

Manastash Creek Bridge at Williams Property

Mitch and Julie Williams
 7501 Manastash Road (site address)
 P.O. Box 1702 (mailing address)
 Ellensburg, WA 98926
 509-899-0168 (cell)
 mitch@mwilliams.net



Drawing List:

1. Project Location & Drawing List
2. Basis of Design
3. Site Preparation & Water Control
4. Final Project Site Plan
5. Section at Upstream Edge Bridge
6. Stream Centerline Profile
7. Steel Bridge Requirements
8. Pre-cast Concrete Footings
9. Pre-cast Concrete Backwalls

Certification and Statement (KCC title 12.08.020):

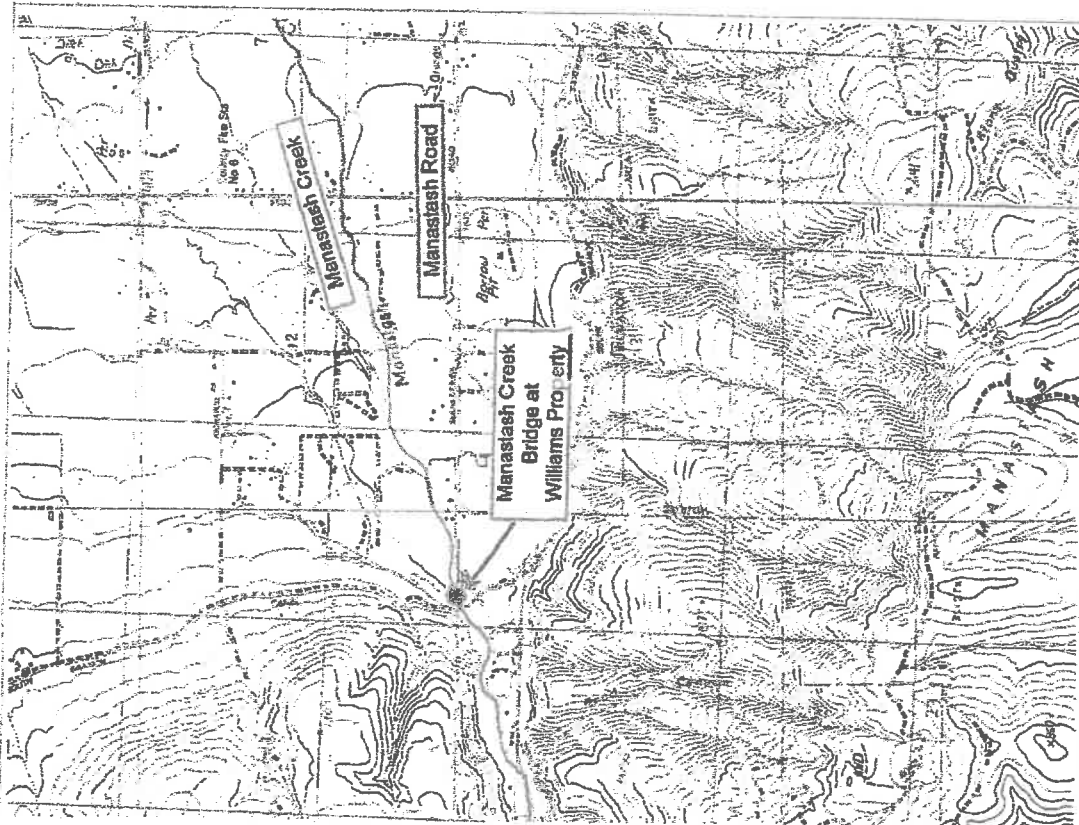
These construction plans for Manastash Creek Bridge at Williams Property were prepared by Paul Tappel, PE (Washington PE No. 23801) in accordance with the requirements of the Kittitas County Road Standards.

Paul Tappel, Professional Engineer, who has prepared these plans, by execution and/or seal hereof does hereby affirm responsibility to the County, as a beneficiary of said engineer's work, for any errors and omissions contained in these plans, and approval of these plans by the Department of Public Works shall not relieve the engineer who has prepared these plans of any such responsibility.

PROJECT LOCATION IS ABOUT 6 MILES SOUTHWEST OF ELLENSBURG, WA	MITCH AND JULIE WILLIAMS (OWNER) 7501 MANASTASH ROAD ELLENSBURG, WA 98926	509-899-0168	JULY 2018
	PAUL TAPPEL (ENGINEER) 3100 - 243rd STREET SW BRIER, WA 98036	425-482-6420	MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY
			PROJECT LOCATION & DRAWING LIST DRAWING 1

These plans have been reviewed by Kittitas County Department of Public Works and have been accepted for complying with the requirements of Kittitas County Road Standards.

County Engineer _____ Date _____



MANASTASH CREEK BRIDGE LOCATION IN NW 1/4 SECTION 14, T17N, R12E, KITTITAS COUNTY. ACCESS TO THE SITE VIA DRIVEWAY AT 7501 MANASTASH ROAD. PROPOSED BRIDGE WILL BE ABOUT 70' DOWNSTREAM FROM A WOOD BRIDGE OWNED BY KITTITAS RECLAMATION DISTRICT ALONG SOUTH BRANCH CANAL. MAP SCALE: 1" = 2,000', USGS QUAD MAP 1:24,000 SCALE.

Manastash Creek Bridge

Basis of Design

Project Objectives

Provide a functional and cost-effective bridge crossing of Manastash Creek for vehicle access to one existing residence owned by Mitch and Julie Williams. Meet all requirements for flood flow conveyance, Emergency Vehicle Access (EVA), Kittitas County Code, fish passage and fisheries resources, floodplain development, etc.

Site Survey

A total station survey instrument (Leica TC800) was used to survey 0.4 acres surrounding the proposed bridge location. A 240'-long reach of Manastash Creek was surveyed to determine creek profile, cross-section dimensions, and other variables.

Geotechnical

On-site soils were observed to be coarse mixtures of cobble, gravel & sand, which are a mixture of native alluvial materials and imported rock. Allowable bearing pressure for these types of soils are 3,000 pounds per square foot (International Building Code, Table 1804.2). Total bearing capacity under proposed bridge footing slabs will be almost 250,000 pounds, which will substantially exceed any possible combination of dead load (e.g. structures and road surfacing) and live load (e.g. vehicles and snow).

