STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	A.1

NPS PMIS No. 228726
NPS Drwg No. 149/150822

U. S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
OLYMPIC NATIONAL PARK

PLANS FOR PROPOSED PROJECT

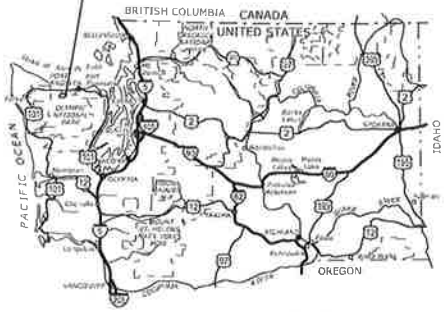
WA NPS OLYM 2017(1)

SPRUCE RAILROAD TRAIL
SEGMENT B

CLALLAM COUNTY
WASHINGTON

BASE LENGTH 1.86 MILES
OPTION Z LENGTH 3.83 MILES

Project Location



WASHINGTON KEY MAP

WORLD HERITAGE SITE

TYPE OF CONSTRUCTION:

Excavation, embankment, drainage, aggregate base, structure, retaining wall and paving

DESIGN STANDARDS:

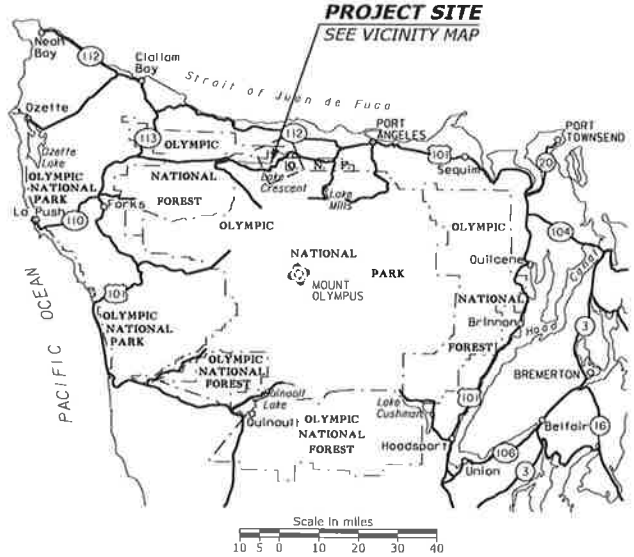
AASHTO Guide for the Development of Bicycle Facilities

LRFD Guide Specification for the Design of Pedestrian Bridges

SPECIFICATION:

Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14

N



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B. SUMMARY OF QUANTITIES
C. TYPICAL SECTIONS
D. PLAN
E. SOIL EROSION AND SEDIMENT CONTROL
F. DRAINAGE
G. TUNNEL
H. MSE WALL
I. STRUCTURES
J. EXTERIOR ROCKFALL MITIGATION
K. TEMPORARY TRAFFIC CONTROL PLAN

PLANS PREPARED BY

AECOM

APPROVED:

_____ DATE _____
Chief of Engineering,
Western Federal Lands Highway Division

/s/ Lee Taylor DATE 5/17/19
Superintendent,
Olympic National Park

PROJECT MANAGER
K. LOFTSGAARDEN

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	A.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822

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STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	A.3

Δ	total central angle
Δc	curve central angle
Ø	diameter
θs	spiral central angle
abut.	abutment
ADT	average daily traffic
AH	ahead
appr.	approach
BK	back
BM	bench mark
BP	balance point
br.	bridge
brg.	bearing
cc or c. to c.	center to center
℄	centerline
clr.	clear
CMP	corrugated metal pipe
col.	column
conc.	concrete
conn.	connection
constr. jt.	construction joint
cont.	continuous
CS	point of curve to spiral
ctrs.	centers
CUFT	cubic foot (feet)
culv.	culvert
CUYD	cubic yard(s)
D	diameter
DHV	design hourly volume
dia.	diameter
diag.	diagonal
diaph.	diaphragm
dist.	distance
drwg(s).	drawing(s)
E	east
e	superelevation rate
El. 94.16 ft	elevation with number
elev.	elevation
emb.	embankment
EP	edge of pavement
EQ or eq.	equation
ER	edge of road
EW	edge of water
exc.	excavation
exp. jt.	expansion joint
fin.	finish
flg.	flange
ft2	square foot
ft3	cubic foot (feet)
ftg.	footing
ga.	gage (gauge)
galv.	galvanized
hdwl.	headwall
hex.	hexagon
HW	high water
ID	inside diameter
jt.	joint
L	length of curve
lam.	lamination
lat.	latitude
LNFT	linear foot (feet)
long.	longitudinal
LPSM	lump sum
Ls	length of spiral
lt. or LT	left
LW	low water
M.L.	main line
M.P.	mile post
matl.	material
max.	maximum
MGAL	thousand gallon
min.	minimum
mon.	monument
N	north
NC	normal crown
o. c.	on center
o. to o.	out to out
OD	outside diameter
OG	original ground
PC	point of curve
PCC	point of compound curve
PCS	point of curve to spiral
PI	point of intersection
pl.	plate
POC	point on curve
POS	point on spiral
POT	point on tangent
PS	point of tangent to spiral
PSC	point of spiral to curve
PST	point of spiral to tangent
PT	point of tangent
pvmt.	pavement
R	radius
R.	range
R/W	right-of-way
rdwy.	roadway
reinf.	reinforcement
reqd.	required
rt. or RT	right
rte.	route
S	south
SADT	seasonal average daily traffic
SC	point of spiral to curve
sec.	section
shldr.	shoulder
SLRY	slurry unit
spa.	spacing, spaces or spaced
SQFT	square foot
SQYD	square yard
SRS	point of spiral to reverse spiral
SS	point of spiral to spiral (no curve)
ST	point of spiral to tangent
STA, Sta.	station
std.	standard
stgr.	stringer
stiff.	stiffener
struc.	structural
STS	point of spiral to tangent spiral
sym.	symmetrical
T	tangent distance
T.	township
TBM	temporary bench mark
thd.	thread
TS	point of tangent to spiral
Ts	tangent distance (spiraled curve)
typ.	typical
V	design speed
vph	vehicles per hour
VPI	vertical point of intersection
W	west
yd2	square yard
yd3	cubic yard(s)

NOTE:

1. Other symbols used in the plans will be shown in a legend on the appropriate plan sheet.

National Boundary
State Boundary
County Boundary
City Boundary
Township or Range Line
Section Line
Section Corner (Found, Projected)
¼ Section Line
¼ Section Corner (Found, Projected)
1/16 Section Line
1/16 Section Corner (Found, Projected)
Property Line w/Found Property Corner
Parcel Number
National Park Boundary
National Forest Boundary
National Wildlife Refuge Boundary
BLM Lands Boundary
Indian Reservation Boundary
Existing Roadway (Road, Paved, Gravel)
Railroad
Trail
Fiber Roll or Wattle
Silt Fence
Intermittent Drainage or Small Creek
Large Creek or River
Lake, Pond or Reservoir; Marshland
Spring or Seep
Treeline; Individual Trees
Material Source; Bore Hole; Test Pit
Spot Elevation; Coordinate Grid Tick
Above Ground Tank; Underground Tank
Boulder; Well; Satellite Dish; Grave
Cooking Grate; Garbage Can; Picnic Table
Flagpole; Fire Hydrant
Gas & Water Meter; Gas & Water Valve
Control Point (Terrestrial and GPS); Jump Hub

North Arrow

	EXISTING	PROPOSED
Slope Stake Limits	Toe of Fill / Top of Cut / Transition	
Fence		
Gate with Fence		
Cattleguard		
Guardrail		
Concrete Barrier		
Retaining Wall	wall face	
Signs (single, double post; portable)		
Delineators		
Pipe Culvert (arrow shows flow)		
Pipe Culvert with End Section		
Pipe Culvert with Headwall		
Pipe Culvert with Drop Inlet		
Box Culvert		
Bridge		
Underdrain		
Overhead/Above Ground Utilities		
Underground Utilities		

FM = force main, FO = fiber optic, G = gas, IRR = irrigation, O = oil, P = power, SA = sanitary sewer, SD = storm drain, SS = storm sewer, STEAM = steam, T = telephone, TV = CATV, W = water

Poles (Power, Telephone, Joint Use, Light, Support w/Anchor)

Miscellaneous Utility Features

EM = electric meter, T = telephone pedestal, TV = CATV pedestal, UP = transformer or junction box, WF = water fountain

Building
Right-of-Way Line with Monument
Permanent Easement
Construction Easement — no symbol —
Riprap

NPS Drwg. No. 149/60519

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

PLAN SYMBOLS AND ABBREVIATIONS

DETAIL APPROVED FOR USE 11/2001
REVISED: 9/2005 1/2007 10/2009 10/2014

DETAIL W101-1

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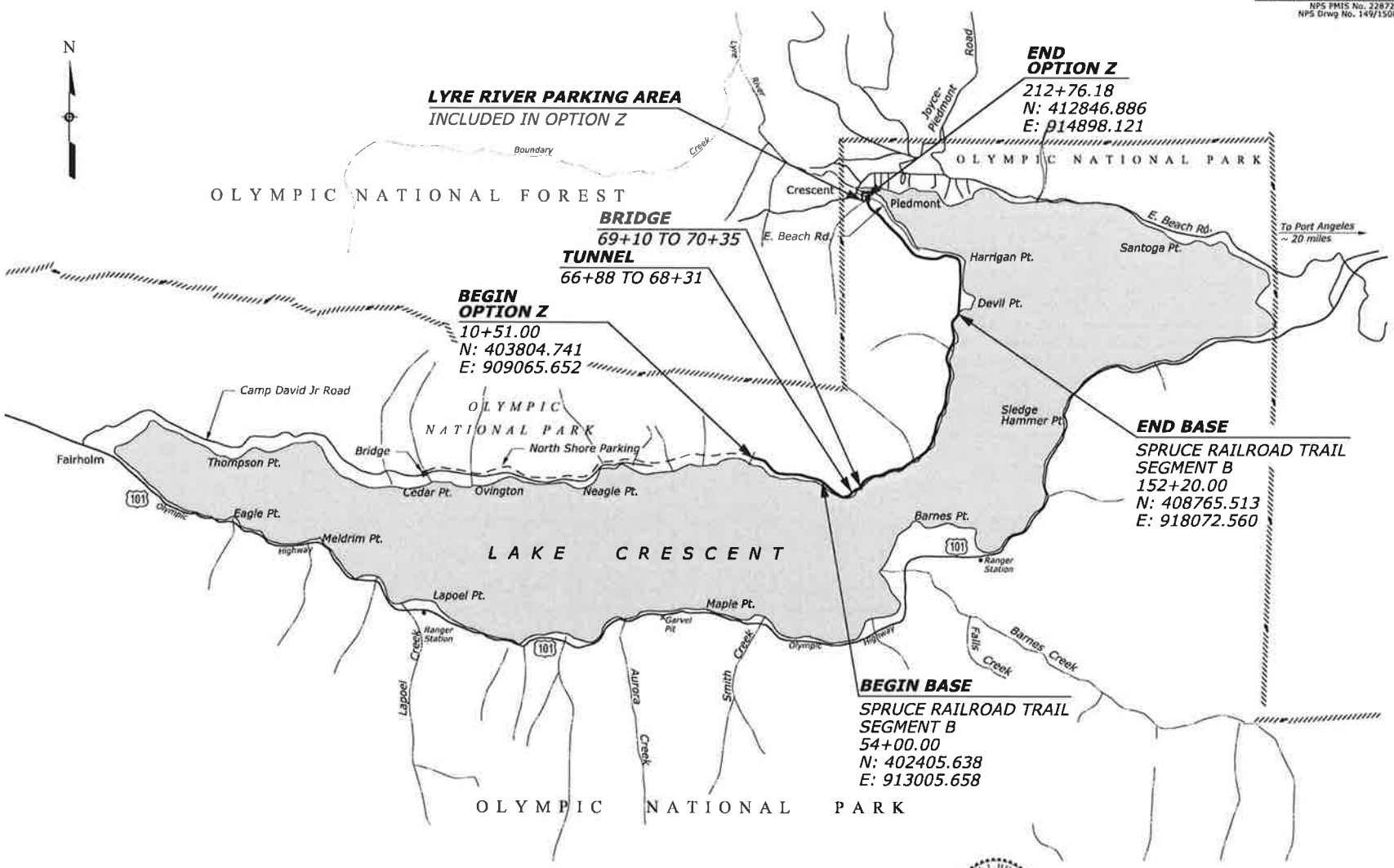
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	A.4

NPS PMIS No. 228726
NPS Drwg No. 149/150822



VICINITY MAP

SUMMARY OF QUANTITIES - BASE

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	B.1

NPS PMIS No. 228726
NPS DRWG No. 149/150822

AMEND	Line Item No.	Pay Item Number	Pay Item Description	Unit	Sheet and Description: Section C TYPICAL SECTIONS	Section D PLAN & PROFILE	Section E EROSION CONTROL	Section F DRAINAGE	Section G TUNNEL	Section H MSE WALL	Section I STRUCTURES	Section J EXTERIOR ROCKFALL MITIGATION	MISCELLANEOUS	ALLOWANCE		Estimated Quantities: Bid Schedule	Remarks and/or Determination of Estimated Quantity
	A0020	15101-0000	MOBILIZATION	LPSM												ALL	
	A0040	15201-0000	CONSTRUCTION SURVEY AND STAKING	LPSM												ALL	
	A0060	15301-0000	CONTRACTOR QUALITY CONTROL	LPSM												ALL	
	A0080	15401-0000	CONTRACTOR TESTING	LPSM												ALL	
	A0100	15501-0000	CONSTRUCTION SCHEDULE	LPSM												ALL	
	A0120	15705-0100	SOIL EROSION CONTROL, SILT FENCE	LNFT			500									500	
	A0140	15705-1400	SOIL EROSION CONTROL, FIBER ROLL	LNFT			200									200	
	A0160	15705-2000	SOIL EROSION CONTROL, FLOATING TURBIDITY CURTAIN	LNFT			200									200	
	A0180	20101-0000	CLEARING AND GRUBBING	ACRE		2.1										2.1	
	A0200	20401-0000	ROADWAY EXCAVATION	CUYD		7,216								64		7,280	
	A0220	20435-2000	BACKFILL, GRANULAR	CUYD	70											70	
	A0240	20701-0100	SEPARATION-STABILIZATION GEOTEXTILE, CLASS 1, TYPE A (NONWOVEN)	SQYD	15,250			117						133		15,500	
	A0260	20801-0000	STRUCTURE EXCAVATION	CUYD							80			10		90	
	A0280	20810-0000	SHORING AND BRACING	LPSM						All						ALL	
	A0300	25101-0200	PLACED RIPRAP, METHOD A, CLASS 2	CUYD				45						5		50	
	A0320	25101-0300	PLACED RIPRAP, METHOD A, CLASS 3	CUYD	1,825					345				75		2,245	
	A0340	25501-1000	MECHANICALLY STABILIZED EARTH WALL, WELDED WIRE FACE (Contractor Designed)	SQFT						5,917						5,917	
	A0360	25701-0200	CONTRACTOR FURNISHED MECHANICALLY STABILIZED EARTH WALL DESIGN	LPSM						All						ALL	
	A0380	26001-0000	ROCK BOLT (25 KIP EXTERIOR)	LNFT								2,615				2,615	
	A0400	26001-0000	ROCK BOLT (50 KIP EXTERIOR)	LNFT								640				640	
	A0420	26002-0000	ROCK DOWEL (TRANSITION)	LNFT					100							100	
	A0440	26002-0000	ROCK DOWEL (EXTERIOR)	LNFT								685				685	
	A0460	26002-0000	ROCK DOWEL (INTERIOR)	LNFT					1,600							1,600	
	A0480	30201-2000	ROADWAY AGGREGATE, METHOD 2	CUYD	3,790											3,790	Contract Quantity
	A0500	55201-0200	STRUCTURAL CONCRETE, CLASS A (AE)	CUYD							26					26	Contract Quantity
	A0520	55401-1000	REINFORCING STEEL	LB							2,634					2,634	Contract Quantity
	A0540	55504-0000	PRE-FABRICATED STEEL BRIDGE	LPSM							All					ALL	

MileStone: 100% edited-10-4-19
Date Completed: In Progress
Report Date: 10/03/19

SUMMARY OF QUANTITIES - BASE

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	B.2

NPS PMIS No. 228726
NPS DRWG No. 149/150822

AMEND	Line Item No.	Pay Item Number	Pay Item Description	Unit	Section C TYPICAL SECTIONS	Section D PLAN & PROFILE	Section E EROSION CONTROL	Section F DRAINAGE	Section G TUNNEL	Section H MSE WALL	Section I STRUCTURES	Section J EXTERIOR ROCKFALL MITIGATION	MISCELLANEOUS	ALLOWANCE		Estimated Quantities Bid Schedule	Remarks and/or Determination of Estimated Quantity
	A0560	55601-0900	BRIDGE RAILING, STEEL (Approach)	LNFT							24					24	
	A0580	55706-1000	STRUCTURAL TIMBER AND LUMBER, UNTREATED	LPSM					All							ALL	
	A0600	56601-0000	SHOTCRETE (MIN 4-INCH)	SQYD					480							480	
	A0620	56601-0000	SHOTCRETE (MIN 3-INCH)	SQYD					360							360	
	A0640	56701-0000	MICROPILE (7" OD x 0.5" WT, Installed in 10" Diam. Bored Hole)	LNFT							128					128	
	A0660	56705-0000	MICROPILE LOAD VERIFICATION TEST	EACH							1					1	
	A0680	56706-0000	MICROPILE PROOF LOAD TEST	EACH							2					2	
	A0700	60201-0800	24-INCH PIPE CULVERT	LNFT				339						20		359	
	A0720	60210-0800	END SECTION FOR 24-INCH PIPE CULVERT	EACH				12								12	
	A0740	60504-0000	GEOCOMPOSITE SHEET DRAIN SYSTEM	SQYD					40							40	
	A0760	62201-0250	DUMP TRUCK, 10 CUBIC YARD MINIMUM CAPACITY	HOUR										100		100	
	A0780	62201-3150	HYDRAULIC EXCAVATOR, CRAWLER MOUNTED, 1.0 CUBIC YARD MINIMUM CAPACITY WITH THUMB ATTACHMENT	HOUR										100		100	
	A0800	62302-0100	SPECIAL LABOR, SLOPE SCALING (SAFETY SCALING)	HOUR								20				20	
	A0820	62302-0100	SPECIAL LABOR, SLOPE SCALING	HOUR					40			860				900	
	A0840	62405-0300	PLACING CONSERVED TOPSOIL, 4-INCH DEPTH	SQYD			11,210							40		11,250	
	A0860	62515-1000	MULCHING, DRY METHOD (CONSERVED CHIP DEBRIS, 4" DEPTH)	ACRE			2.1							0.1		2.2	
	A0880	62515-3000	MULCHING, HYDRAULIC METHOD, BONDED FIBER MATRIX	ACRE			0.2							0.3		0.5	
	A0900	63302-0000	SIGN SYSTEM	SQFT		40.1										40.1	
	A0920	63501-0000	TEMPORARY TRAFFIC CONTROL	LPSM												ALL	
	A0940	64703-1000	MITIGATION, LANDSCAPING LOG	EACH			35									35	
	A0960	65101-1000	DRAPED ROCKFALL PROTECTION, WIRE MESH (EXTERIOR)	SQYD								6,800				6,800	
	A0980	65301-0000	MIDSLOPE ROCKFALL ATTENUATOR	SQYD								200				200	
	A1000	65501-0000	ANCHORED WIRED MESH SYSTEM	SQYD					120							120	

