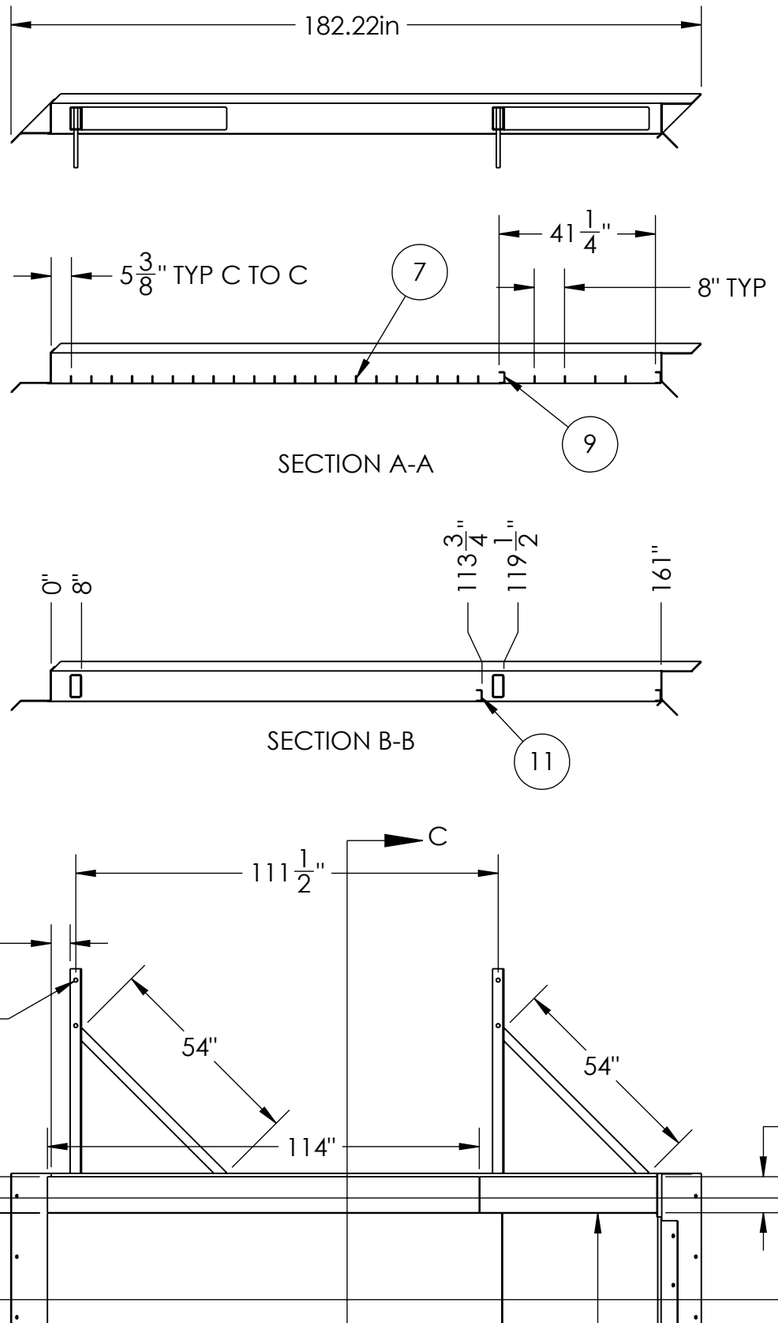


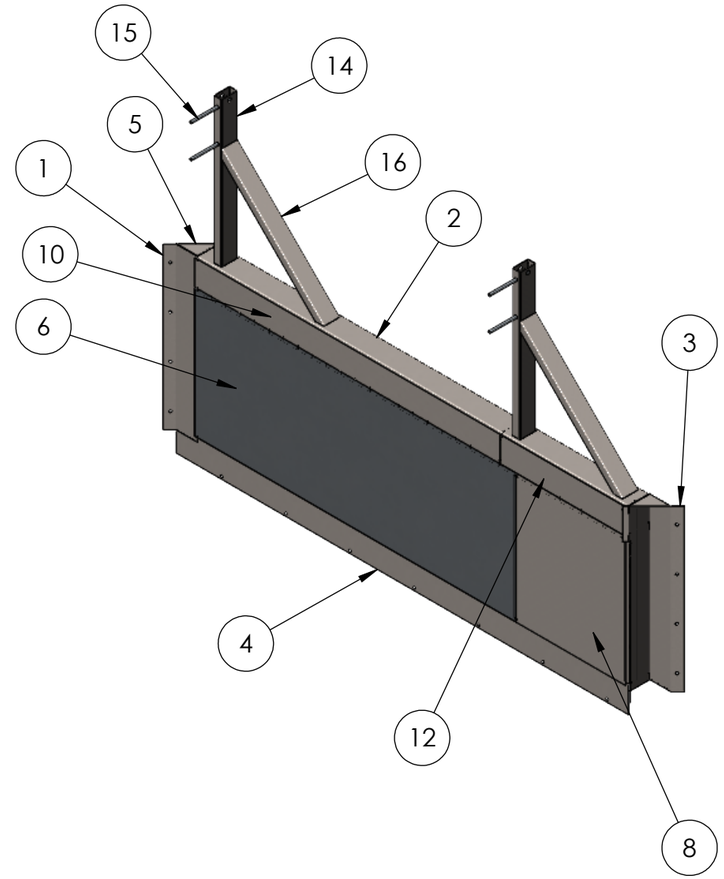




UNLESS OTHERWISE SPECIFIED:	Aqua Systems 2000 Inc.
All dimensions are in inches; All dimensions are to be +/- 1/32"	YAKAMA NATION SCREEN AND CLEANER ASSEMBLY 4570R1
MATERIAL: SEE BOM	
REVISIONS: / DATE:	DRAWN BY: CWH / DATE: 2024-08-15
	SIZE: B / FILE #: 4570R2
	SCALE: 1:48 / SHEET 1 OF 1

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	4548R1	LH WALL SUPPORT	1
2	4549R1	TOP CHANNEL	1
3	4578R1	RH WALL SUPPORT	1
4	4551R1	FLOOR SUPPORT	1
5	4552R1	SUPPORT GUSSET	2
6	4553R1	3/32" OPENING PERFORATED PLATE	1
7	4554R1	BOTTOM FLAT BAR SUPPORT	25
8	4556R1	DS BOTTOM COVER PLATE	1
9	4557R1	BOTTOM ROW SUPPORT CHANNEL	2
10	4558R1	UPPER COVER PLATE	1
11	4559R1	TOP ROW SUPPORT CHANNEL	2
12	4560R1	DS UPPER COVER PLATE	1
13	4575R1	MIDDLE CHANNEL	1
14	4574R1	CLEANER MOUNT	4
15	4576R1	1" 304SS ALL THREAD	4
16	4573R1	BRACE CHANNEL	2





UNLESS OTHERWISE SPECIFIED:		Aqua Systems 2000 Inc.	
All dimensions are in inches; All dimensions are to be +/- 1/32"		YAKAMA NATION LAWRENCE DITCH SCREEN	
MATERIAL: SEE BOM			
REVISIONS:	DATE:	DRAWN BY: CWH	DATE: 2024-08-15
		SIZE B	PART #: 4550R2
		SCALE:	1:40 SHEET 1 OF 1