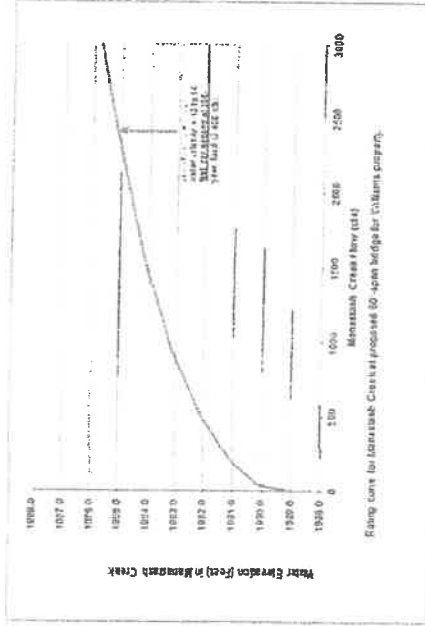
Hydrology and Hydraulic Design

The 100-year flood flow for Manastash Creek at the project site was estimated to be 2,600 cubic feet per second (cfs) using the USGS' most recent method for calculation of flood flows for ungaged streams and rivers in Washington (Mastin et al. 2017). It was assumed that 200 cfs would overtop from the mainstem creek upstream of the KR D canal. A peak flow rate = 2,400 cfs was used for bridge design.



A flow rating curve was developed to show the relationship between Manastash Creek flow and water surface elevation at the proposed bridge site (see below). Hydraulic conditions during a 100-year flood are estimated to be:

- Water depth 6' at the bridge location, with "standing waves" at least 1' high.
- Water velocity averaging 12 to 14 feet per second with high turbulence and whitewater.
- Substantial transport of large wood and bedload, turbid water conditions.



Bridge Structure

Superstructure to be a pre-fabricated modular weathering steel bridge 60'-span x 14'-wide deck for single-lane travel. Reinforced pre-cast concrete (WSDOT Class 4000) footings and backwalls to support each end of bridge. All bridge design to support HL-93 live load with deflection < L/300. HL-93 is a nominal (conceptual) 57-ton truck about 56'-long. The bridge structure will easily support fire apparatus as specified in KCC 20.02.050, for which the live load requirement is 75,000 pounds (37½ tons).

Structure Protection from Hydraulic Forces

Tractive force calculations and hydraulic conditions during the estimated 100-year flood were combined with the engineer's experience with design of stable stream channels, to select armor rocks 36" to 48"-size to wrap around concrete footings. Rock slopes will extend from above footing steps to about 2' below the creek's lowest channel elevation (thalweg) to minimize the chances for footing scour and/or undermining.

Channel Characteristics, Open Area for Floods, etc.

Stream simulation design considerations (for culverts) were adapted to the proposed bridge location. Measured Ordinary High Water (analogous to Channel Bed Width or Bankfull Width) was 42', which would suggest a drainage structure with span at least 52'-wide for stream simulation (per WDFW method). The selected 60'-span bridge will allow all construction work to be completed outside the existing low-flow channel, which will remain undisturbed.

The 100-year flood flow was routed under the proposed bridge using Manning's equation, and the bridge was designed for 3' freeboard (minimum) between the bottom of bridge beams and the flood water level. Total open area under the bridge will be 2.8 times an existing KR D bridge immediately upstream. The proposed bridge will have essentially zero effects on the 100-year flood flow, transport of large wood, bedload passage, fish passage, and other aquatic resource considerations.

Site Preparation and Water Control

Cleaning within the wooded riparian area will be limited to an area about 5' outside the perimeter of excavation and fill for bridge and driveway construction. Four cottonwood trees 12" to 18"-trunk diameter will be placed over Manastash Creek downstream of the bridge, for in-stream large wood habitat similar to natural windthrow.

All excavation and fill work will be separated from flowing water. Trashpump(s) will be used to remove turbid water from excavated trenches (for rock slope placement), to prevent turbid water from splashing into Manastash Creek.

JULY 2018

MITCH AND JULIE WILLIAMS (OWNER)
7500 MANASTASH ROAD
ELLENBURG, WA 98926 509-899-0168

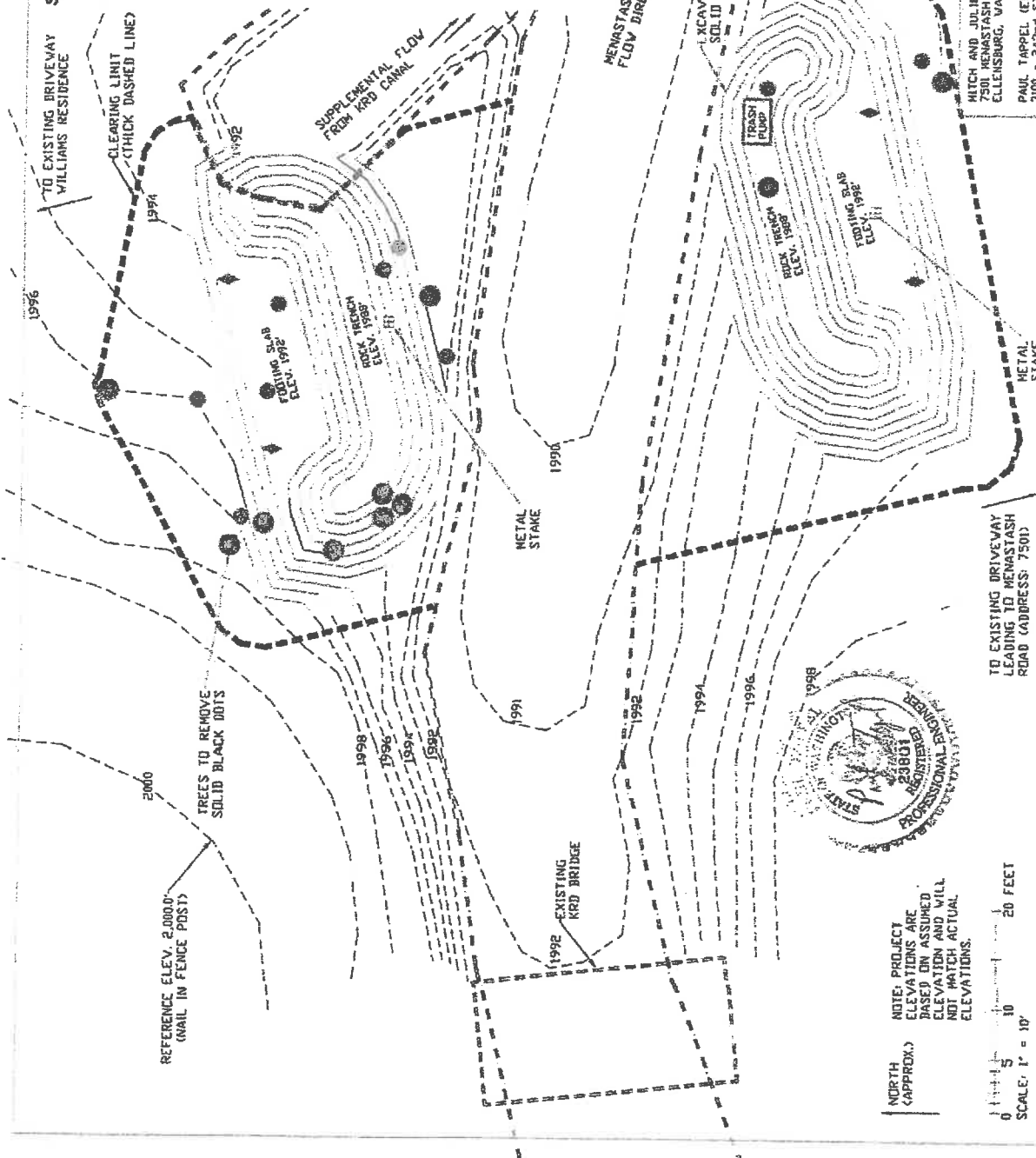
MANASTASH CREEK BRIDGE AT
WILLIAMS PROPERTY