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Date Completed: In Progress
Report Date: 10/03/19

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SUMMARY OF QUANTITIES - Option Z

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	B.3

NPS PMIS No. 228726
NPS DRWG No. 149/150822

AMEND	Line Item No.	Pay Item Number	Pay Item Description	Unit	Sheet and Description: Section C TYPICAL SECTIONS	Section D PLAN & PROFILE	Section E EROSION CONTROL	Section F DRAINAGE	Section G TUNNEL	Section H MSE WALL	Section I STRUCTURES	Section J EXTERIOR ROCKFALL MITIGATION	MISCELLANEOUS	ALLOWANCE		Estimated Quantities: Bid Schedule	Remarks and/or Determination of Estimated Quantity
	Z0020	15101-0000	MOBILIZATION	LPSM												ALL	
	Z0040	15201-0000	CONSTRUCTION SURVEY AND STAKING	LPSM												ALL	
	Z0060	15301-0000	CONTRACTOR QUALITY CONTROL	LPSM												ALL	
	Z0080	15401-0000	CONTRACTOR TESTING	LPSM	All	All										ALL	
	Z0100	21201-0000	LINEAR GRADING	MILE		2.0										2.0	
	Z0120	30201-2000	ROADWAY AGGREGATE, METHOD 2	CUYD	1,205											1,205	Contract Quantity
	Z0140	40301-0100	ASPHALT CONCRETE PAVEMENT, TYPE 1 (3 inch compacted depth)	TON	3,315	425								60		3,800	
	Z0160	60201-0400	12-INCH PIPE CULVERT	LNFT				10								10	
	Z0180	60915-1000	WHEELSTOP, CONCRETE	EACH		20										20	
	Z0200	63401-0100	PAVEMENT MARKINGS, TYPE A, SOLID (WHITE)	LNFT		890										890	
	Z0220	63405-0450	PAVEMENT MARKINGS, TYPE A, ACCESSIBILITY SYMBOL (WHITE)	EACH		2										2	
	Z0240	63501-0000	TEMPORARY TRAFFIC CONTROL	LPSM												ALL	

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Date Completed: In Progress
Report Date: 10/03/19

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STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	C.1

NPS PMIS No. 228726
NPS Drwg No. 149/150822

TYPICAL SECTION QUANTITES

ITEM	DESCRIPTION	QUANTITY BASE	QUANTITY OPTION Z	UNITS	ESTIMATING VALUE
20435-2000	BACKFILL GRANULAR	70	0	CUYD	
20701-0100	SEPARATION-STABILIZATION GEOTEXTILE, CLASS 1, TYPE A (NONWOVEN)	15250	0	SQYD	
25101-3000	PLACED RIPRAP, METHOD A, CLASS 3	1825	0	CUYD	
30201-2000	ROADWAY AGGREGATE, METHOD 2	3790	1205	CUYD	CONTRACT QUANTITY
40301-0100	ASPHALT CONCRETE PAVEMENT, TYPE 1 (3 INCH COMPACTED DEPTH)	0	3315	TON	2.05 TON/CUYD

FOOTNOTES:

[1] Fill slope is 1:2 unless otherwise noted, see cross sections.

[2] In cut section, ditch depth is 1' unless otherwise noted.

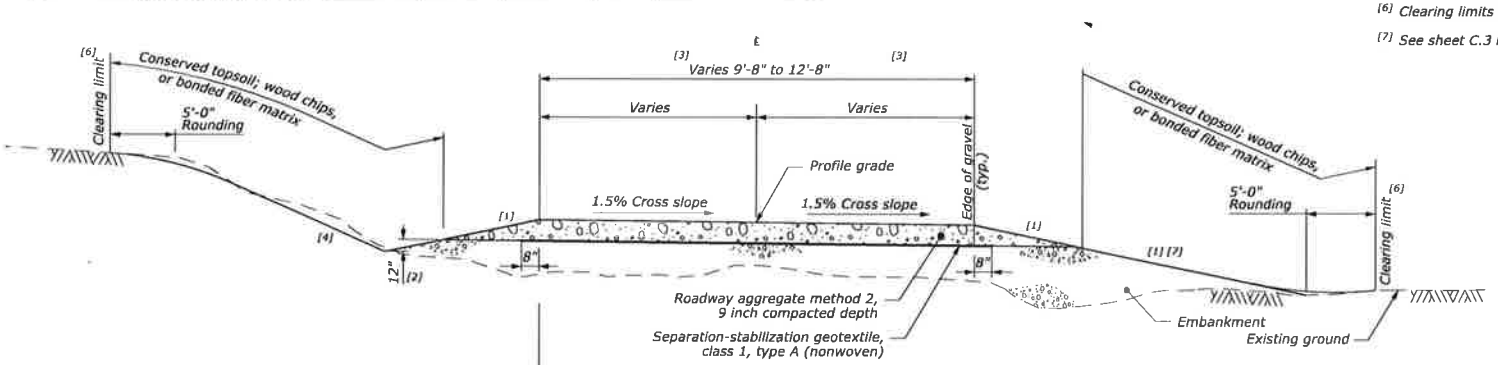
[3] See D Section plans for tapers.

[4] Cut slope is 1:1.5 unless otherwise noted, see cross sections.

[5] Not used

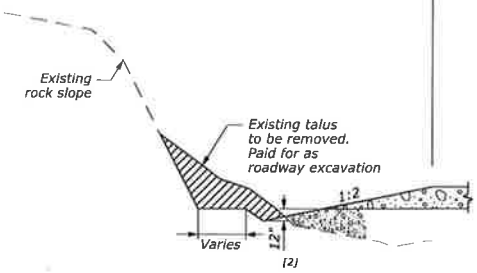
[6] Clearing limits per Clearing Report.

[7] See sheet C.3 for slope benching and riprap fill.



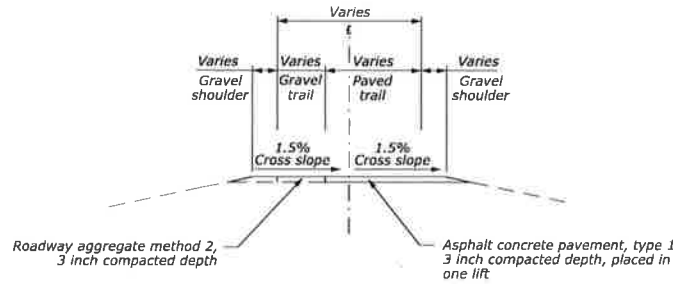
SPRUCE RAILROAD TRAIL

54+00.00 to 66+88.00
68+31.00 to 69+10.00
70+35.00 to 152+20.00
Bridge 69+10.00 TO 70+35.00
(See sheet C.2 for Wall Section)



LEFT SIDE WITH TALUS REMOVAL

54+00.00 to 56+30.00
60+10.00 to 64+10.00
71+50.00 to 72+90.00
82+70.00 to 83+50.00
84+30.00 to 85+30.00
86+10.00 to 86+70.00
116+70.00 to 118+50.00
120+30.00 to 120+50.00



TYPICAL PAVING SECTION

OPTION Z ONLY
10+51.00 to 212+76.18

GENERAL NOTES:

1. Stockpile topsoil during clearing and grubbing and from excavation for placement under "Placing conserved topsoil, 4-inch depth". Stockpiling is incidental to other bid items.

2. Verify existing ground elevation prior to staking due to previous road pioneering and tree cutting.

NO SCALE

TYPICAL SECTIONS

Designed by: T. La 04/2017 | Checked by: B. Huschke 08/2019

J:\DCS\Projects\TFN\0541215_WFL\Spruce\B1300>CAD>CES\9110-CAD\Sb>SHEETS\B_Olym2017(1)_ca.dgn [US_Sur_2d]

8 October 2019 11:31 AM

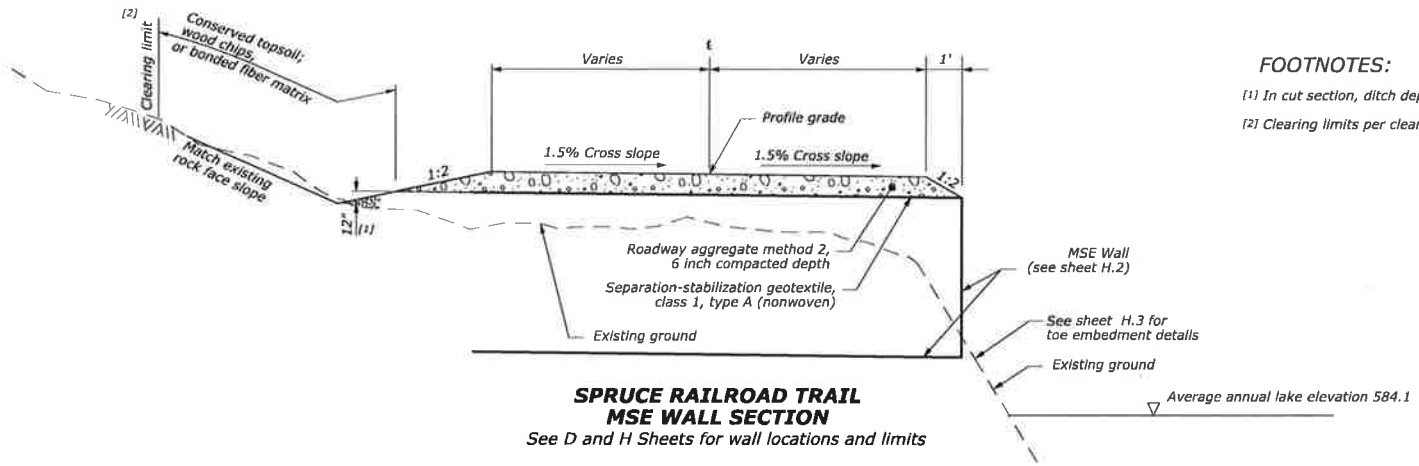
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	C.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822

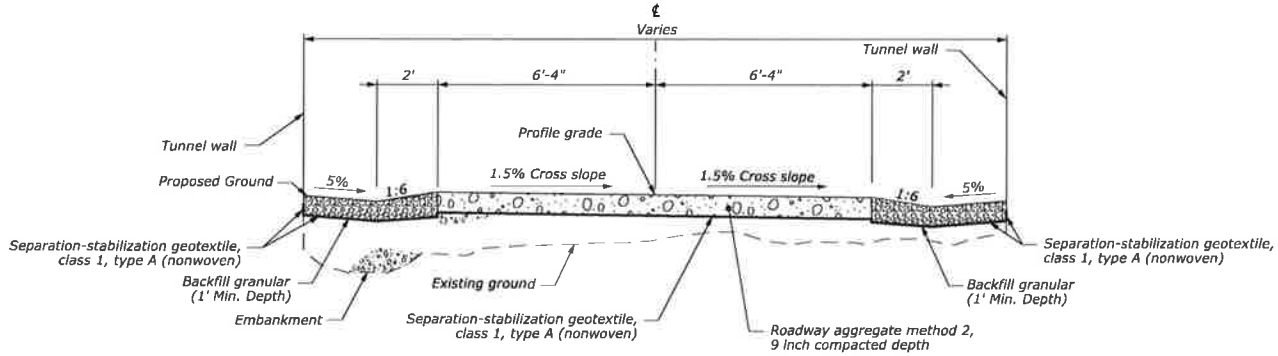
FOOTNOTES:

[1] In cut section, ditch depth is 1' unless otherwise noted.

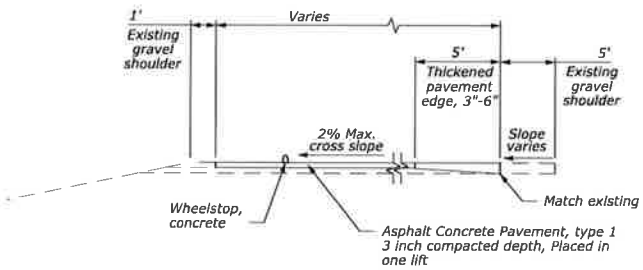
[2] Clearing limits per clearing report.



SPRUCE RAILROAD TRAIL
MSE WALL SECTION
See D and H Sheets for wall locations and limits



SPRUCE RAILROAD TRAIL
INNER TUNNEL TRAIL
66+88.00 to 68+31.00
See G Sheets



LYRE RIVER PARKING LOT AREA
OPTION Z ONLY

NO SCALE

TYPICAL SECTIONS

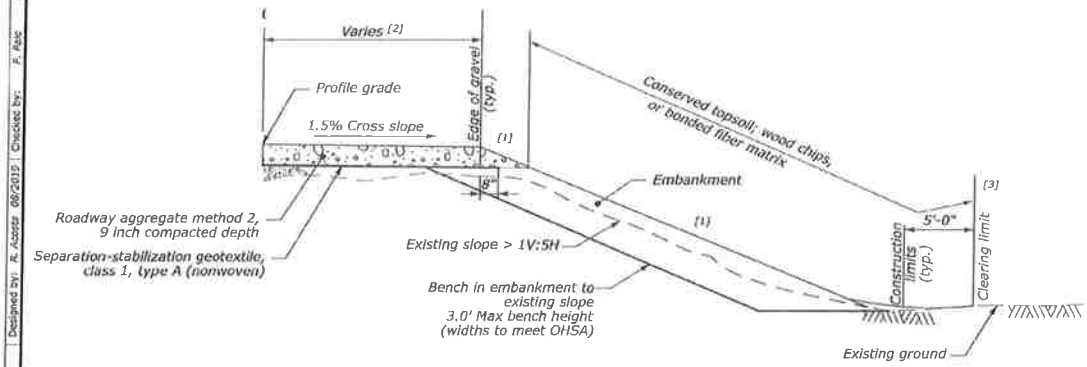
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 220726 NPS Dwg No. 149/150822	C.3

FOOTNOTES:

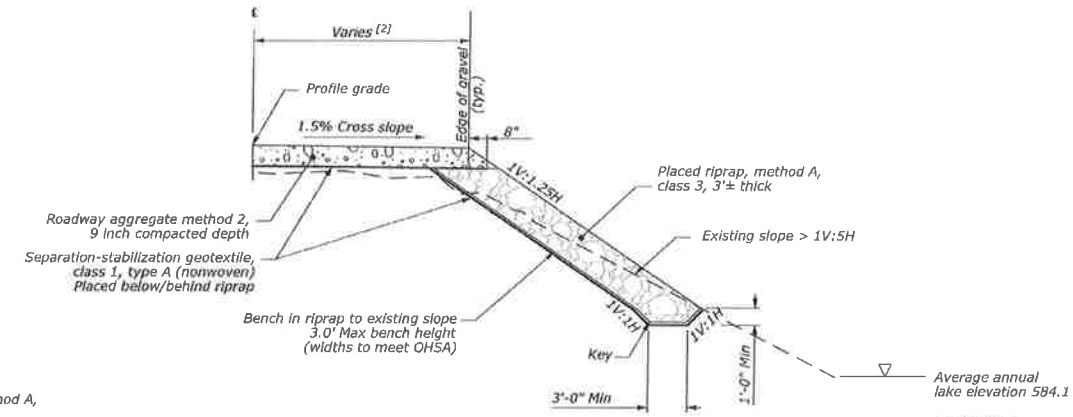
[1] Fill slope is 1V:2H unless otherwise noted, see cross sections.

[2] See D Section plans for tapers.

[3] Clearing limits per Clearing Report.