PAUL TAPPEL (ENGINEER)
2100 243RD STREET SW
BRIER, WA 98302 425-482-6420

BASIS OF DESIGN
DRAWING 2

Site Preparation & Water Control Notes:

1. Clearing shall be completed prior to other work. All plants within clearing limits to be entirely removed, including 18 cottonwood trees 8" to 24" trunk diameter (pull out stumps). Four cottonwood trees 12" to 18" trunk diameters to be removed in largest pieces practical, then carried downstream of new bridge location (within 80') to be cast across creek to resemble natural stream. All other clearing debris to be disposed on-site within 400' of bridge location. All other clearing debris to be landowner. Pile debris and mesh down.
2. Engineer will set stakes at four outside footing corners for new bridge, shown as black diamonds this drawing, plus offset stakes to retain these locations during excavation.
3. There are no buried utilities at this project site.
4. Menastash Creek to remain within existing channel during entire bridge construction project (i.e. no creek bypass, no fish salvage needed). Approximate excavation contours shown this drawing would maintain separation of earthwork from flowing water. However, if minor site differences result in extension of excavation into shallow water areas, Contractor to place sandbag dam along creek bank to isolate excavation from flowing water.
5. Excavation to proceed from both sides of creek for placement of large rocks and footings. Separately stockpile cobble, gravel & sand materials from surface excavations, for retreated and bank backfill over rock slopes and underneath bridge (engineer will advise).
6. Engineer to lay out trenches for large rock placements, and will survey bottom elevations. Contractor to place several rows of large rocks (place largest rocks in bottom rows) to get above water level, then finish excavations for footing subgrades. Place pre-cast concrete footings, then backfill behind footings for equipment pads to finish placement of large rock slopes (see other drawings).
7. Contractor to supply and operate gas-powered trenchpump(s) to remove muddy water from rock trenches, with discharge to fill ground (within 100') for infiltration into ground. Large rocks may be placed in shallow standing water, with trashpump(s) operated to prevent muddy water from splashing into creek.



NOTE: PROJECT ELEVATIONS ARE BASED ON ASSUMED ELEVATION AND WILL NOT MATCH ACTUAL ELEVATIONS.

SCALE: 1" = 10'
0 5 10 20 FEET

JULY 2018

MENASTASH CREEK BRIDGE AT WILLIAMS PROPERTY
SITE PREPARATION & WATER CONTROL DRAWING 3

MITCH AND JULIE WILLIAMS (OWNER)
750 MENASTASH ROAD
ELLENBURG, VA 98986 509-959-0168

PAUL TAPPEL (ENGINEER)
3100 - 243RD STREET SW
BRIER, VA 98036 425-482-6420



NOTE: AFTER BRIDGE CONSTRUCTION, SPREAD 2 lb. EROSION CONTROL SEEDS OVER DISTURBED SOILS. THEN SPREAD 12 BALES STRAW MULCH.

REFERENCE ELEV. 2,000.0' (NAIL IN FENCE POST)

14'-WIDE ASPHALT OVER BRIDGE TAPERS TO 12'-WIDE PAVED DRIVEWAY. SLOPE ROAD FILL AT 1.5:1 TYP.

SECTION AT UPSTREAM EDGE BRIDGE, DWG. 5

TO EXISTING DRIVEWAY WILLIAMS RESIDENCE

PROPOSED CONTOURS SOLID BLACK LINES

SUPPLEMENTAL FLOW FROM KRD CANAL

10'-SPAN x 14'-WIDE WEATHERING STEEL BRIDGE w/ ASPHALT DECK

TYPICAL EDGE OF WATER

STREAM CENTERLINE PROFILE, DWG. 6

MEWASTASH CREEK FLOW DIRECTION

YEAR INDENT IN WINGWALL & LOAD RATING SIGN

EXISTING CONTOURS LIGHT DASHED LINES

ROCK SLOPE TO WRAP AROUND EACH BRIDGE FOOTING, SEE OTHER DWGS.

TO EXISTING DRIVEWAY LEADING TO MEWASTASH ROAD (ADDRESS: 7501)

SCALE: 1" = 10'

NOTE: PROJECT ELEVATIONS ARE BASED ON ASSUMED ELEVATION AND WILL NOT MATCH ACTUAL ELEVATIONS.

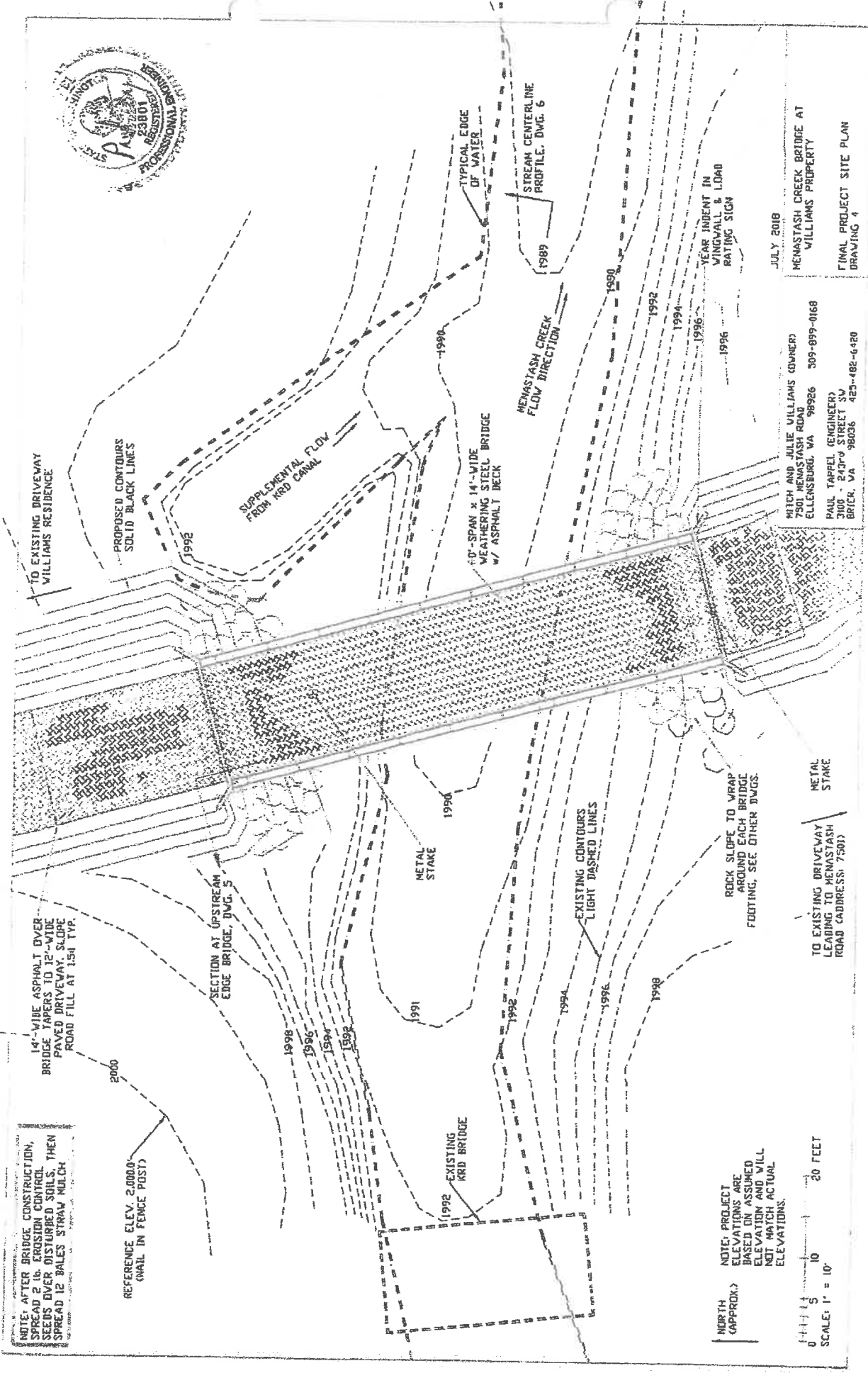
NORTH (APPROX.)



MITCH AND JULIE WILLIAMS (OWNER)
7301 MEWASTASH ROAD
ELLENBURG, VA 98926 309-899-0168

PAUL TAPPEL (ENGINEER)
3100 S. 24TH STREET SW
BRIER, VA 98036 425-482-6420

JULY 2018
MEWASTASH CREEK BRIDGE AT WILLIAMS PROPERTY
FINAL PROJECT SITE PLAN
DRAWING 4



Streambank Notes:

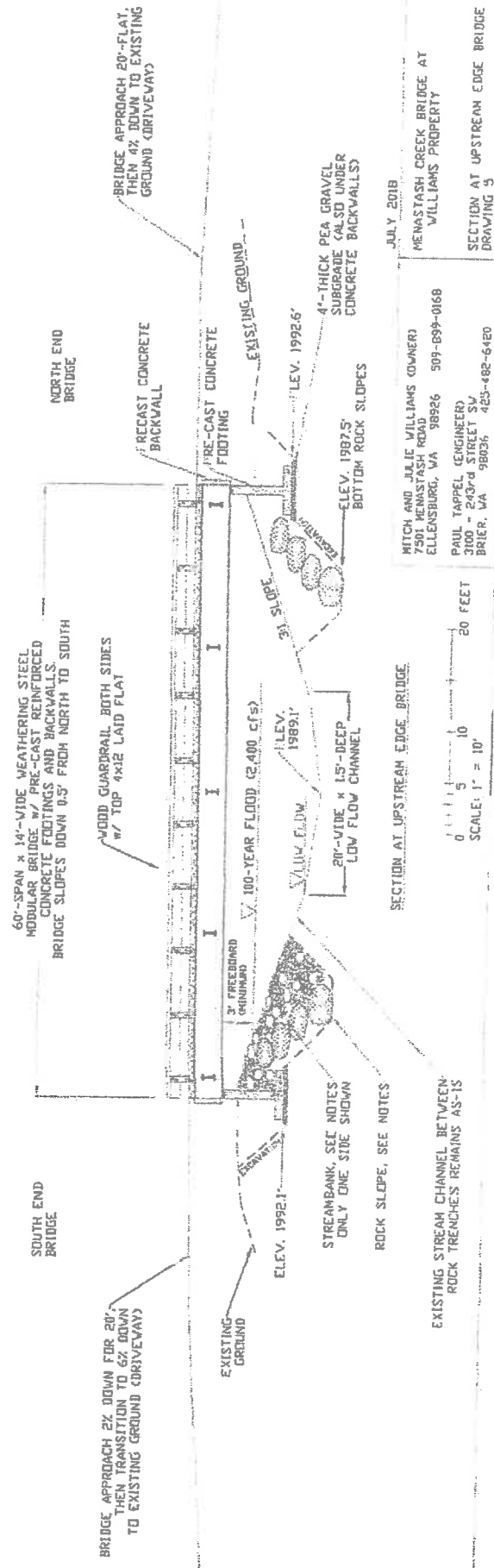
1. For excavation of rock trenches and footing subgrades, remove surface layers of cobble, gravel & sand to stockpile separately (engineer to advise). These relatively coarse (vs. silty) native materials will be used to fill over rock slopes, and to re-build Manastash Creek banks after footing placement.
2. Native cobble, gravel & sand materials to be spread over rock slopes, and around bridge footings as shown in this drawing. Final streambank contours will be approximately the same as original bank contours in near vicinity to and under the new bridge.
3. Native cobble, gravel, & sand materials to be placed under and around bridge spread over large rocks and along the bank, then roughly raked with excavator teeth for final streambanks.