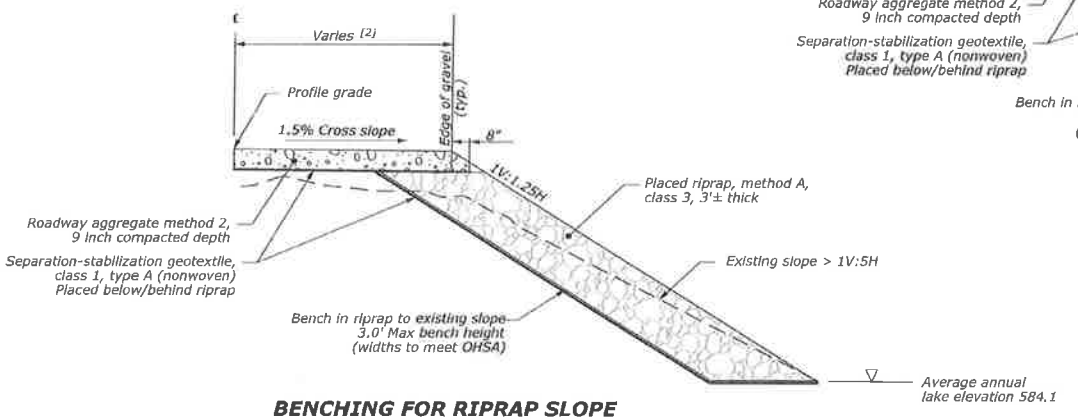


BENCHING FOR NON-RIPRAP SLOPE WITH TOE ABOVE LAKE LEVEL



BENCHING FOR RIPRAP SLOPE WITH TOE ABOVE LAKE LEVEL

71+10 to 71+30	87+50 to 87+70
72+60 to 73+60	87+90 to 89+10
76+50 to 76+90	94+30 to 94+70
77+30 to 77+70	95+10 to 95+30
78+30 to 79+60	108+70 to 110+40
80+00 to 80+50	117+10 to 117+90
81+20 to 82+30	118+50 to 118+80
86+40 to 86+70	



BENCHING FOR RIPRAP SLOPE WITH TOE AT LAKE LEVEL

76+90 to 77+30
79+60 to 80+00
87+70 to 87+90
94+70 to 95+10

NO SCALE

RISHENG PIAO
STATE OF WASHINGTON
53578
REGISTERED PROFESSIONAL ENGINEER

EXPIRES: 5/13/2021

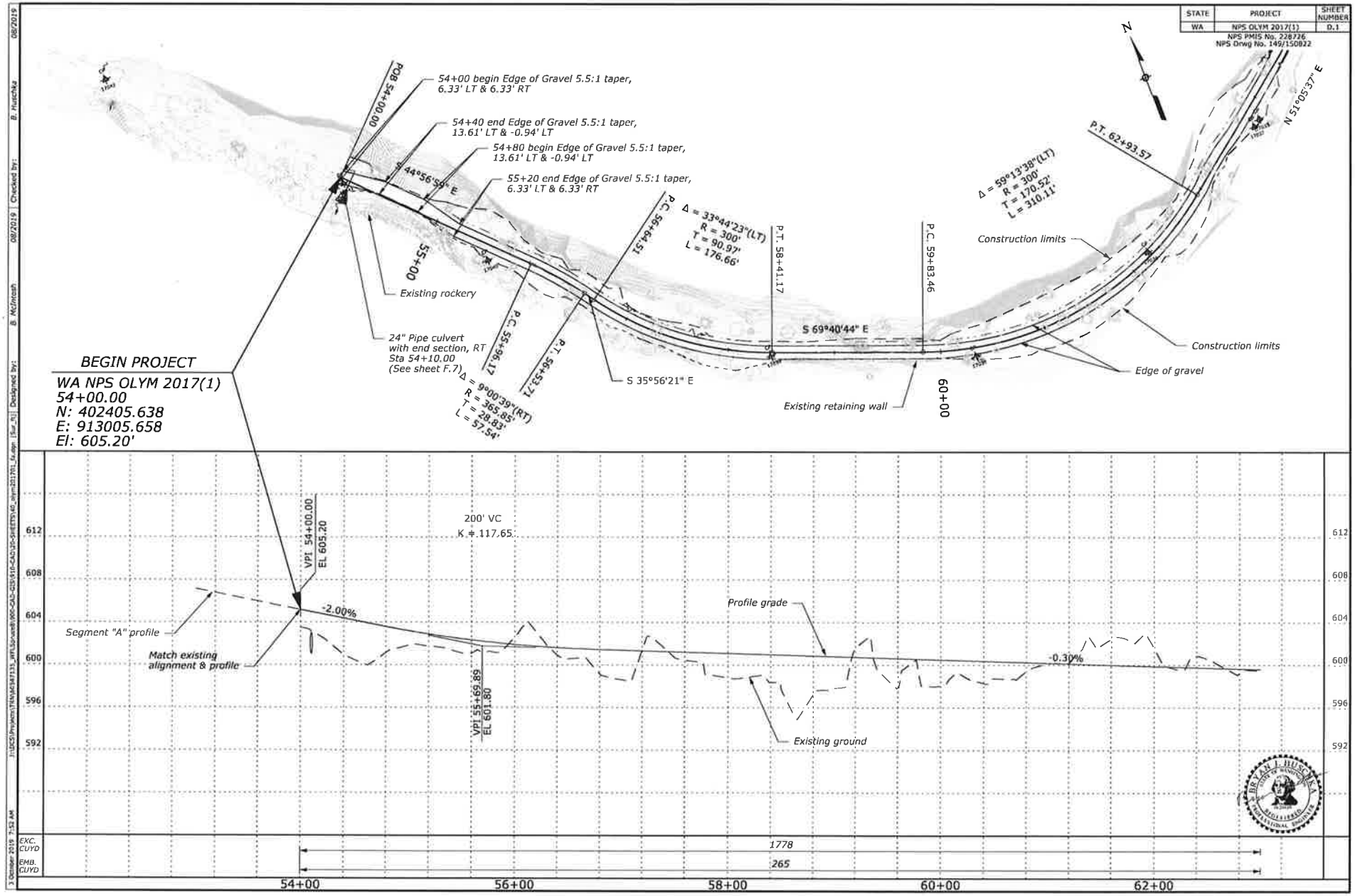
SLOPE BENCHING TYPICAL SECTIONS

Designed by: R. Acosta 08/2019 | Checked by: R. Pelc 08/2019

8 October 2019 6:44 PM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.1

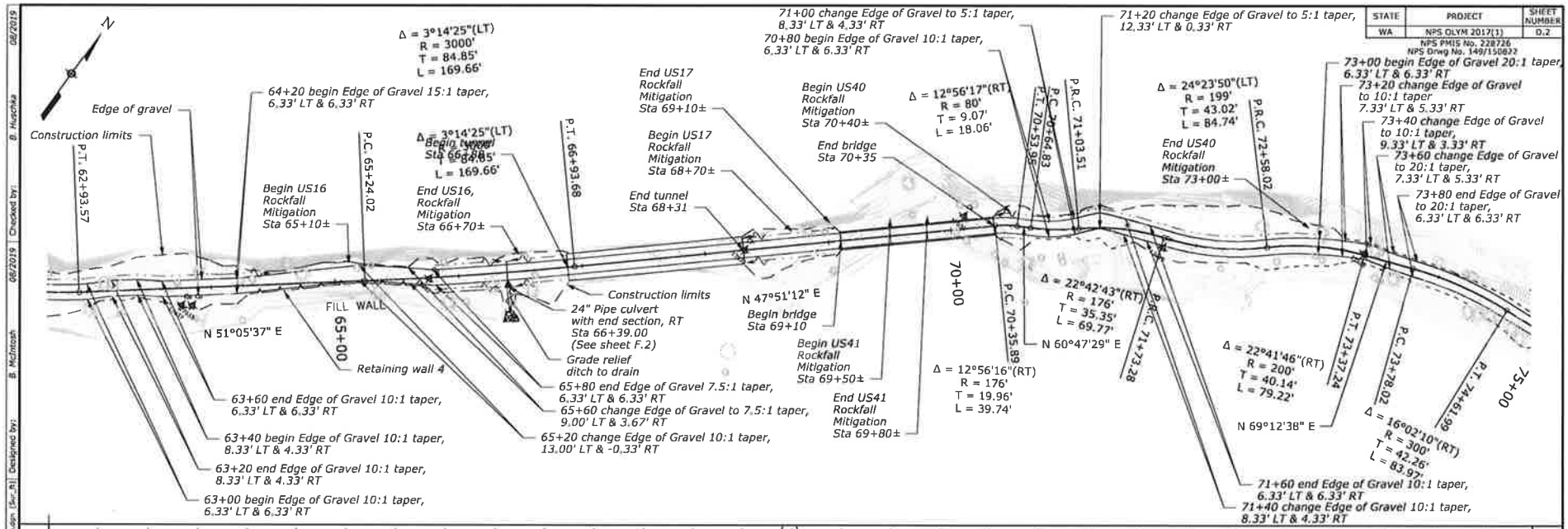
NPS PMIS No. 228726
NPS Drwg No. 149/150822

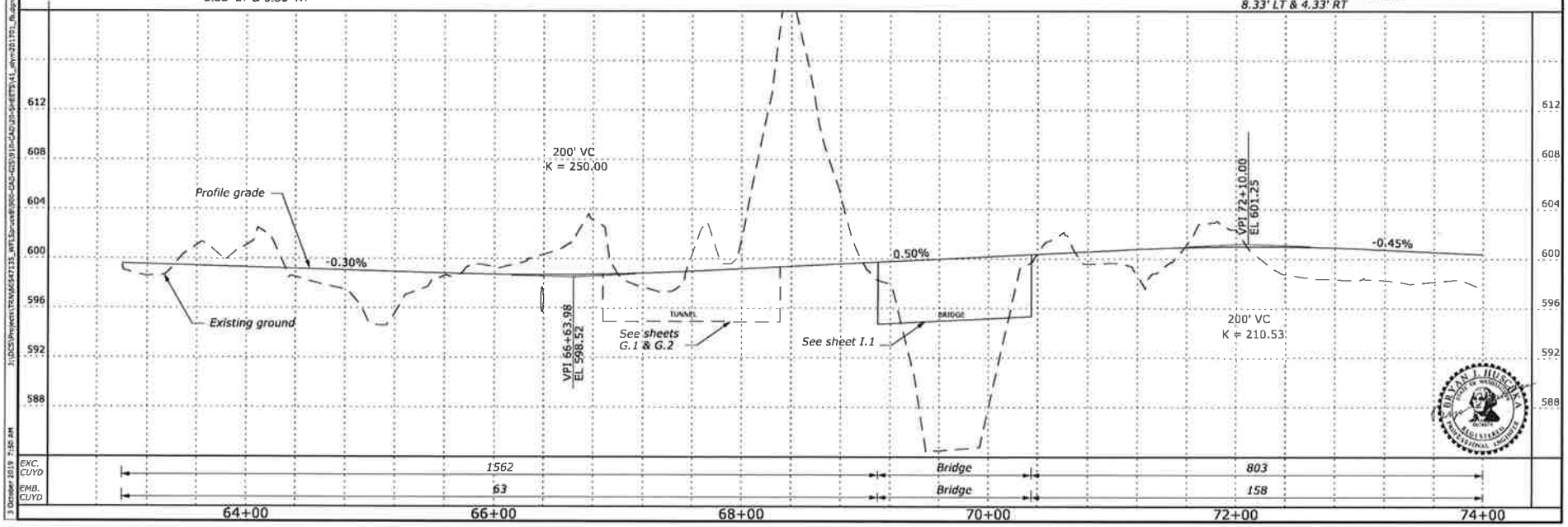


3 October 2019 7:52 AM | J:\DCS\Projects\TRANS\4547135_NPS\Survey\900-CAD-CIS\610-CAD\20-SHEETS\40_olym2017(1)_Rudge [Sur_TL] | Designed by: B. McIntosh | Checked by: B. Hudachka | 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822



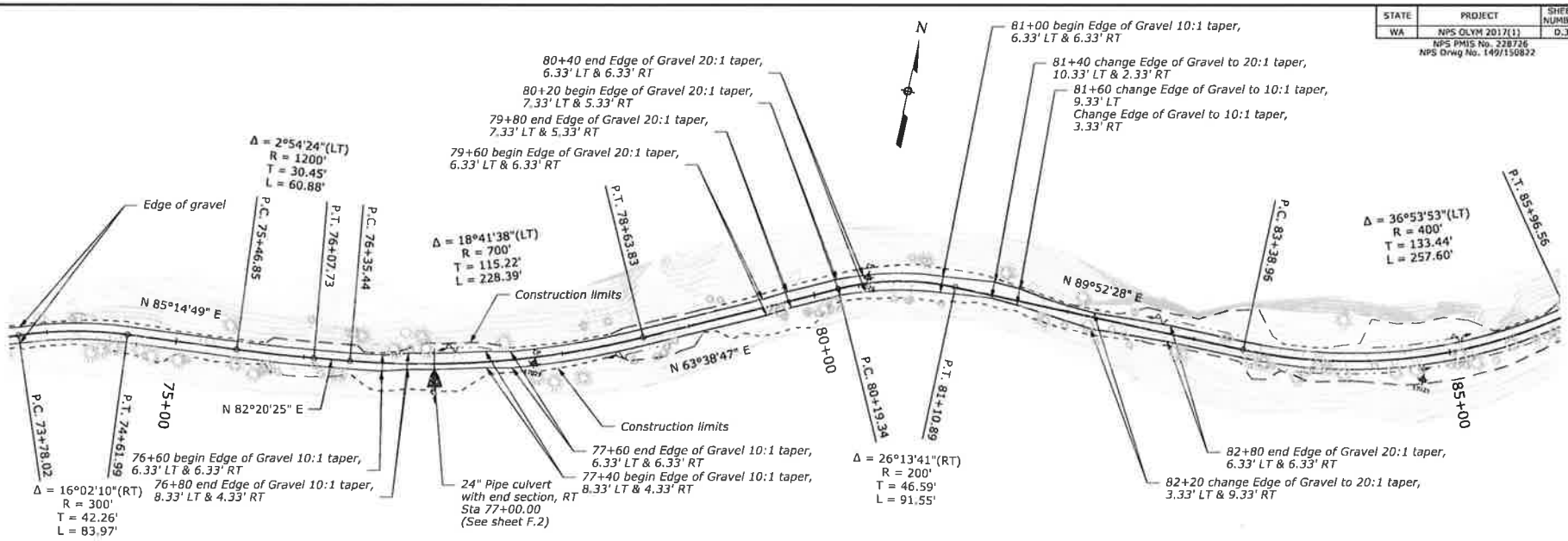


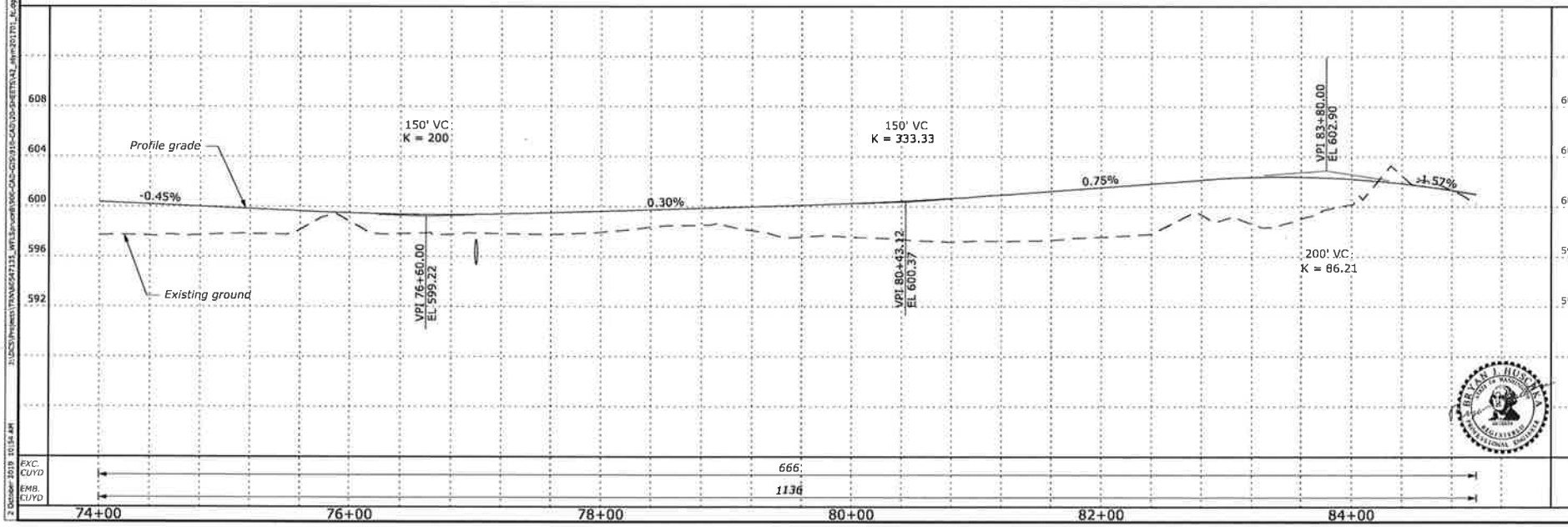
BRYAN J. HUDSKA
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

3 October 2019 7:50 AM | Designed by: B. McIntosh | Checked by: B. Hudska | 08/2019 | 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.3

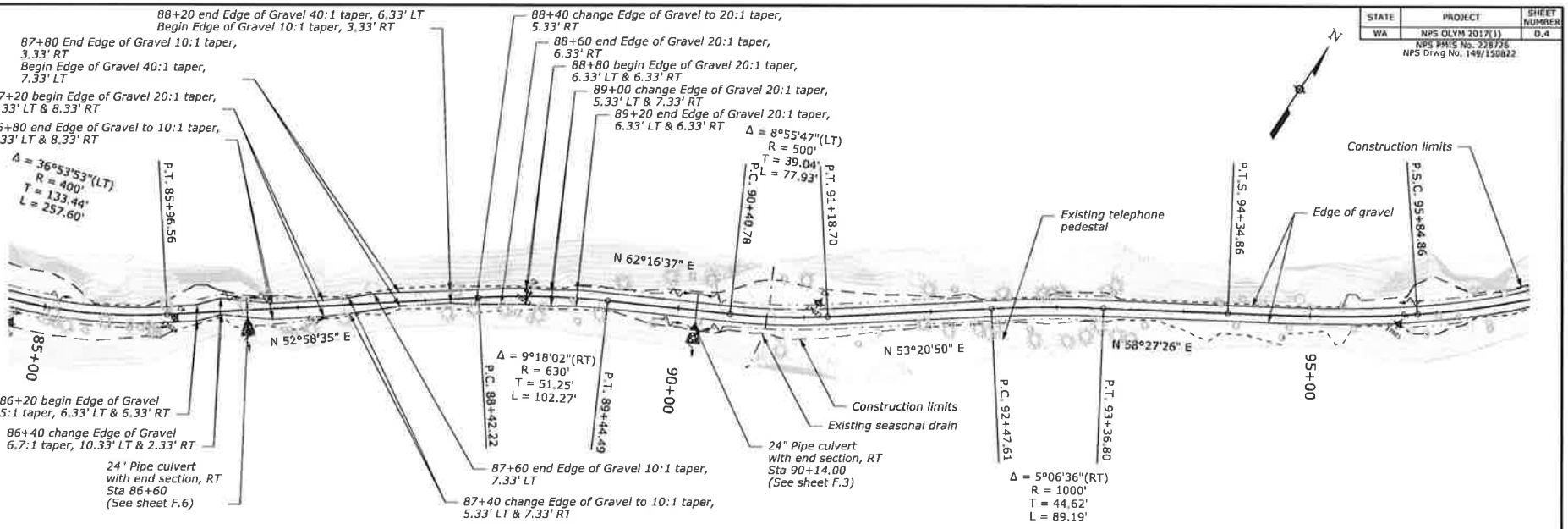
NPS PMIS No. 228726
NPS Drwg No. 149/150822