Rock Slope Notes:

1. Engineer will assist with layout for rock slope trenches and rock placement.
2. Rocks to be 36" to 48"-size, with largest rocks placed in bottom rows.
3. Place rocks one at a time for single row, then backfill with native soils to top of rocks, tamp backfill, then place next row rocks. Top of rocks shall be at slope 1.5:1 approximately.
4. Bottom rows rocks may be placed in shallow standing water in trench. Pump water as required to prevent overflow into creek channel.
5. Top of rock slopes shall be at least 12" above top of pre-cast concrete footing slabs.

Bridge Elevation & Open Area Notes:

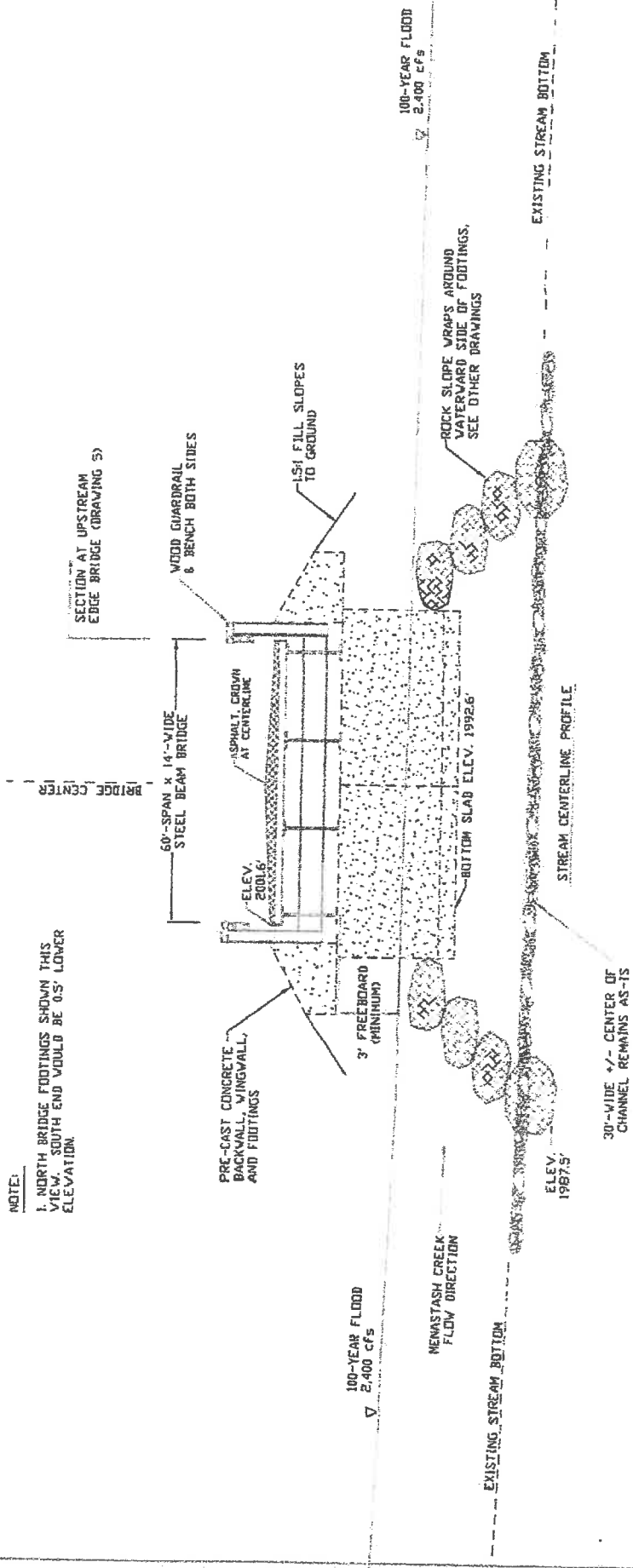
1. New bridge deck will be 1.5' to 2.0' higher than the existing KR D wood bridge's deck about 70' upstream. The higher deck elevation will provide 3' freeboard (minimum) over the estimated 100-year flood (2,400 cfs).
2. Open area under the new bridge for flood flow conveyance, wood and bedload transport, fish passage, and all fluvial processes will be 342 ft². Open area under the existing KR D wood bridge = 123 ft². The proposed bridge will have open area 2.8 times as large as the existing KR D bridge (which withstood the May 2011 flood), resulting in no obstruction to the 100-year flood, large wood transport, bedload passage, etc. for Manastash Creek.



JULY 2018
 MITCH AND JULIE WILLIAMS (OWNER)
 7901 MANASTASH RD 98926 509-699-0168
 ELLENSBURG, WA 98926
 PAUL TAPPEL (ENGINEER)
 3100 - 243rd STREET SW
 BRIER, WA 98026 425-482-6420

SECTION AT UPSTREAM EDGE BRIDGE
 0 10 20 FEET
 SCALE: 1" = 10'

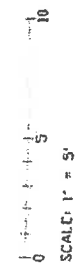
SECTION AT UPSTREAM EDGE BRIDGE
 WILLIAMS PROPERTY
 SECTION AT UPSTREAM EDGE BRIDGE
 DRAWING 9



NOTE:
 1. NORTH BRIDGE FOOTINGS SHOWN THIS VIEW. SOUTH END WOULD BE 0.5' LOWER ELEVATION.

JULY 2018
 NEMASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

MITCH AND JULIE WILLIAMS (OWNER)
 7501 NEMASTASH ROAD
 ELLENSBURG, WA 98026 509-899-0168
 PAUL TAPPEL (ENGINEER)
 3100 - 243RD STREET SW
 BRIER, WA 98036 425-482-6420



30'-WIDE +/- CENTER OF CHANNEL REMAINS AS-IS

100-YEAR FLOOD 2,400 cfs

100-YEAR FLOOD 2,400 cfs



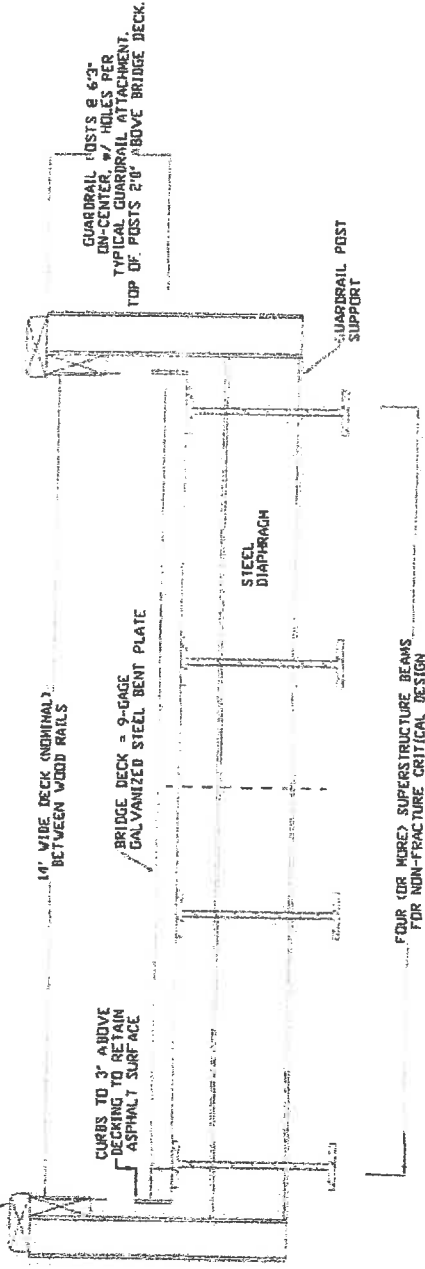
STEEL BRIDGE REQUIREMENTS:

- 60'-SPAN (BEAM END-TO-END) BY 14'-WIDE (DECK WIDTH) MODULAR WEATHERING STEEL BEAM BRIDGE TO BE PRE-FABRICATED AND SHIPPED TO THE PROJECT SITE (6 MILES SOUTHWEST OF ELLENSBURG, WASHINGTON, ACCESSIBLE BY ROAD).
- ALL ON-SITE WORK INCLUDING LIFTING THE BRIDGE OFF TRANSPORT TRUCK(S), PLACING BRIDGE ON BEARING PLATES, WELDING BEAMS TO PLATES, BOLT INSTALLATION ALONG BRIDGE CENTERLINE, AT BEARING PLATES, AND RAIL ASSEMBLY WILL BE ACCOMPLISHED BY ON-SITE CONTRACTOR.
- WOOD RAIL MATERIALS (4x12's) AND RAIL HARDWARE TO BE SUPPLIED BY ON-SITE CONTRACTOR AND ALL RAIL ASSEMBLY BY CONTRACTOR. METAL GUARDRAILS NOT NEEDED FROM BRIDGE SUPPLIER.
- CONTRACT SPECIFICATION 6-03 (INCLUDES DETAILED REQUIREMENTS FOR BRIDGE DESIGN AND SUPPLY. THIS DRAWING SUPPLEMENTS THIS SPECIFICATION).
- BRIDGE SUPPLIER TO PROVIDE BRIDGE SUPERSTRUCTURE PRE-FABRICATED IN HALVES WITH DECK MATERIAL ATTACHED, BEARING PLATES, ELASTOMERIC (OR SIMILAR) BEARING PADS, RAIL POSTS, AND ALL ASSEMBLY HARDWARE (NUTS AND BOLTS).

LOADS AND DEFLECTION:

- LIVE LOAD = HL-93 (14,000 POUNDS OVER 55'-LONG VEHICLE AXLES).
- INCLUDE ASPHALT DECK 3"-THICK AT CURBS (TO TOP OF CURBS) AND CROWNED 3" TO BRIDGE CENTERLINE FOR DEAD LOAD.
- LIVE LOAD REFLECTION < 1/300.

WOOD RAILS & BENCHES SEE DETAILS IN SPECIFICATION. TOP BENCH TO OVERHANG INSIDE EDGE RAIL BY 1/2".



FOUR (OR MORE) SUPERSTRUCTURE BEAMS FOR NON-FRACTURE CRITICAL DESIGN

STEEL BRIDGE
SYNTHETIC CROSS-SECTION

THIS CROSS-SECTION SHOWS FOUR W30x BEAMS @ 4'-3" ON-CENTER; THESE BRIDGE ELEMENTS MAY VARY WITH FINAL DESIGN.