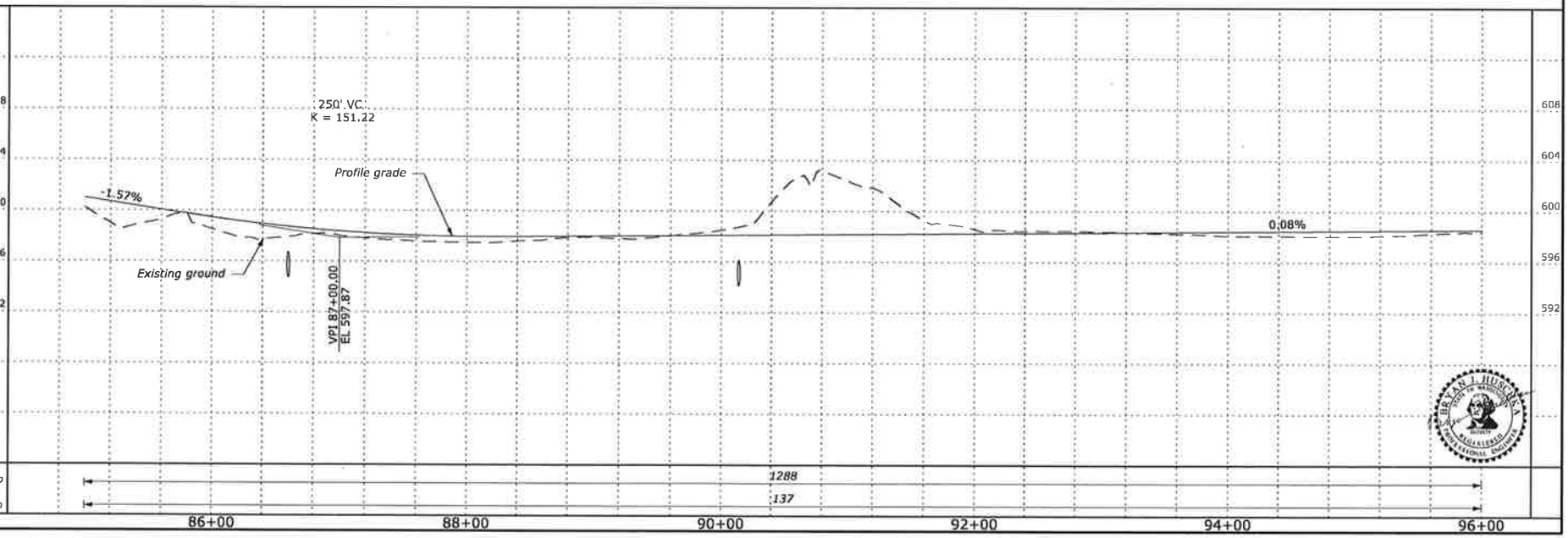




STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	0.4

NPS PMIS No. 228726
NPS Drwg No. 149/150822

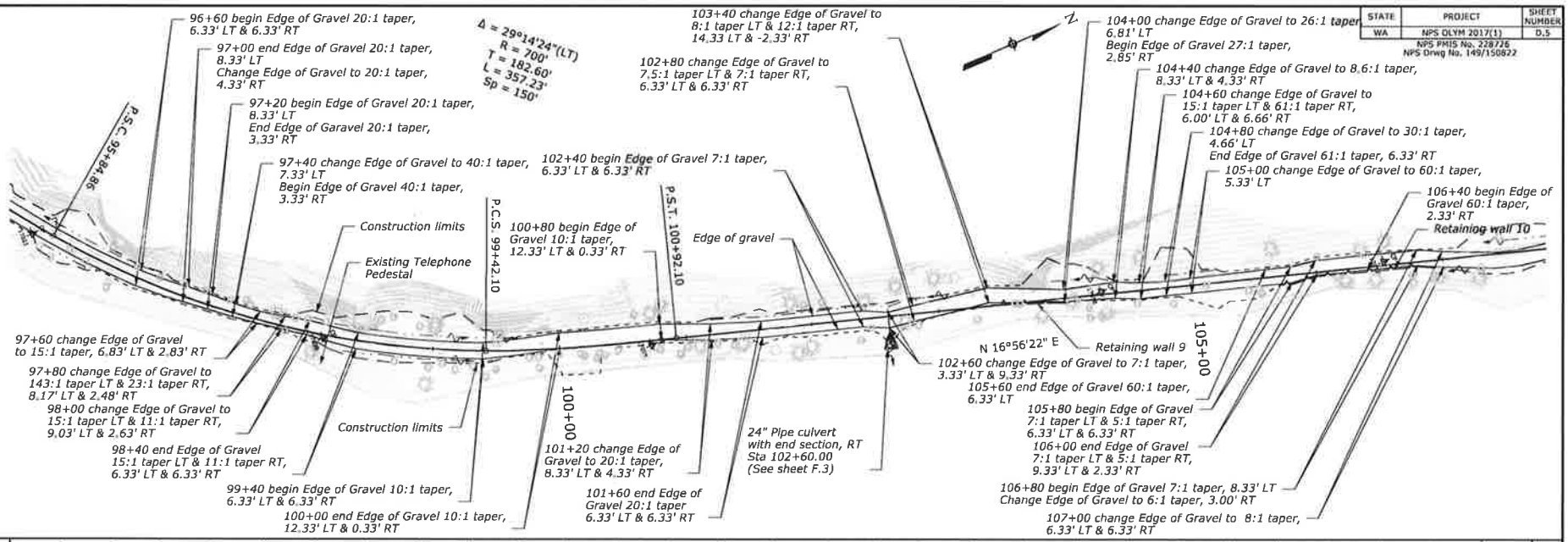


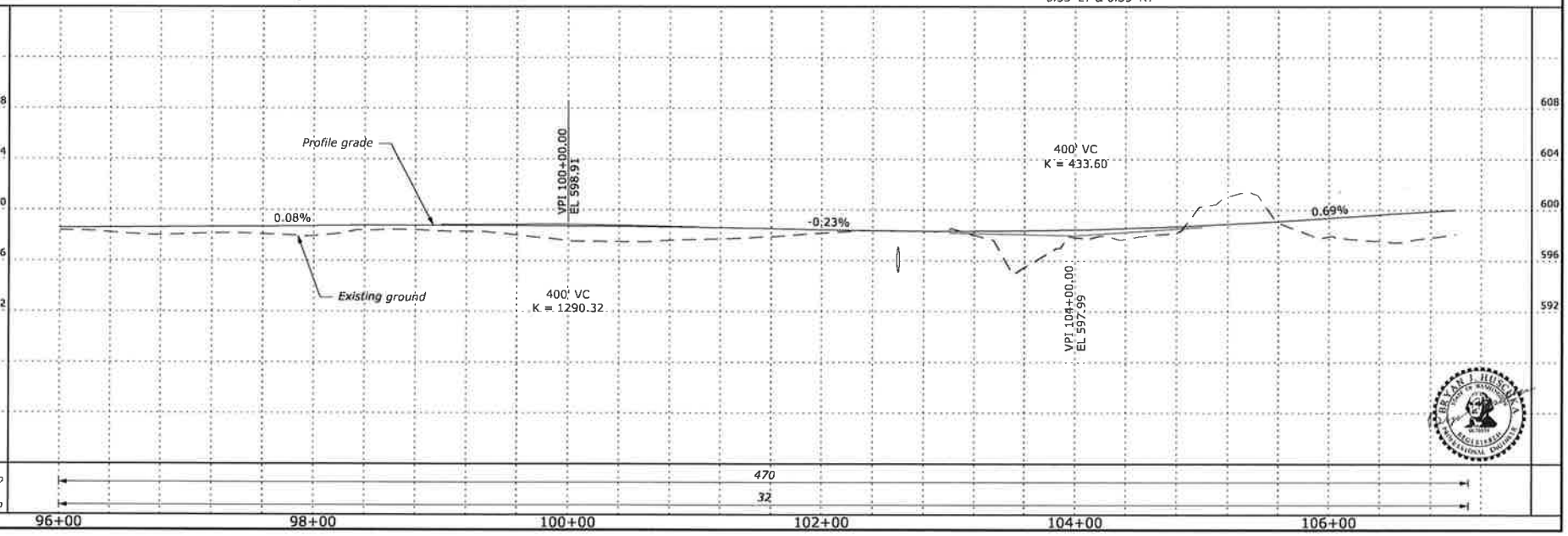


11 September 2019 12:57 PM | J:\DCS\Projects\TRANS\547133_WFLSprucelB\900-CAD\20-Sheet\F\0.47_olym201701_ltd.dgn [Sur_R] | Designed by: B. McIntosh 08/2019 | Checked by: B. Hutchka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.5

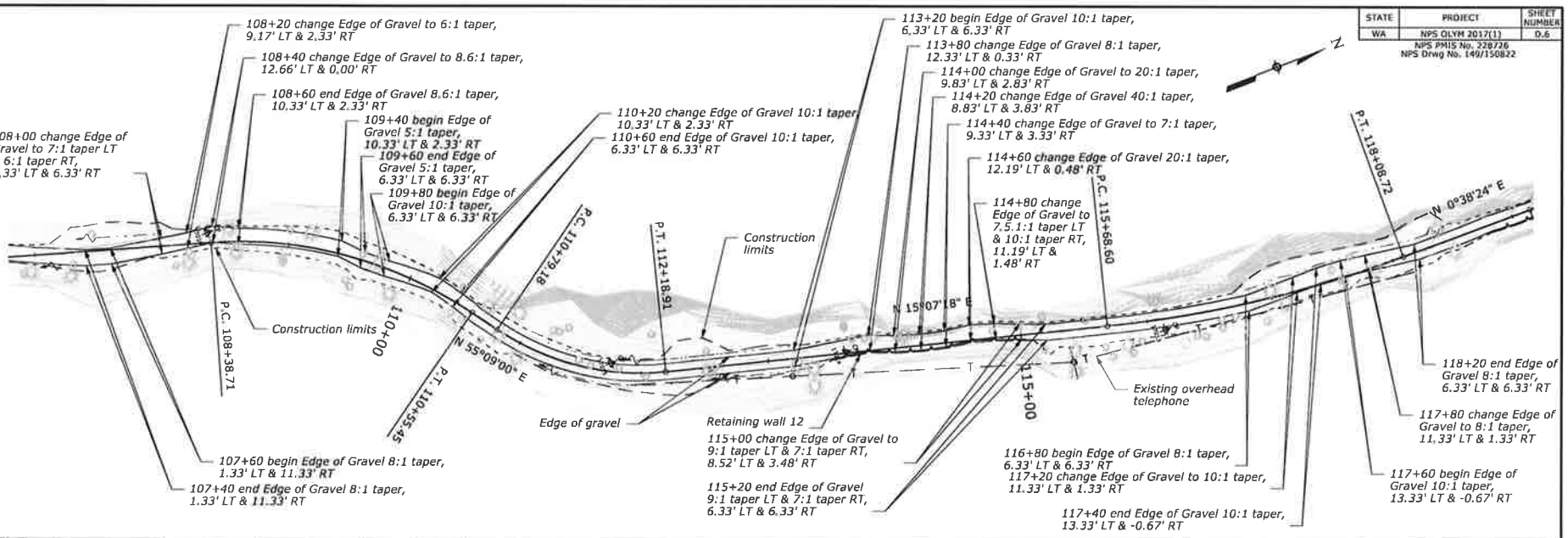
NPS PMIS No. 228726
NPS Drwg No. 149/150822

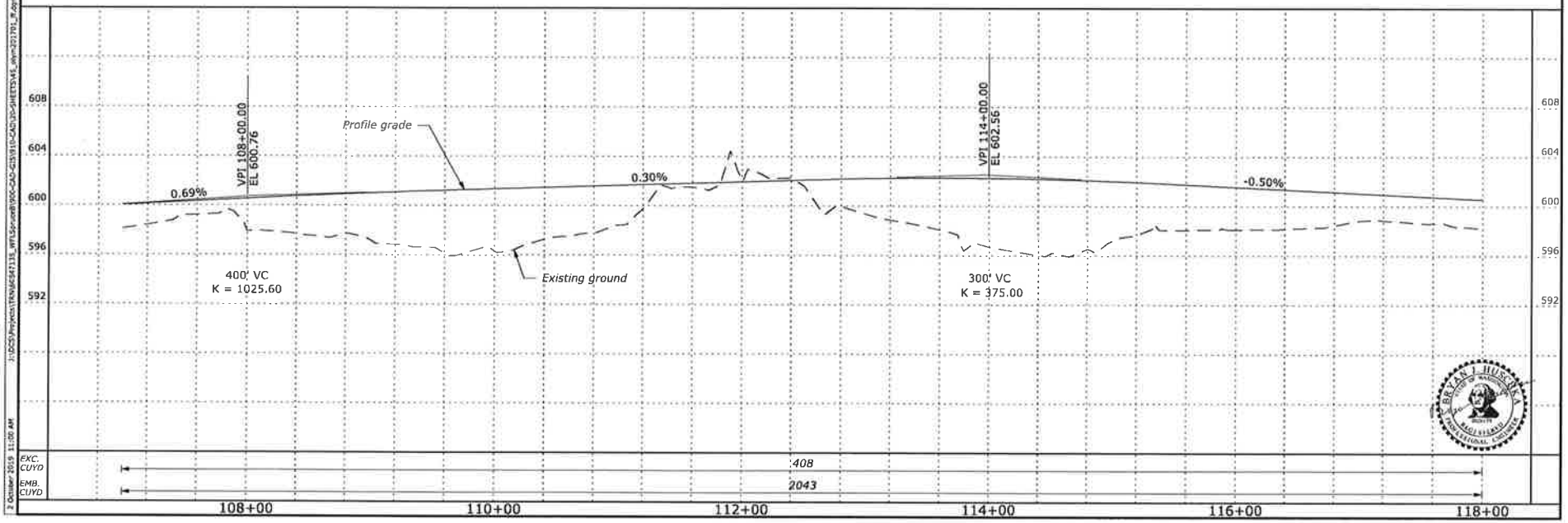




STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.6

NPS PMIS No. 228726
NPS Drwg No. I49/150822



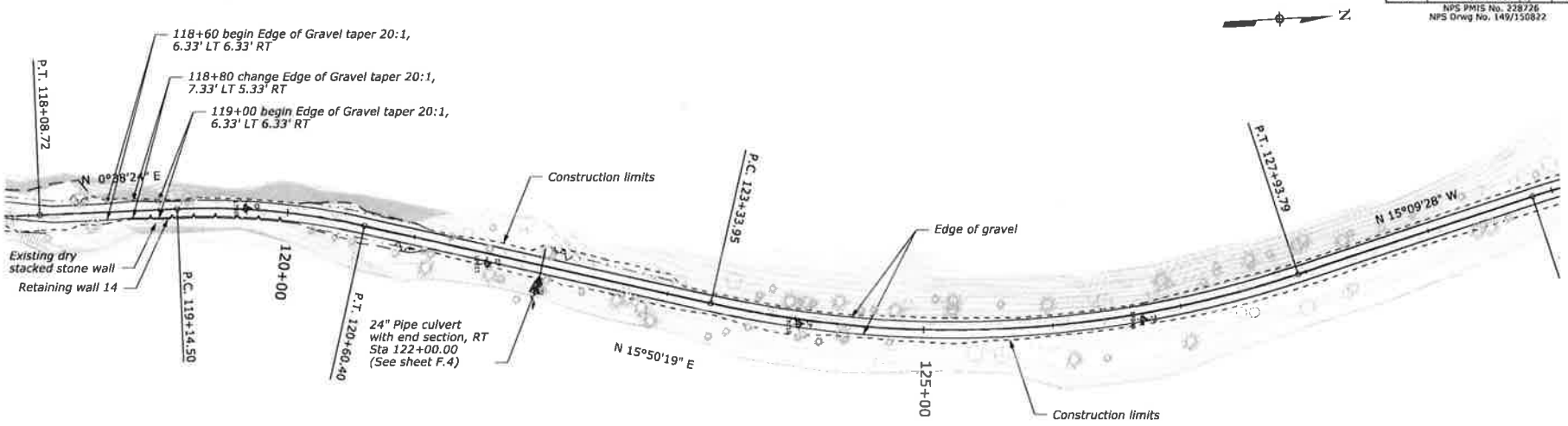


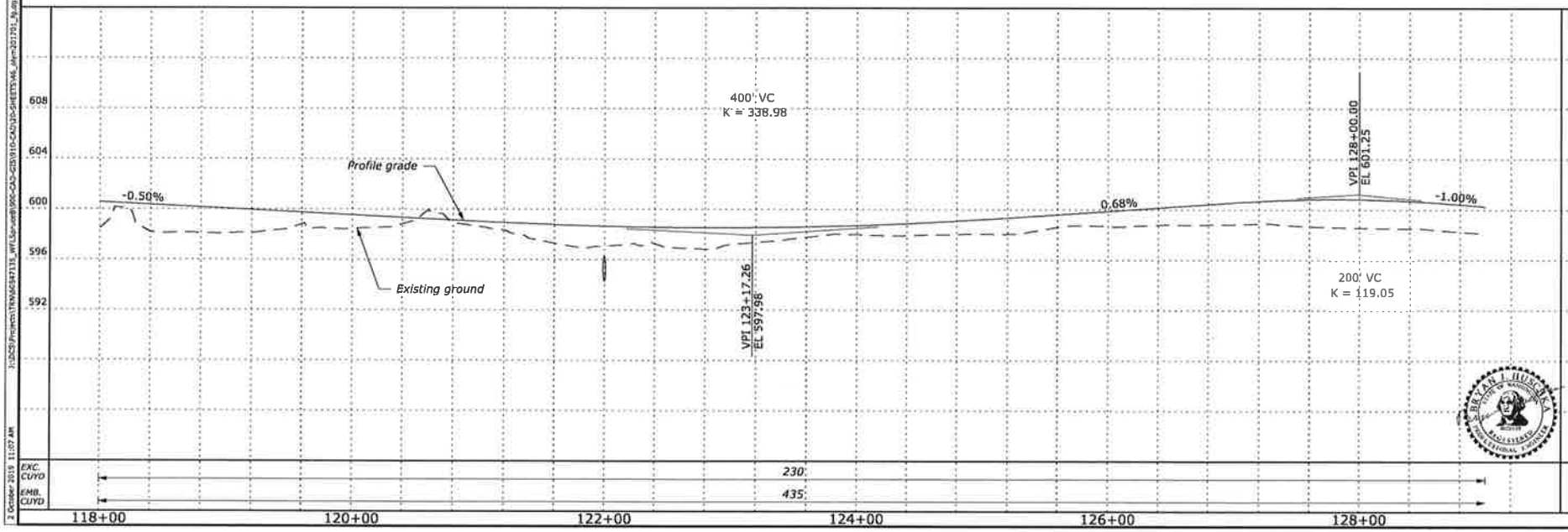
BRIAN J. HUSCHKA
STATE OF WASHINGTON
45417
REGISTERED PROFESSIONAL ENGINEER

2 October 2019 11:00 AM | J:\DCS\Projects\TRANSE541113_WFLSc-ove\9900-CAD-425918-CAD\20-SHEETS\45_olym-201701_P.dgn | Sw_RJ | Designed by: B. McIntosh 08/2019 | Checked by: B. Huschka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.7