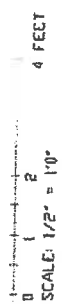
JULY 2018

MEVASTASH CREEK BRIDGE AT WILLIAMS PROPERTY

MITCH AND JULIE WILLIAMS (OWNER)
750 MEVASTASH ROAD
ELLENSBURG, WA 99926 509-899-0168

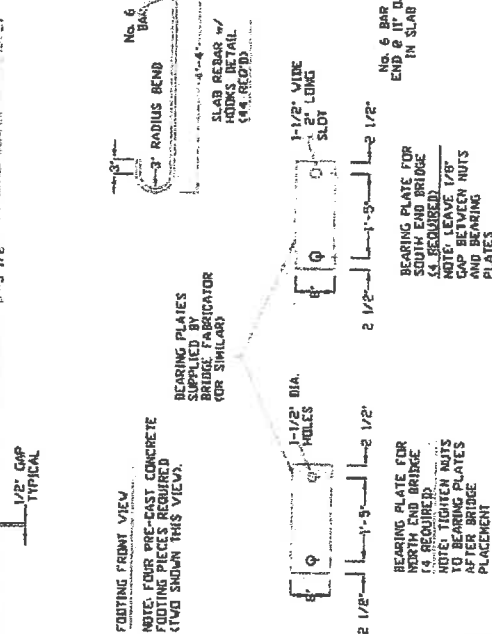
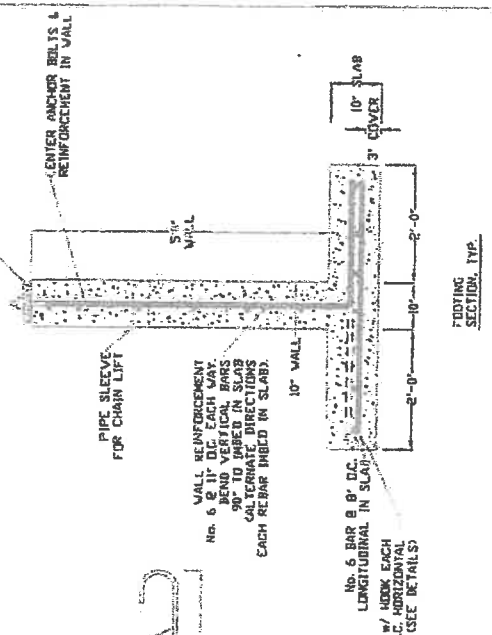
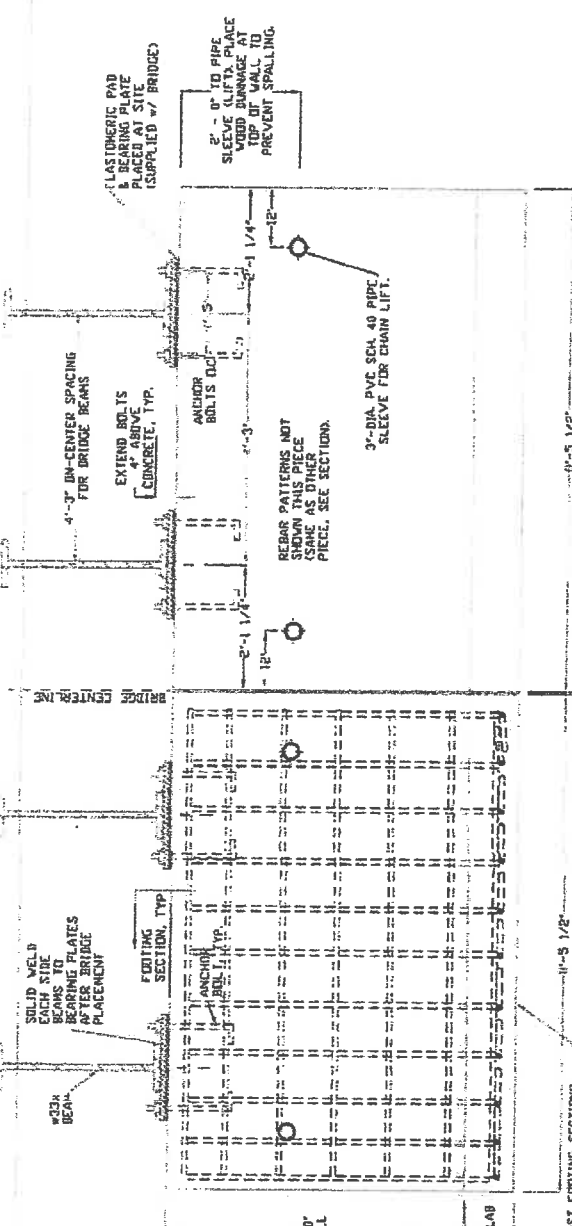
PAUL TAPPEL (ENGINEER)
3100 N 243rd STREET SW
BRIER, WA 98005 425-482-6420

STEEL BRIDGE REQUIREMENTS
DRAWING 7



SCALE 1/2" = 10'
0 1 2 4 FEET

NOTE: THIS DRAWING BASED ON ASSUMED BRIDGE BEAM SPACING AND BEARING PLATE SIZE. THE ENGINEER WILL REVIEW BRIDGE DESIGN SHOP DRAWINGS, AND WILL MAKE CHANGES TO PRE-CAST CONCRETE DRAWINGS (INCLUDING BACKWALLS), DEPENDING ON FINAL BRIDGE SUPERSTRUCTURE DESIGN.



JULY 2018
MANASTASH CREEK BRIDGE AT
WILLIAMS PROPERTY
PRE-CAST CONCRETE FOOTINGS
DRAWING 8

MITCH AND JULIE WILLIAMS (OWNER)
7701 MANASTASH ROAD
ELLENBURG, VA 98926 509-899-0168

PAUL TAPPEL (ENGINEER)
3100 - 243RD STREET SW
BRIER, VA 98036 425-482-6420



NOTE: CAST FOOTING SECTIONS SO BOTTOMS OF FOOTINGS ARE FLAT. G.O. DO NOT CAST ON SAND SURFACE.

PRE-CAST CONCRETE NOTES & SPECIFICATIONS:
1. PRE-CAST CONCRETE SUPPLIER MAY RESIZE AND INSTALL ALTERNATE LIFT SYSTEM FOR FOOTING PIECES. INSTEAD OF CHANGES SHALL BE COORDINATED WITH ENGINEER (INCLUDING BACKWALLS), AND ALL LIFTING HARDWARE (GAP CUTTERS) SHALL BE PROVIDED TO GENERAL CONTRACTOR FOR THE ON-SITE USE.

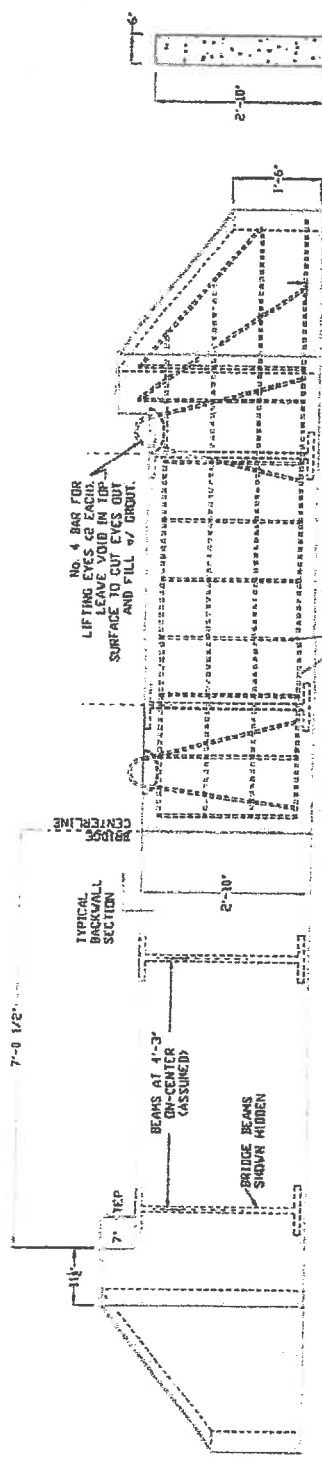
2. CONCRETE - CLASS 4000, WSDOT SPEC. 6-02. REINFORCEMENT - GRADE 60 DEFORMED STEEL BARS; WSDOT SPEC. 6-02. ALL REINFORCEMENT REQUIREMENTS APPLY TO FOOTINGS AND BACKWALLS.

3. ANCHOR BOLTS - 1/2\"/>

4. PRE-CAST CONCRETE SUPPLIER TO SUPPLY FOUR PRE-CAST CONCRETE FOOTING PIECES ON-SITE BY ANCHOR BOLTS & HARDWARE. BRIDGE SUPPLIER TO SUPPLY ALL HARDWARE AND LIFTING HARDWARE. PRE-CAST CONCRETE SUPPLIER ALSO TO SUPPLY FOUR BACKWALL PIECES ON-SITE.

5. ON-SITE GENERAL CONTRACTOR TO LIFT PRE-CAST FOOTING PIECES BY TRUCK AND PLACE ON PEA GRAVEL BEARING PLATE. PRE-CAST CONCRETE BACKWALLS REST ON TOP OF PEA GRAVEL BEDDING.

6. FOOTING PIECES = 11,500 LB. EACH (APPROX.).

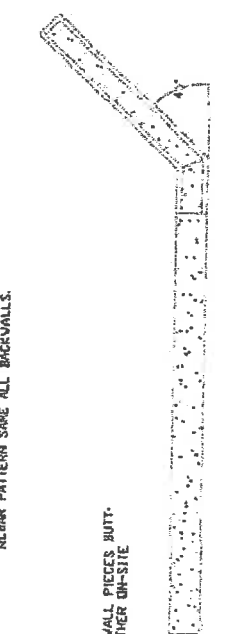


TYPICAL BACKWALL SECTION

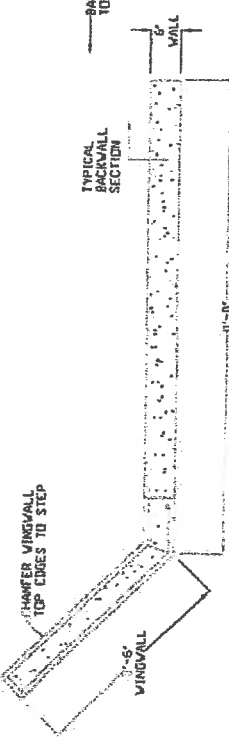
No. 4 BAR FOR LIFTING EYES (2 EACH) LEAVE VOID IN TOP SURFACE TO CUT EYES OUT AND FILL w/ GROUT.

No. 4 REBAR @ 9" O.C. HORIZONTAL AND No. 4 BARS @ 12" O.C. VERTICAL. ALL BARS ANGLED w/ WING. REBAR PATTERN SAME FOR ALL BACKWALLS.

BACKWALL ELEVATION VIEW (LOOKING LANIWARD)

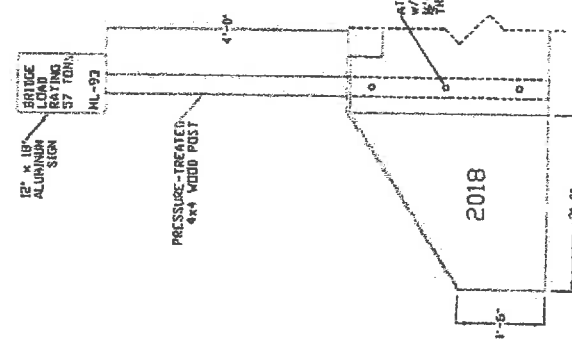


TYPICAL BACKWALL SECTION



BACKWALL TOP VIEW

NOTE: LOAD RATING SIGN WOULD FACE OPPOSITE DIRECTION FROM DATE (TOWARDS VEHICLE INGRESS)



SCHEMATIC WINGWALL ELEVATION FOR SIGN PLACEMENT. DATE TO SHOW DATE WHEN SIGN WOULD BE INSTALLED. WINGWALL BEARSTREAM SURFACE & LOAD RATING SIGN (INGRESS RIGHT SHOULDER)

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

- PRE-CAST CONCRETE BACKWALL NOTES:
1. TWO PAIRS REPTD AS SHOWN.
 2. CHAMFER TOP AND END EDGES 1" ON OUTSIDE LENGTHS EACH BACKWALL & WINGWALL SECTION TO STEP.
 3. CUT OFF REBAR LIFT LOOPS AT LEAST 1/2" BELOW TOP OF BACKWALL, AND FILL HOLES w/ GROUT AFTER PLACEMENT.
 4. INVENTURE DATE (YEAR) ON DOWNSTREAM FACE OF WINGWALL. HEIGHT 4'-1 1/2" W/OC x 3/8" DEEP NUMBERS (SEE SCHEMATIC).



JULY 2018
 MANASTASH CREEK BRIDGE AT WILLIAMS PROPERTY
 PRE-CAST CONCRETE BACKWALLS
 DRAWING 9

MITCH AND JULIE WILLIAMS (OWNER)
 7501 MANASTASH ROAD
 ELLENSBURG, VA 98926 509-899-0168

PAUL TAPPEL (ENGINEER)
 3100 - 243rd STREET SW
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