NPS PMIS No. 228726
NPS Drwg No. 149/150822





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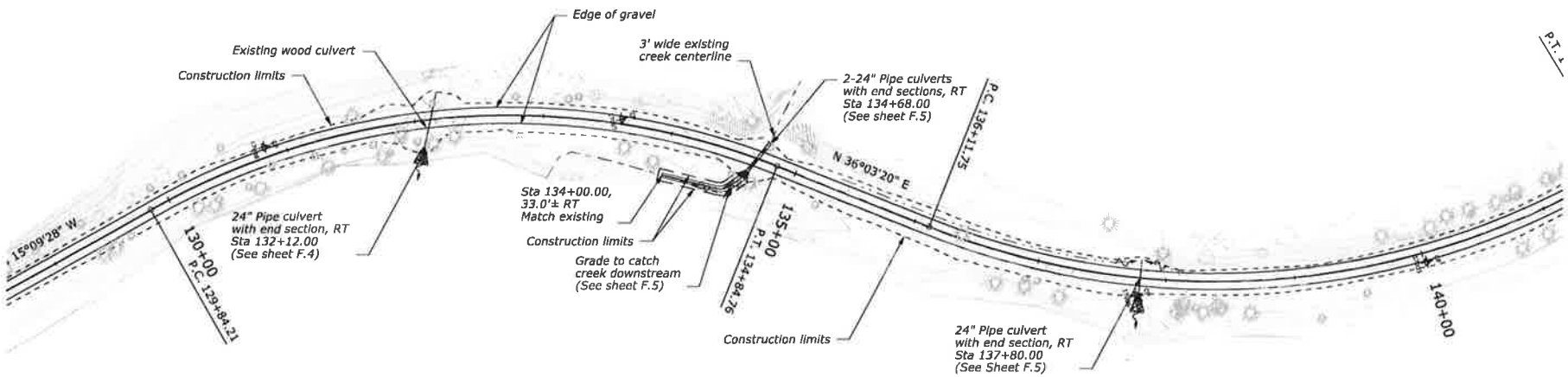
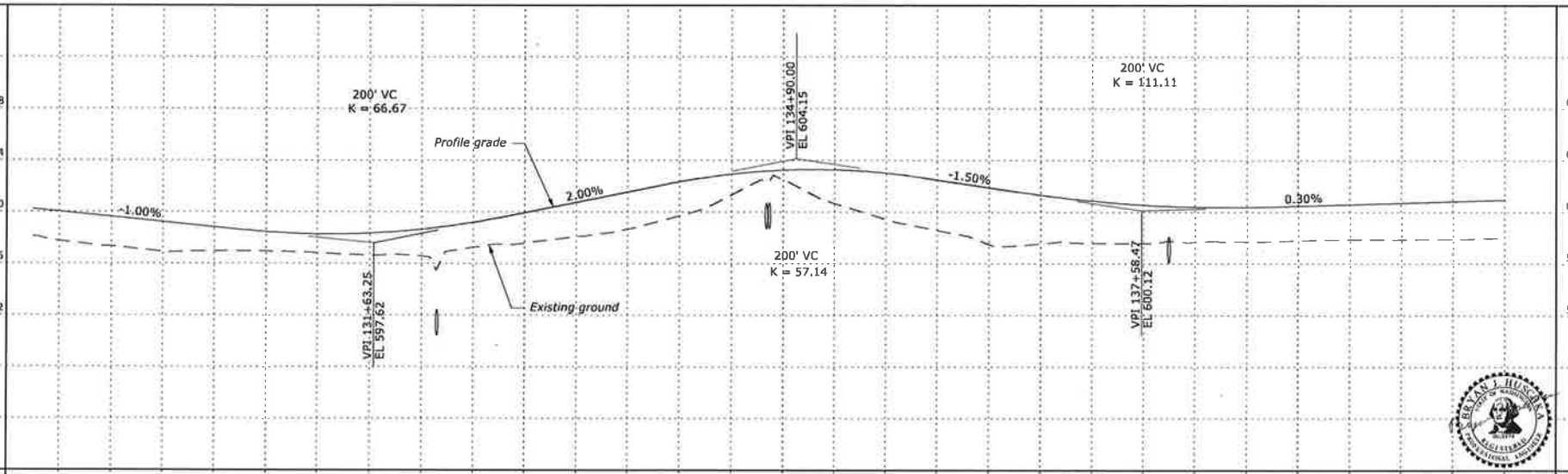
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.8

NPS PMIS No. 228726
NPS Drwg No. 149/150822



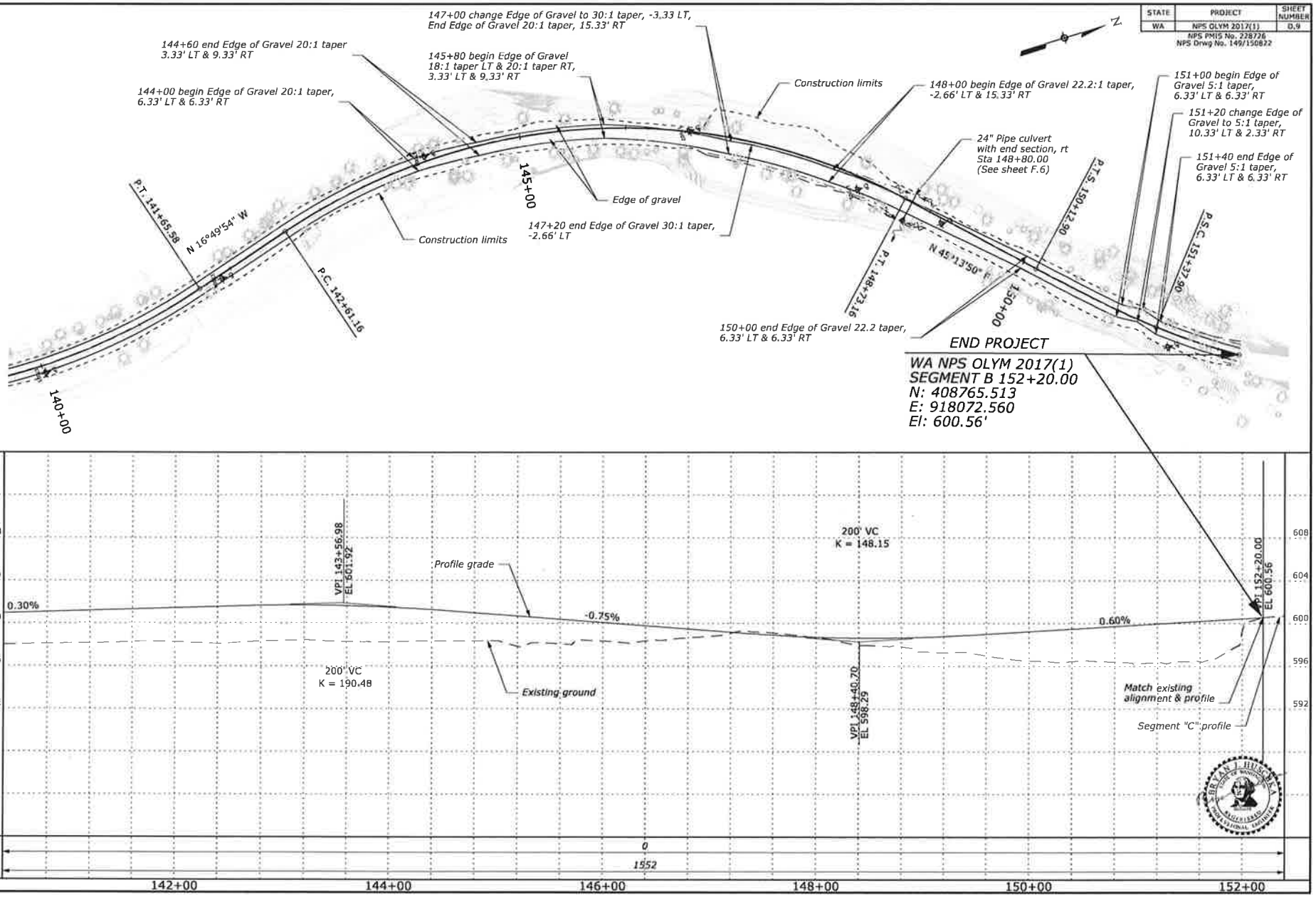


BRIAN J. HUSCHKA
STATE OF WASHINGTON
REGISTERED
PROFESSIONAL ENGINEER

2 October 2019 11:08 AM
J:\DCS\Projects\TRANS\547135_WFSdivce\600-CAD-CDS\810-CAD\30-SHEETS\47_sem221701_Plugin [Sur_N] Designed by: B. McIntosh 08/2019 Checked by: B. Huschka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.9

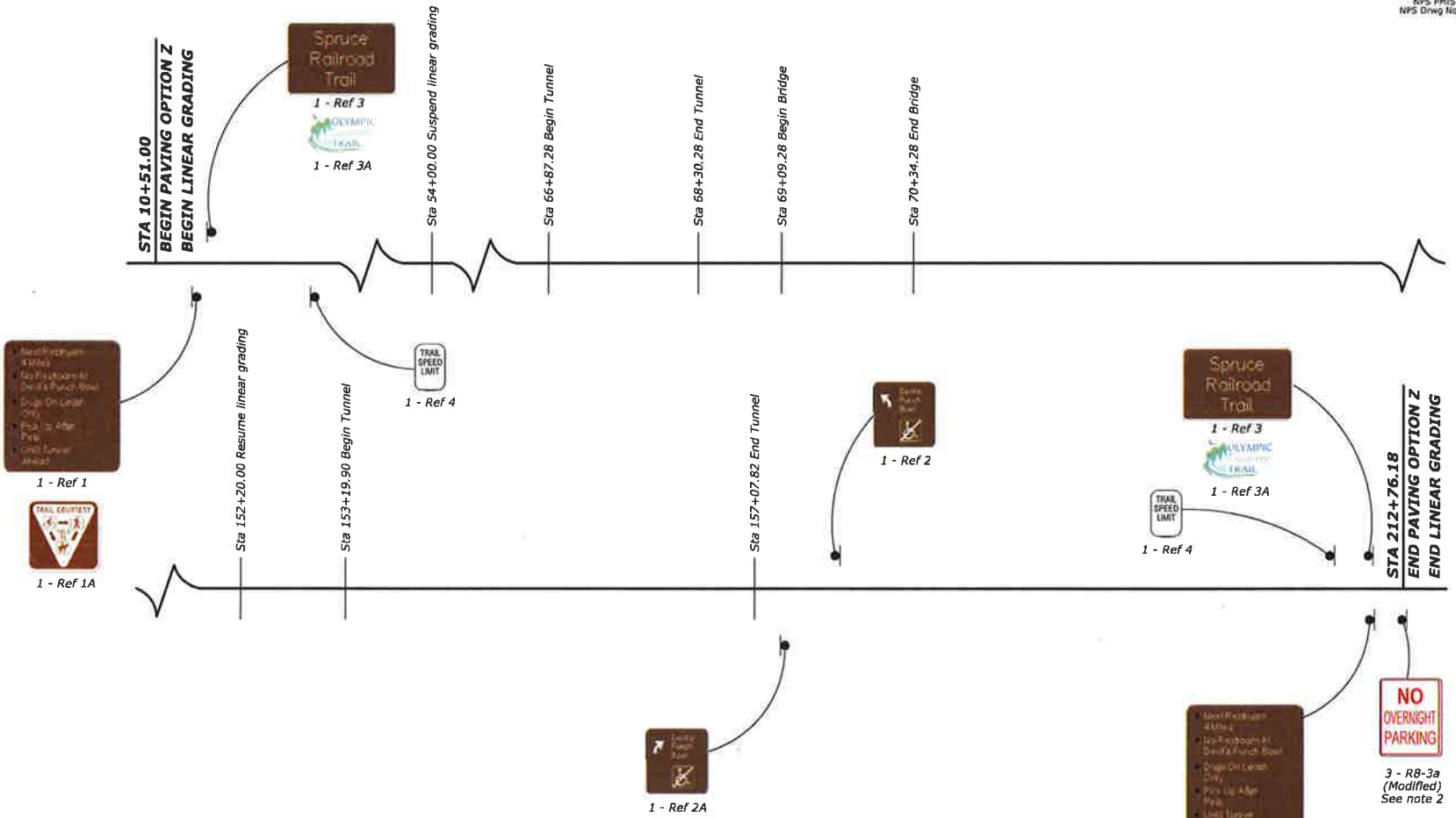
NPS PMIS No. 228726
NPS Drwg No. 149/150822



11 September 2019 1:17 PM | J:\DCS\Projects\TRANS\54713\5_WFL\Source\B\900-CAD-02\S916-CAD\10-SHEETS\46_alrm\201701_B.dgn | Sur_RI | Designed by: B. McIntosh | 08/2019 | Checked by: B. Huschka | 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.10

NPS PMIS No. 228726
NPS Drwg No. 149/150822



NOTES:

1. See sheets D.12 and D.13 for sign details.
2. Locate at three locations, equally spaced, on fence at Lyre Trailhead.
3. Sign locations and layouts shall be approved by COR.

NO SCALE

LINE GRAPH

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.11

NPS PMIS No. 228726
NPS Drwg No. 149/150822

PARKING LOT QUANTITIES

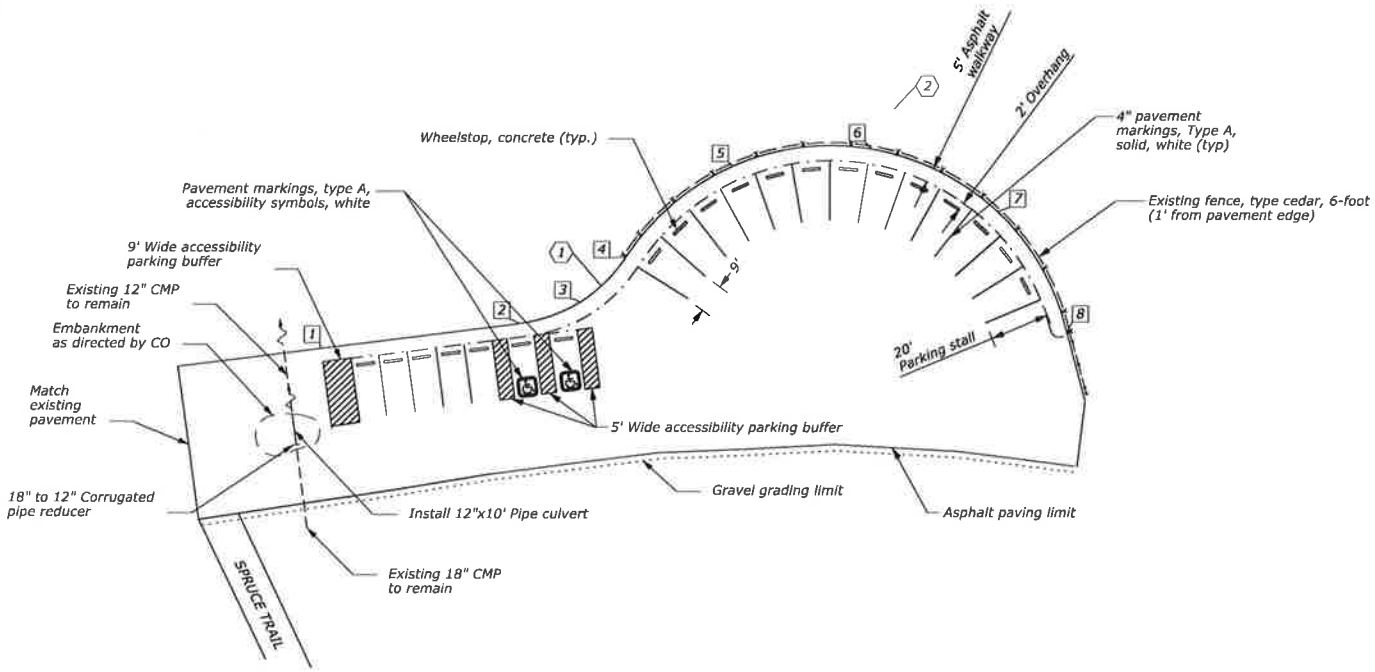
ITEM	DESCRIPTION	QUANTITY	UNITS
40301-0100	ASPHALT CONCRETE PAVEMENT, TYPE 1 (3 INCH COMPACTED DEPTH)	425	TON
60915-1000	WHEELSTOP, CONCRETE	20	EACH
63401-0100	PAVEMENT MARKINGS, TYPE A, SOLID, WHITE	890	LNFT
63405-0450	PAVEMENT MARKINGS, TYPE A, ACCESSIBILITY SYMBOL (WHITE)	2	EACH

PARKING LOT EDGE OF PAVEMENT TABLE

	POINT TYPE	NORTHING	EASTING	ELEVATION
1	PI	412849.869	915003.737	595.90
2	PC	412815.540	915061.289	596.06
3	POC	412808.989	915081.658	595.84
4	PT/PC	412811.554	915102.901	595.47
5	POC	412813.588	915149.528	594.65
6	POC	412789.564	915189.541	594.30
7	POC	412747.452	915209.663	594.60
8	PT	412701.228	915203.215	595.44

PARKING LOT CURVE TABLE

	CURVE DATA
1	R - 50.00'
	Δ - 49°25'11" (L)
	L - 43.13'
2	R - 81.02'
	Δ - 133°55'10" (R)
	L - 189.37'



NO SCALE

LYRE RIVER PARKING LOT PAVING PLAN (OPTION Z ONLY)

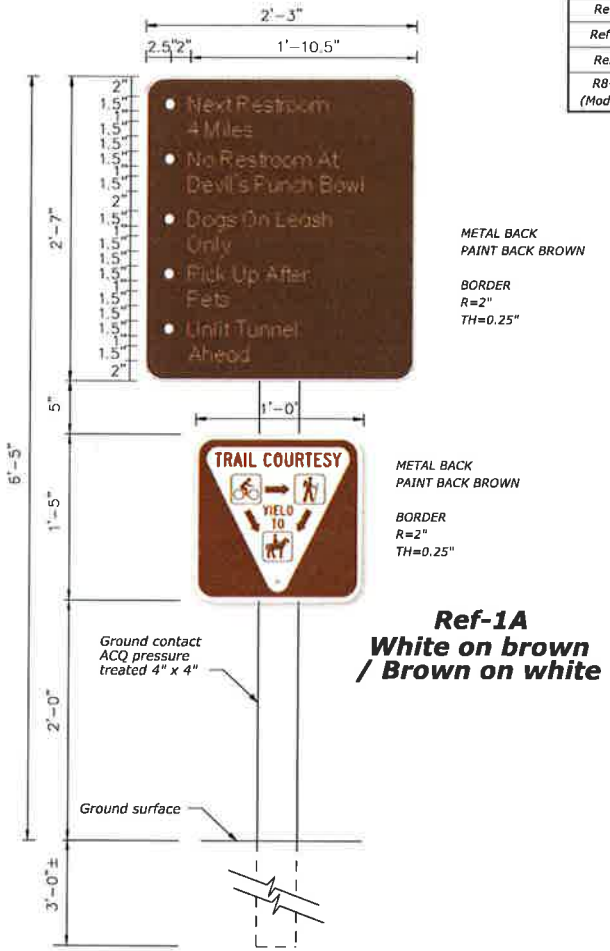
3 October 2019 11:24 AM | J:\DCD\Projects\TRM\60547135_NPSSpruce8\9th-CAD-GIS\10-CAD\20-SHEETS\50_olym2017(1)_fulge | 105_Sur | Designed by: B. McIntosh 08/2019 | Checked by: B. Hutchka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.12

NPS PMIS No. 228726
NPS Drwg No. 149/150822

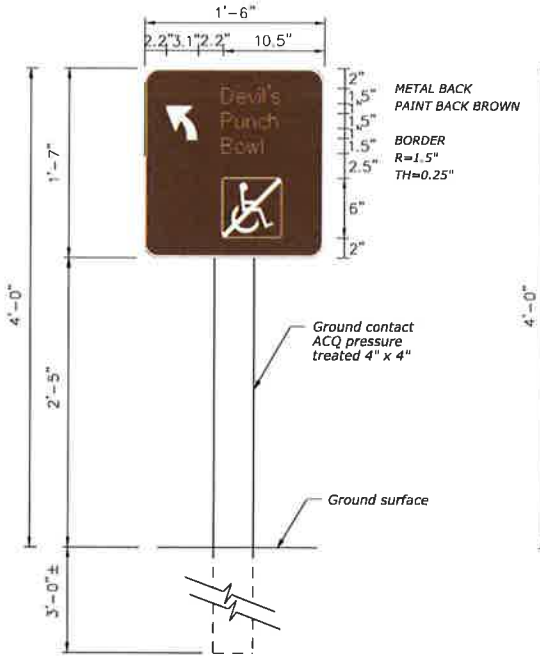
PERMANENT SIGN QUANTITIES

SIGN	DESCRIPTION	SIGN SIZE INCH x INCH	AREA (SQFT)	NUMBER OF SIGNS	QUANTITY (SQFT)
Ref-1	DIRECTIONAL	27 x 31	5.8	2	11.6
Ref-1A	TRAIL COURTESY	12 x 17	1.4	2	2.8
Ref-2	DEVIL'S PUNCHBOWL (LEFT)	18 x 19	2.4	1	2.4
Ref-2A	DEVIL'S PUNCHBOWL (RIGHT)	18 x 19	2.4	1	2.4
Ref-3	ENTRANCE SIGN	34 x 22	5.2	2	10.4
Ref-3A	TRAIL IDENTIFICATION SIGN	18 x 12	1.5	2	3
Ref-4	TRAIL SPEED LIMIT 15	12 x 18	1.5	2	3
R8-3a (Modified)	NO OVERNIGHT PARKING	12 x 18	1.5	3	4.5
				TOTAL	40.1

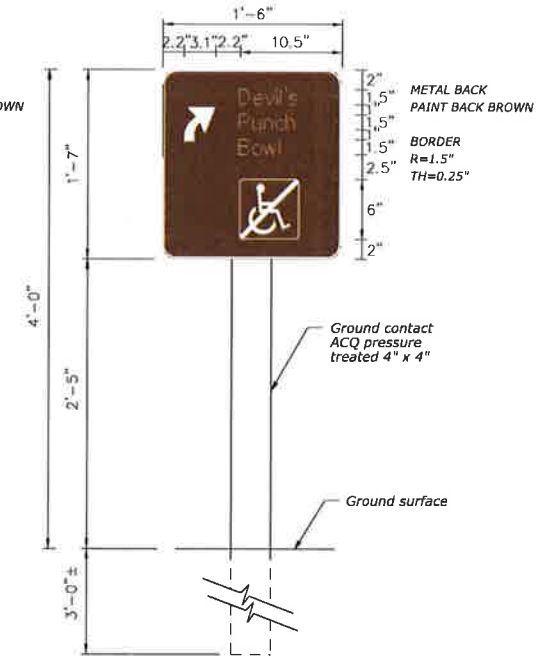


Ref-1A
White on brown / Brown on white

Ref-1
White on brown



Ref-2
White on brown



Ref-2A
White on brown

NO SCALE

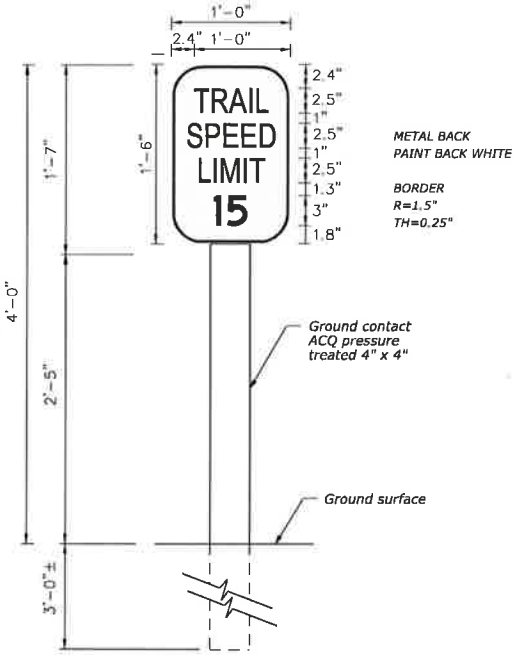
TABULATION OF SIGN QUANTITIES / SIGN DETAILS

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.13

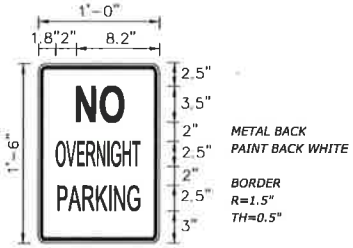
NPS PMIS No. 228726
NPS Drwg No. 149/150822

Ref-3a
Colors on black

Ref-3
White on brown



Ref-4
Black on white



R8-3a (modified)
Red on white

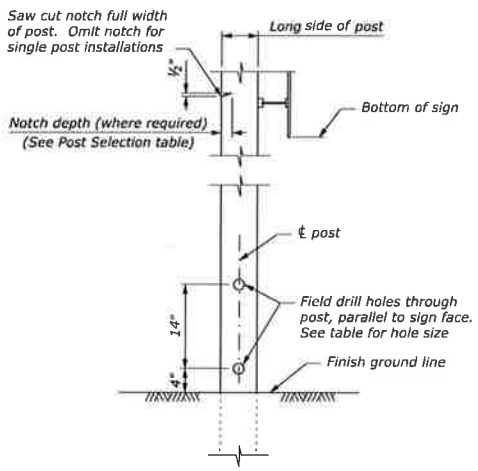
NO SCALE

SIGN DETAILS

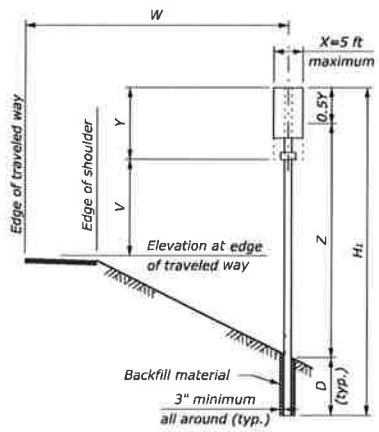
Designed by: B. McIntosh 08/2019 | Checked by: B. Huspeka 08/2019

2 October 2019 1:39 PM

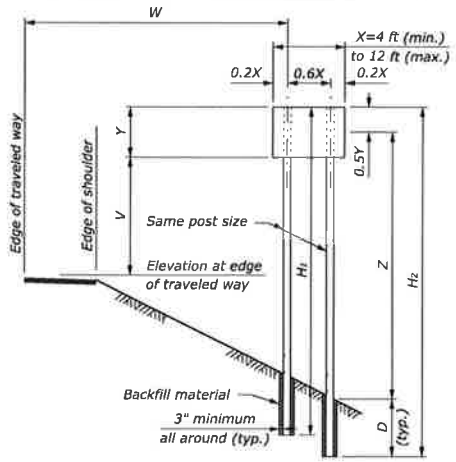
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.14



POST DETAIL



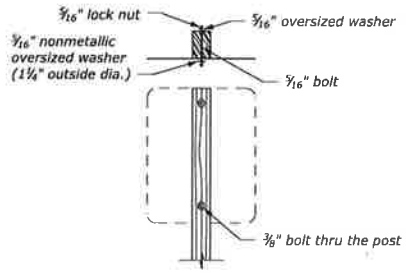
SINGLE POST SIGNS



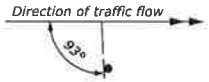
TWO POST SIGNS

NOTE:

1. Traffic barrier protection is required for all posts larger than 6" x 8" when located within the clear zone or if the post is vulnerable to being struck when placed outside the clear zone.
2. H_1 thru H_4 indicate overall post length. Select post lengths to fit field conditions.
3. D is the minimum post embedment depth for average soil conditions. See Wood Post Selection Table below.
4. Z is the height from ground line to mid-height of sign at the longest post.
5. For the purpose of post selection X and Y are as follows:
   - Single sign, or back to back signs: X and Y are the overall dimensions of the signs.
   - Multiple sign installations: X and Y are the dimensions of a rectangle enclosing all the signs.



TYPICAL MOUNTING FOR SIGNS WITHOUT ANGLES

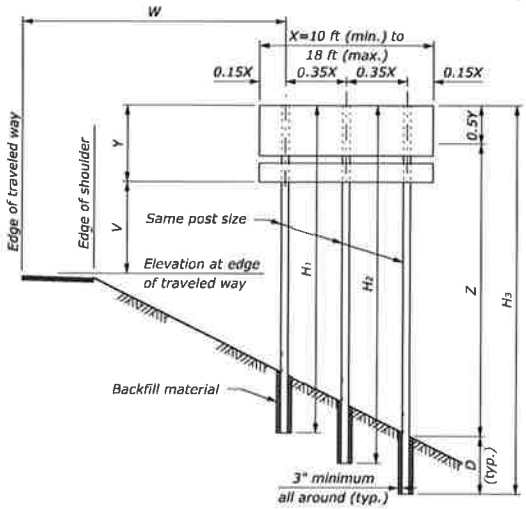


SIGN INSTALLATION ANGLE

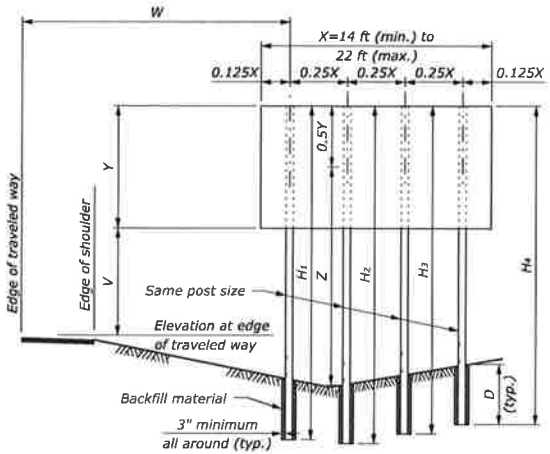
For all retroflectorized signs where W > 25'

MINIMUM DISTANCE TO SIGN		
Location	Lateral Offset (W)	Mounting Height (V)
Rural Districts	6 ft	5 ft
Business or Residence Districts	2 ft from curb	7 ft

V may be reduced by 1 foot in rural districts for a secondary sign mounted below another sign.



THREE POST SIGNS



FOUR POST SIGNS

WOOD POST SELECTION TABLE						
POST SIZE (inch)	NUMBER OF POSTS				D	Notch depth and hole diameter
	1	2	3	4		
	Product of X-Y-Z in CUFT					
4 x 4	80	155	235	310	3'-0"	-
4 x 6	180	385	545	725	4'-0"	1⅜"
6 x 6	235	475	710	950	4'-0"	1¾"
6 x 8	300	850	1280	1700	4'-0"	2½"
6 x 10	385	1180	1170	2360	5'-0"	-
8 x 10	575	1610	2410	3215	5'-0"	-
8 x 12	775	2310	3465	4620	6'-0"	-

Values shown are the maximum permitted. If the product of XYZ exceeds the limit for the largest post, use steel post installation.

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

PERMANENT SIGN INSTALLATION WOOD POSTS

DETAIL APPROVED FOR USE 10/2009

REVISED:

DETAIL W633-7

11 September 2019 1:39 PM J:\DCS\Projects\TRN\60547135_WFL Spruce\900-CAD-GIS\910-CAD\20-SHEETS\S3_olym201701_fn.dgn [USC]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.15

PROJECT : Spruce Railroad Trail Segment B
DATE OF FIELD WORK : February/November 2017
DATE OF FINAL ADJUSTMENT : February/November/December 2017

GPK FILE DATED N/A

PROJECT UNITS : US SURVEY FOOT
COORDINATE SYSTEM : SPCS NAD83(91); WA North Zone 4601
EPOCH DATE : 91
VERTICAL DATUM : NAVD88 (Determined using Geoid model 96)

POINT NUMBER	STATE PLANE COORDINATES			GEO COORDINATES				DESCRIPTION
	NORTH	EAST	ELEVATION	LATITUDE	LONGITUDE	ELLIPSOID HEIGHT	COMBINED FACTOR	
17001	408469.917	917818.765	597.987	48.0817379	-123.7902903	532.244	0.999917028	Bar w/ Alum Cap
17002	408335.442	917719.906	598.366	48.0813591	-123.7906733	532.619	0.999917015	Bar w/ Alum Cap
17003	408090.966	917668.491	598.108	48.0806839	-123.790845	532.358	0.999917035	Bar w/ Alum Cap
17004	407876.997	917721.815	597.903	48.0801034	-123.7905934	532.154	0.999917051	Bar w/ Alum Cap
17005	407692.963	917757.728	597.878	48.0796031	-123.7904177	532.13	0.999917058	Bar w/ Alum Cap
17006	407469.016	917726.573	596.563	48.0789863	-123.7905099	530.813	0.999917128	Bar w/ Alum Cap
17007	407118.228	917495.758	598.456	48.0780011	-123.7913982	532.696	0.99991705	Bar w/ Alum Cap
17008	406845.250	917447.756	597.287	48.0772482	-123.7915516	531.524	0.999917115	Bar w/ Alum Cap
17009	406442.966	917551.136	598.747	48.0761571	-123.7910657	532.986	0.999917059	Bar w/ Alum Cap
17010	406176.660	917540.059	597.699	48.0754265	-123.7910692	531.937	0.999917118	Bar w/ Alum Cap
17011	405939.139	917479.708	597.245	48.0747695	-123.7912785	531.48	0.999917149	Bar w/ Alum Cap
17012	405756.119	917427.085	598.237	48.0742626	-123.7914648	532.47	0.999917108	Bar w/ Alum Cap
17013	405401.643	917409.674	598.096	48.0732897	-123.7914803	532.327	0.999917128	Bar w/ Alum Cap
17014	405159.912	917335.782	597.823	48.0726197	-123.7917443	532.051	0.99991715	Bar w/ Alum Cap
17015	404984.934	917277.610	600.234	48.0721343	-123.7919546	534.459	0.999917042	Bar w/ Alum Cap
17016	404724.984	917067.654	597.389	48.0714001	-123.7927718	531.606	0.999917188	Bar w/ Alum Cap
17017	404548.900	917019.273	597.422	48.0709126	-123.7929419	531.636	0.999917194	Bar w/ Alum Cap
17018	404334.296	916954.742	597.512	48.0703179	-123.7931719	531.723	0.999917198	Bar w/ Alum Cap
17019	403990.994	916855.964	597.150	48.0693671	-123.7935216	531.357	0.99991723	Bar w/ Alum Cap
17020	403754.398	916750.505	598.034	48.0687078	-123.7939154	532.236	0.999917197	Bar w/ Alum Cap
17021	403574.915	916585.717	598.360	48.0681988	-123.7945607	532.556	0.99991719	Bar w/ Alum Cap
17022	403333.515	916196.216	602.882	48.0674964	-123.7961146	537.063	0.999916985	Bar w/ Alum Cap
17023	403213.464	916000.655	597.745	48.0671469	-123.7968949	531.919	0.999917236	Bar w/ Alum Cap
17024	403040.385	915781.409	598.358	48.0666497	-123.7977637	532.524	0.999917215	Bar w/ Alum Cap
17025	402965.977	915675.368	606.629	48.0664346	-123.7981854	540.791	0.999916824	Bar w/ Alum Cap
17026	402951.325	915238.629	596.995	48.0663484	-123.7999679	531.141	0.999917286	Bar w/ Alum Cap
17027	402830.675	915000.683	597.452	48.0659927	-123.8009214	531.589	0.99991727	Bar w/ Alum Cap
17028	402752.227	914567.859	598.038	48.0657321	-123.8026779	532.16	0.999917247	Bar w/ Alum Cap
17029	402658.986	914434.169	602.050	48.0654625	-123.8032095	536.167	0.99991706	Bar w/ Alum Cap
17030	402583.701	914290.055	599.165	48.0652411	-123.8037866	533.277	0.999917201	Bar w/ Alum Cap
17031	402455.764	914163.670	619.788	48.0648772	-123.8042829	553.895	0.999916222	Bar w/ Alum Cap
17032	402285.191	913973.081	598.631	48.0643898	-123.8050349	532.731	0.999917241	Bar w/ Alum Cap
17033	402153.819	913832.436	599.674	48.064015	-123.8055889	533.769	0.999917198	Bar w/ Alum Cap
17034	408704.759	918046.416	596.420	48.0824051	-123.7893965	530.685	0.999917096	Bar w/ Alum Cap
17035	408535.669	917872.665	596.920	48.0819236	-123.7900803	531.177	0.999917077	Bar w/ Alum Cap
17036	402148.638	913825.463	600.221	48.0640001	-123.8056166	534.316	0.999917172	Bar w/ Alum Cap
17037	402073.497	913690.516	599.496	48.06378	-123.8061562	533.586	0.99991721	Bar w/ Alum Cap

Note: To precisely check distances between points as measured on the ground, inverse the state plane coordinates and divide the computed distance by a mean combined factor of the two points.

SURVEY CONTROL

Sheet 1 of 2

J:\DCS\Projects\TRANS\547135_WS\Spruce\WSC-CAD-GIS\910-CADD\- 2-Oct-2018 12:22 PM Designed by: B. McIntosh Checked by: B. Hunchke 8/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	D.16

PROJECT : Spruce Railroad Trail Segment B
DATE OF FIELD WORK : February/November 2017
DATE OF FINAL ADJUSTMENT : February/November/December 2017

GPK FILE DATED N/A

PROJECT UNITS : US SURVEY FOOT
COORDINATE SYSTEM : SPCS NAD83(91); WA North Zone 4601
EPOCH DATE : 91
VERTICAL DATUM : NAVD88 (Determined using Geoid model 96)

POINT NUMBER	STATE PLANE COORDINATES			GEO COORDINATES				DESCRIPTION
	NORTH	EAST	ELEVATION	LATITUDE	LONGITUDE	ELLIPSOID HEIGHT	COMBINED FACTOR	
17038	402039.020	913505.394	598.501	48.0636659	-123.8069073	532.585	0.99991726	Bar w/ Alum Cap
17039	402107.275	913325.083	598.584	48.0638338	-123.8076549	532.662	0.999917254	Bar w/ Alum Cap
17040	402284.325	913108.117	602.034	48.0642958	-123.8085695	536.105	0.999917082	Bar w/ Alum Cap
17041	402399.810	913006.629	603.566	48.0646014	-123.8090026	537.634	0.999917004	Bar w/ Alum Cap
17042	402569.442	912832.195	607.698	48.0650476	-123.8097422	541.76	0.999916799	Bar w/ Alum Cap

Note: To precisely check distances between points as measured on the ground, inverse the state plane coordinates and divide the computed distance by a mean combined factor of the two points.

SURVEY CONTROL

Sheet 2 of 2

11:\OCS\Projects\16NM\5347133_WF-Spruce\B\WO-CAD-GIS\910-CADD\D- 2-Oct-2019 12:22 PM Designed by: B. McIntosh 8/2019 Checked by: B. Huschke 8/2019

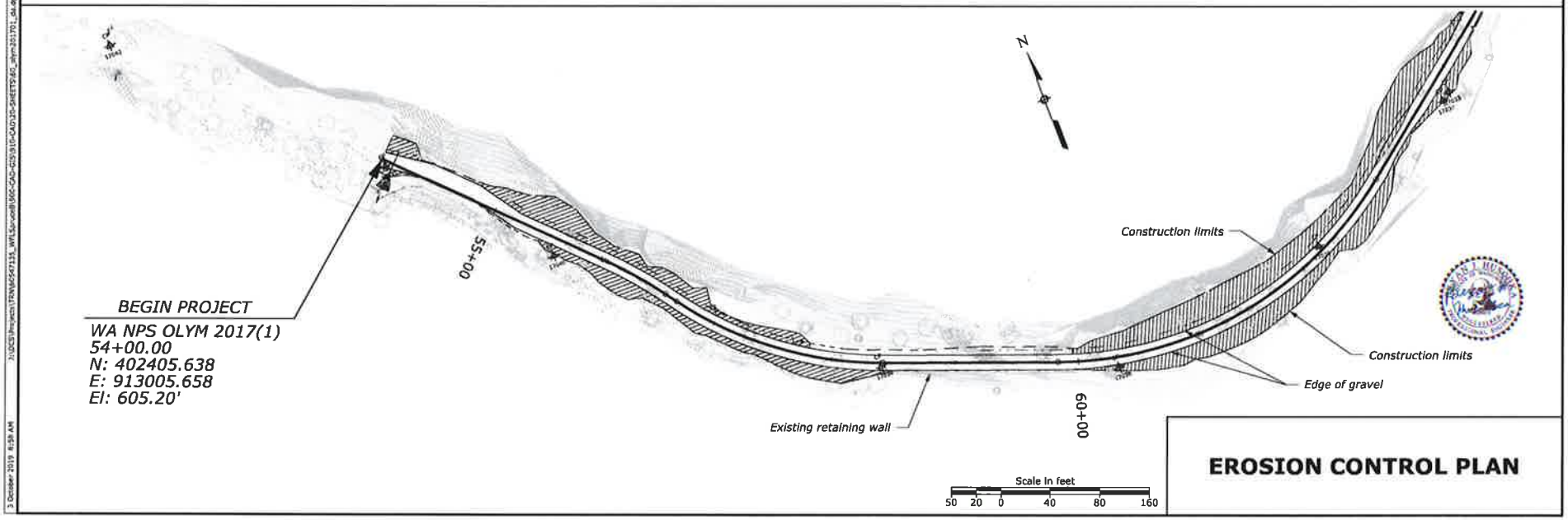
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.1

NPS PMIS No. 228726
NPS Drwg No. 149/150822

SOIL EROSION & SEDIMENT CONTROL LEGEND

- Conserved topsoil and conserved chip debris
- Conserved topsoil, landscape logs and bonded fiber matrix

NOTE:
Install silt fence and fiber roll as directed by the CO.

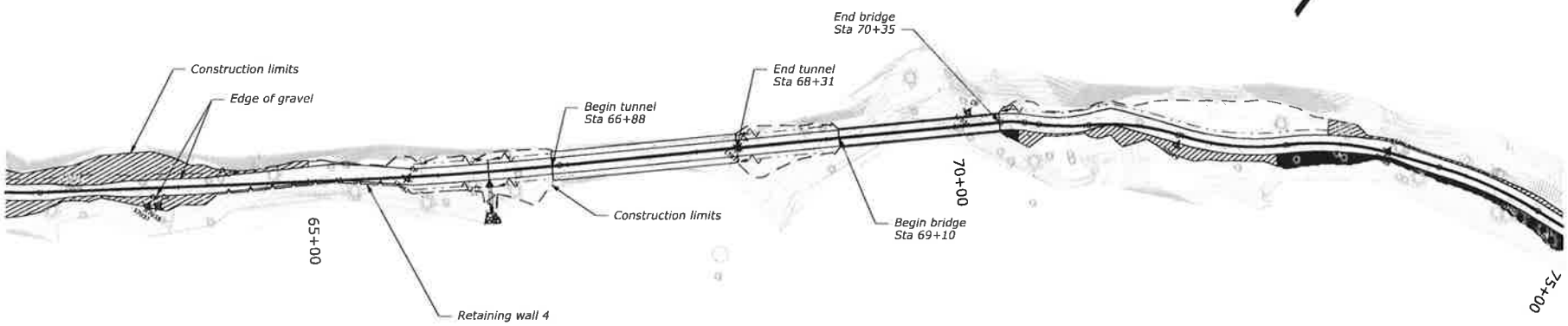


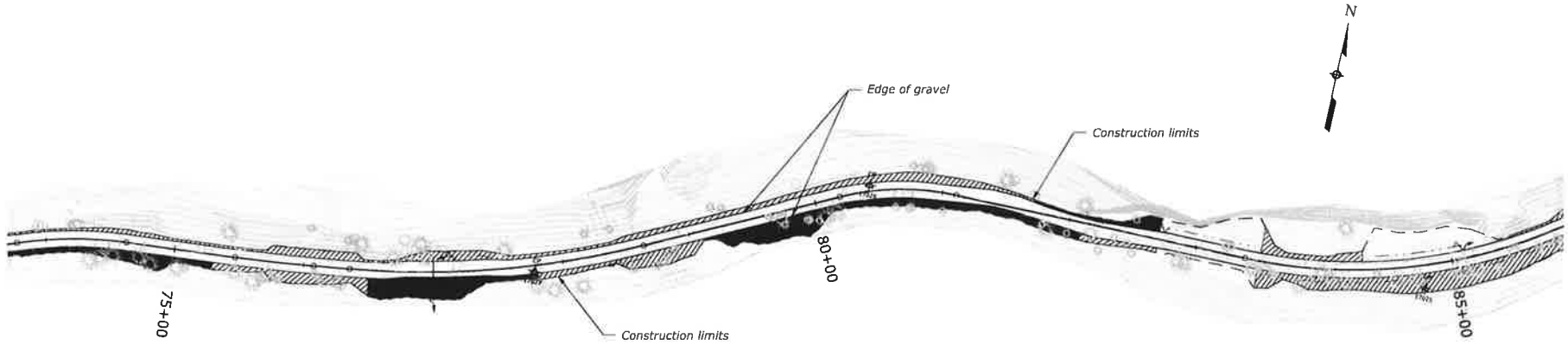
EROSION CONTROL PLAN

3 October 2019 4:59 AM | Designed by: B. McIntosh 08/2019 | Checked by: B. Hutchka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822





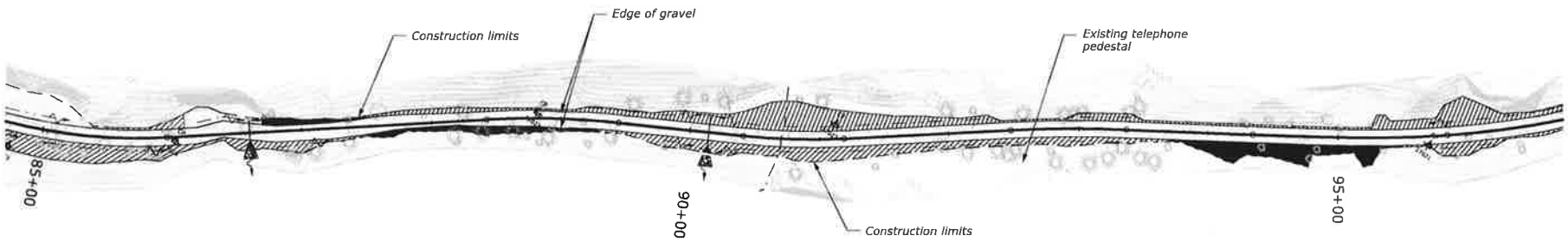
Scale in feet
40 20 0 40 80 160

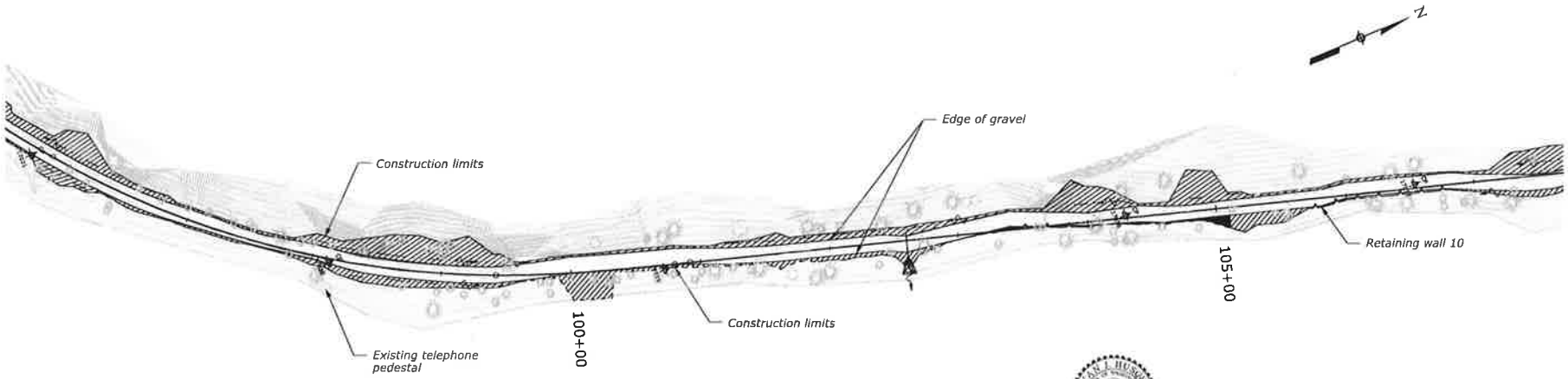
EROSION CONTROL PLAN

2 October 2019 2:48 PM | J:\DCS\Projects\TRANSCEN47135_WFLSp-use8\900-CAD-CD\910-CAD\20-SHEETS\E1_olym201761_ep.dgn [Sw_A] | Designed by: B. McIntosh 08/2019 | Checked by: B. Hunzicka 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.3

NPS PMIS No. 228726
NPS Drwg No. 149/150822





Scale in feet

40 20 0 40 80 160

EROSION CONTROL PLAN

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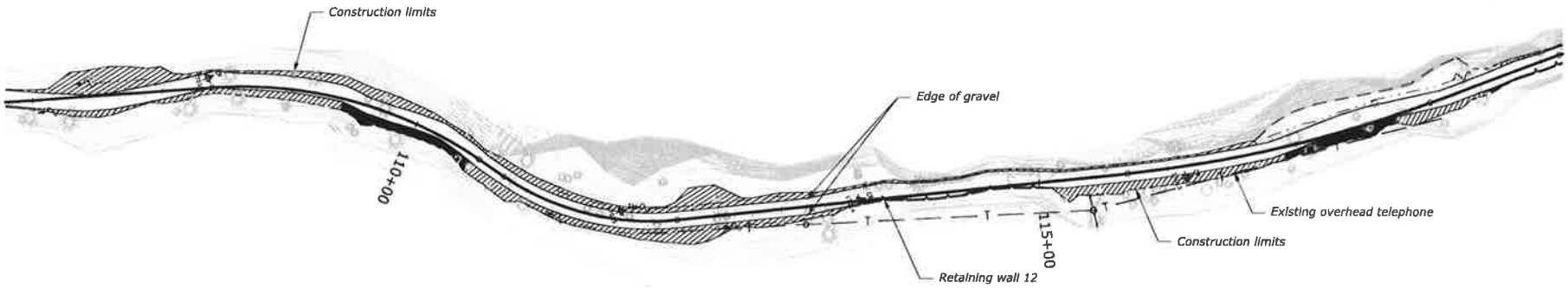
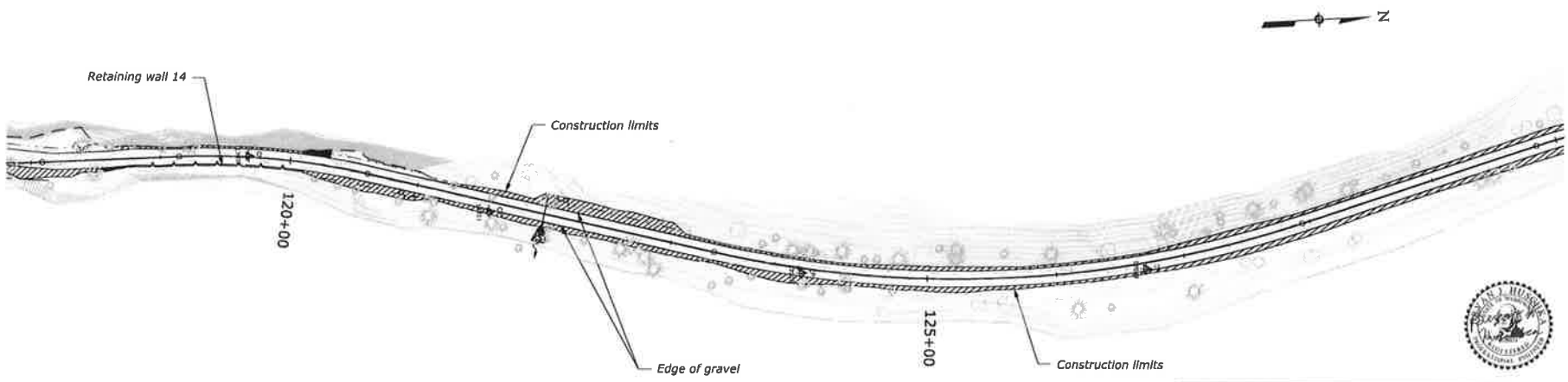
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.4

NPS PMIS No. 228726
NPS Drwg No. 149/150822





Scale in feet
40 20 0 40 80 160

EROSION CONTROL PLAN

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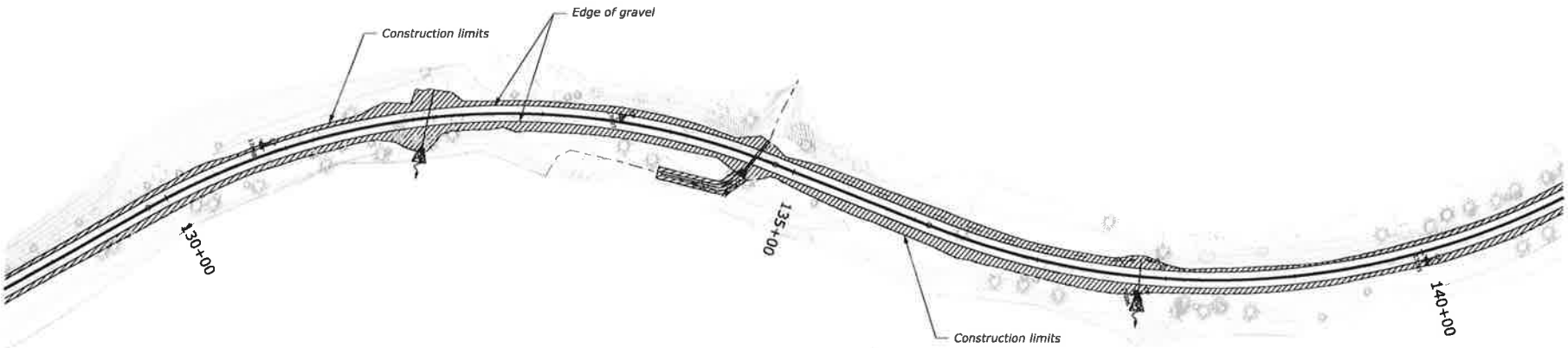
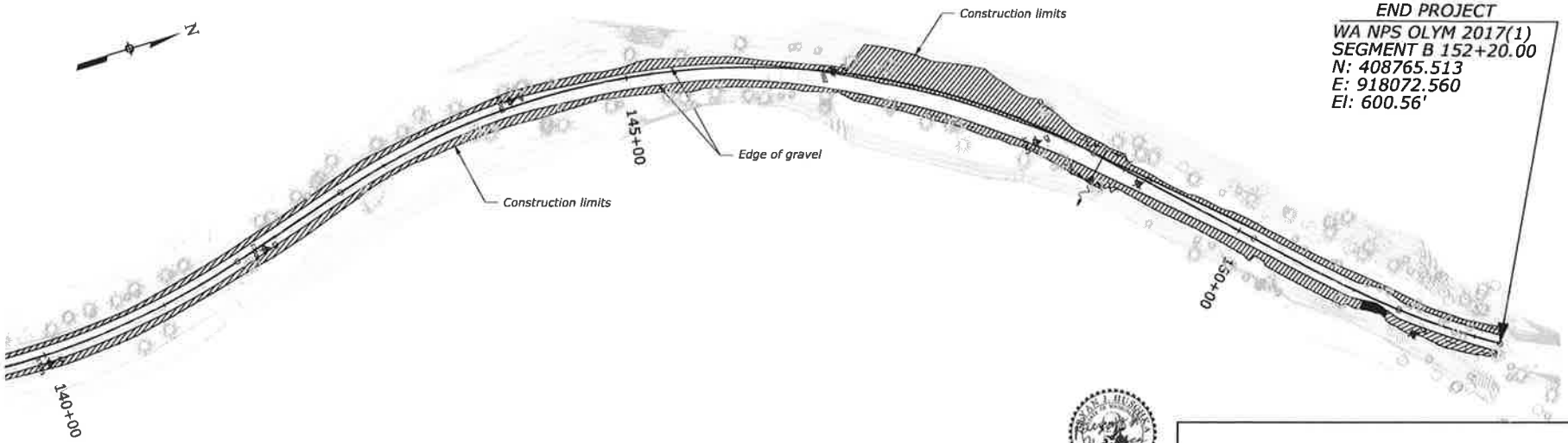
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.5

NPS PMIS No. 228726
NPS Drwg No. 149/150822





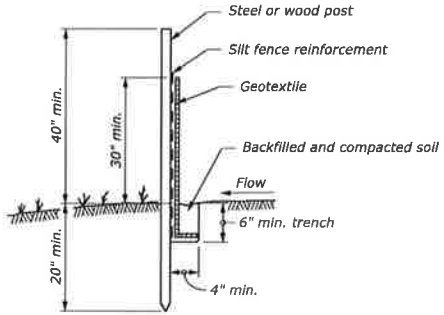
END PROJECT
WA NPS OLYM 2017(1)
SEGMENT B 152+20.00
N: 408765.513
E: 918072.560
El: 600.56'

Scale in feet
40 20 0 40 80 160

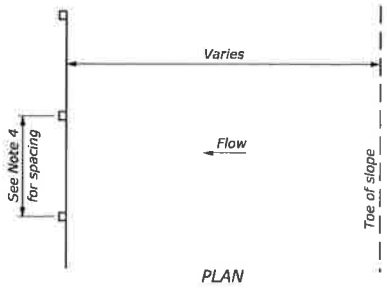
EROSION CONTROL PLAN

2 October 2019 3:09 pm | 08/2019 | B. Huschka | 08/2019 | Checked by: | B. McIntosh | Designed by:

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.6



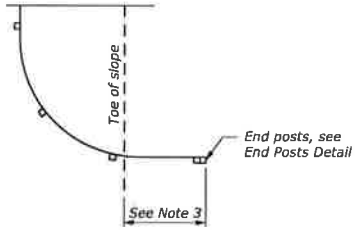
POST AND GEOTEXTILE INSTALLATION DETAIL



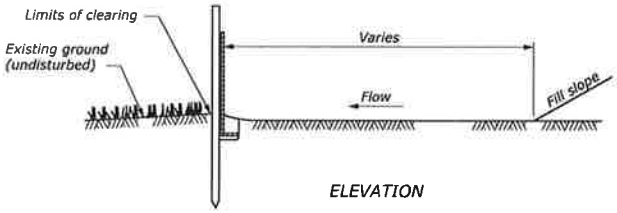
PLAN

NOTE:

1. Alternate preassembled silt fence options will be allowed as long as specified dimensions are satisfied. Follow manufacturer's recommendations for installation procedures. All types must ensure silt fence remains attached to, and does not slide down, supporting posts.
2. Install silt fence to follow the ground contours as closely as possible.
3. Curve ends of silt fence upgrade to prevent water from running around the ends.
4. 10-foot (max.) spacing with silt fence reinforcement. 6-foot (max.) spacing without silt fence reinforcement.

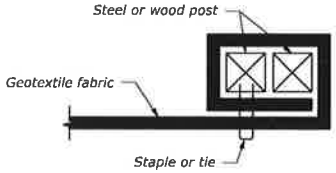


PLAN



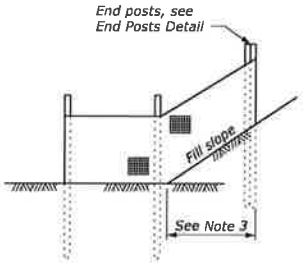
ELEVATION

SILT FENCE INSTALLATION AT TOE OF FILL



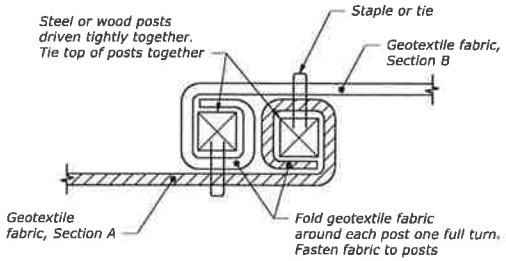
PLAN

END POSTS DETAIL



ELEVATION

END DETAIL



PLAN

POSTS AT JOINTS

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

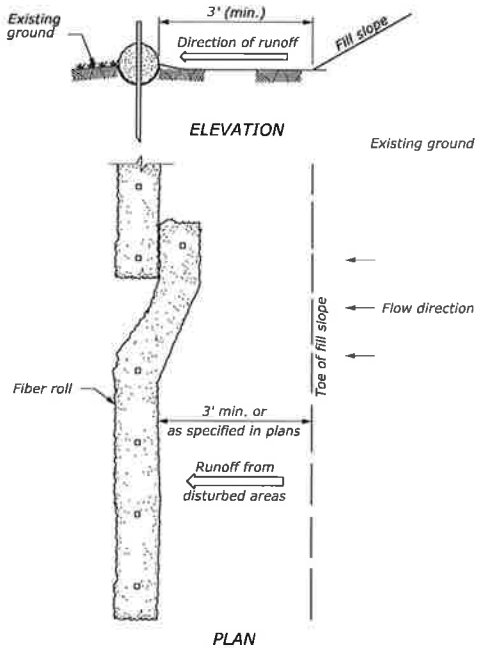
SILT FENCE

DETAIL APPROVED FOR USE --/----
REVISED: 7/2016

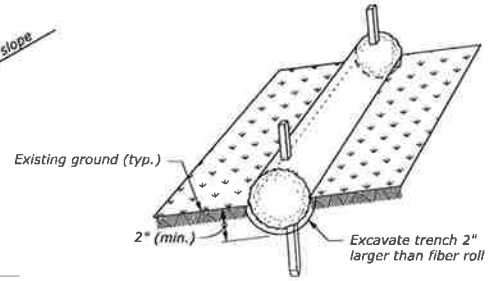
DETAIL W157-1

11 September 2019 2:36 PM J:\DCS\Projects\TRN\60547135_WFLSpruce61900-CAD-GIS\910-CAD\20-SHEETS\65_ekm201701_dt.dgn [USC]

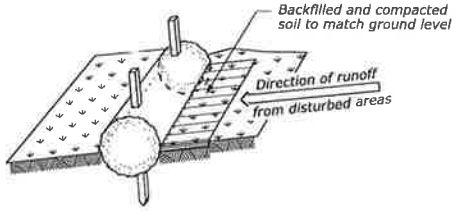
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.7



INSTALLATION BEYOND TOE OF SLOPE



Step 1: Excavate trench and install fiber rolls



Step 2: Backfill soil against fiber rolls

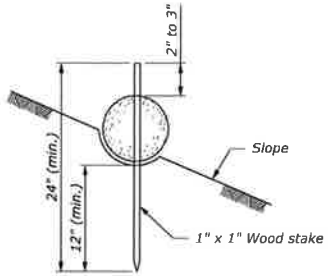
PROPERLY STAKED AND ENTRENCHED FIBER ROLL

NOTE:

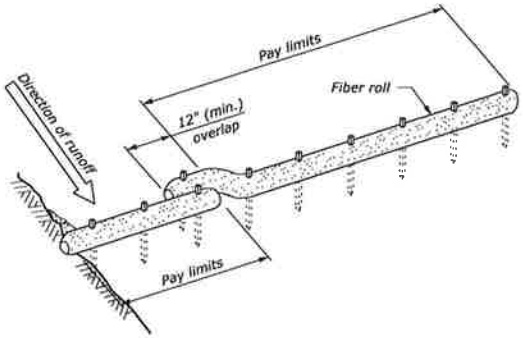
1. *Drive stakes at each end and at 4-foot spacing until fiber roll is secure to slope. Live stakes may be used for permanent installations. Do not crush fiber roll while staking.*
2. *Overlap fiber rolls 12-inch minimum. Drive stakes at 6-inches from fiber roll end angles towards the adjacent fiber roll and space stakes at 4-foot max.*

FIBER ROLL SPACING	
Slope	Spacing (FT)
1:4 or flatter	40
1:3	30
1:2	20
1:1	10

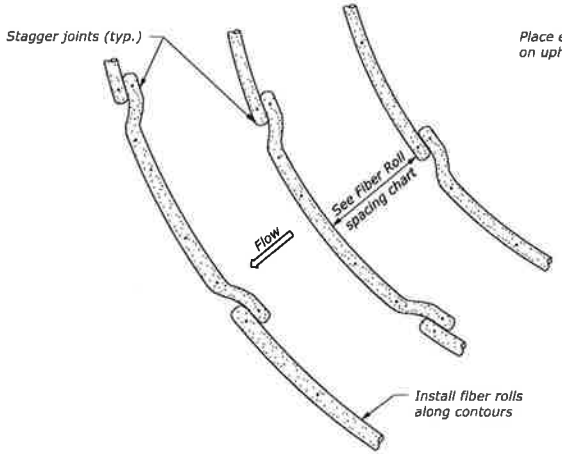
STAKES REQUIRED	
Fiber roll length (FT)	Stakes required for each roll
25	8
20	6
12	4



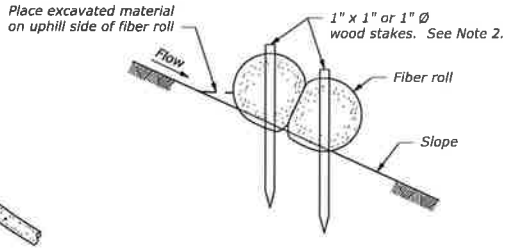
FIBER ROLL STAKING DETAIL



ALTERNATE FIBER ROLL JOINT DETAIL
SLOPE PROTECTION INSTALLATION



INSTALLATION ALONG SLOPES



FIBER ROLL LAPPING DETAIL

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

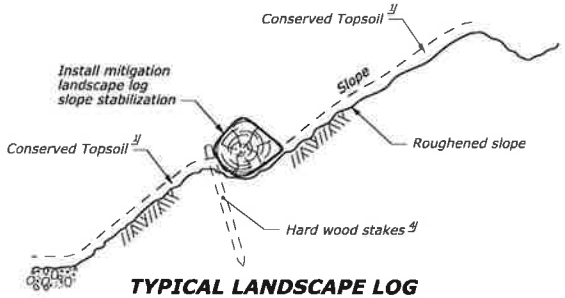
FIBER ROLL

DETAIL APPROVED FOR USE 10/2014
REVISED:
DRAFT: 7/2016

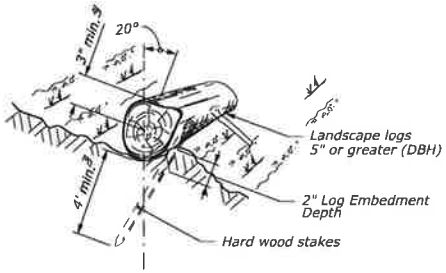
DETAIL
W157-21

11 September 2019 2:54 PM 2:\DCS\Projects\TRN\60547135_WFLSpruceth\900-CAD-GIS\910-CAD\20-SHEETS\66_ohvm201701_dc.dgn [USC]

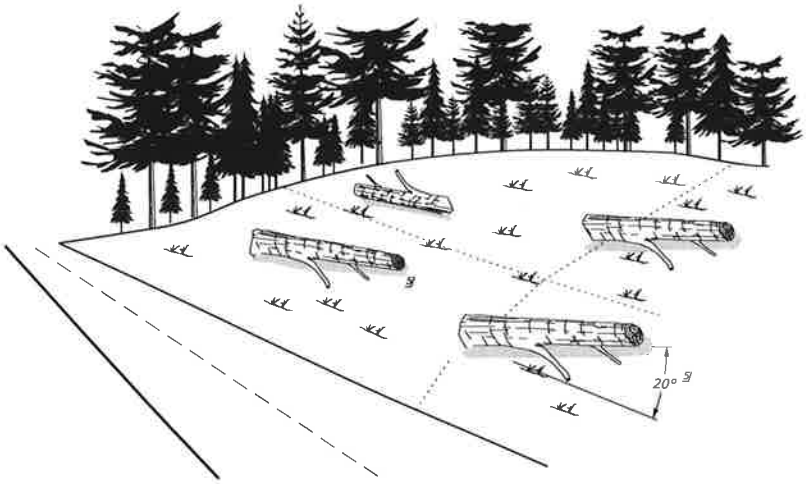
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	E.8



TYPICAL LANDSCAPE LOG SECTION A-A



LOG STAKING 4/ DETAIL



NOTE:

1. Selection, placement location, and orientation of logs will be identified by the CO.
2. Minimum length of landscape logs = 10 feet.

FOOTNOTE:

1/ Place conserved topsoil.

2/ Not used.

3/ Minimum depth of 4-foot, at refusal.

4/ Embed stake to the midpoint of the log at embedment point.

5/ Vary angles and overlap logs by 18" min. to achieve natural fallen appearance, as approved by CO.

NO SCALE

LANDSCAPE LOG SLOPE STABILIZATION

Note: The quantities shown hereon are approximate and are subject to field adjustments.

TABULATION OF DRAINAGE QUANTITIES

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No.	F.1

PAY ITEM NUMBER				20701 -0100	25101 -2000	60201 -0400	60201 -0800	60210-0800																	
Station	ESTIMATED MAXIMUM COVER	STRUCTURAL EXCAVATION	EXCAVATION	SEPARATION-STABILIZATION GEOTEXTILE, CLASS 1, TYPE A (NONWOVEN)	PLACED RIPRAP, CLASS 2	12-INCH PIPE CULVERT	24-INCH PIPE CULVERT	END SECTION FOR 24-INCH PIPE CULVERT													SKEW ANGLE	Allowable Pipe Material (See key below)	BEVELS 1V:nH Lt	BEVELS 1V:nH Rt	REMARKS See below for numbered notes
	FEET	CUYD	CUYD	SQYD	CUYD	LNFT	LNFT	EACH																	
54+10.00	2	6		13	5		24	1														P	x		2
66+39.00	2	18	2	13	5		21	1														P			2, 5
77+00.00	2	9		13	5		21	1														P			2
86+60.00	2	14		13	5		22	1														P			5
90+14.00	2	18		13	5		29	1														P			2
102+60.00	2	10		13	5		23	1														P			2, 3
122+00.00	3	21		13	5		28	1														P			2
132+12.00	7	38		13	5		48	1													70	P			2
134+68.00	3	37	25				62	2													70	P			6
137+80.00	3	18					32	1														P			
148+80.00	3	20		13	5		29	1														P			2
Parking Lot	4	3				10																			4
PROJECT TOTAL		**212**	**27**	**117**	**45**	**10**	**339**	**12**																	

NOTE:

1. Protective apron at culvert outlet with ditch with standard end section per Std. W251-1. (Sheet F.8)
2. Protective apron at culvert outlet without ditch and without standard end section per Std. W251-1. (Sheet F.8)
3. Protective cut slope at culvert inlet. (Sheet F.3)
4. Connect with 18" to 12" corrugated reducer. Option Z only.
5. Grade relief ditch to lake.
6. Re-grade creek to catch downstream.

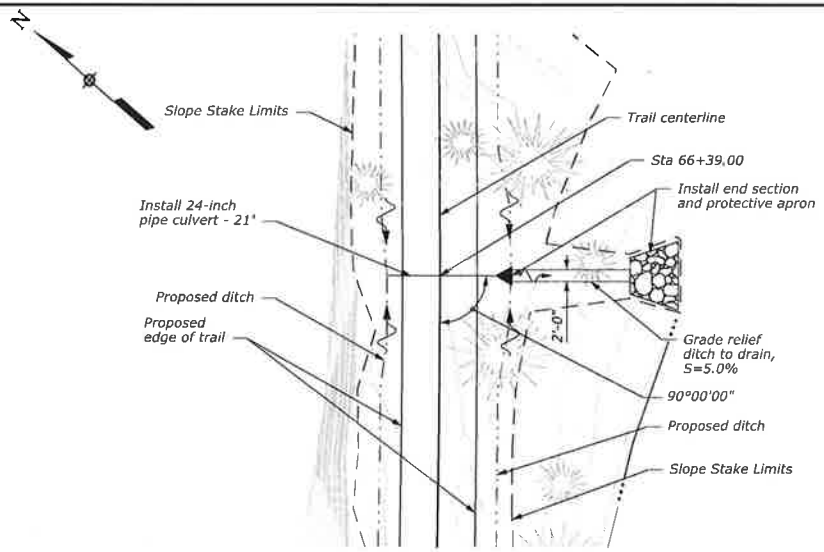
Allowable Pipe Material

A	Aluminum
AS	Aluminized steel
C	Concrete
GS	Galvanized steel
P	Plastic
(blank)	Any appropriate material
x/__	Any appropriate material except __

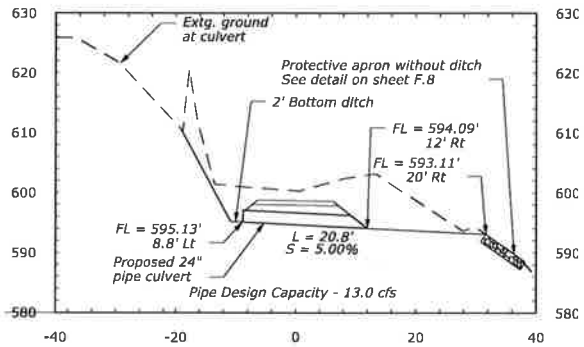
8/2019 B. Huschke Checked by: 8/2019 B. McIntosh Designed by: 2-Oct-2019 2:13 PM J:\DCS\Projects\TRN\A5047135_WFLSpruce\B300-CAD-015910-CAD\25-

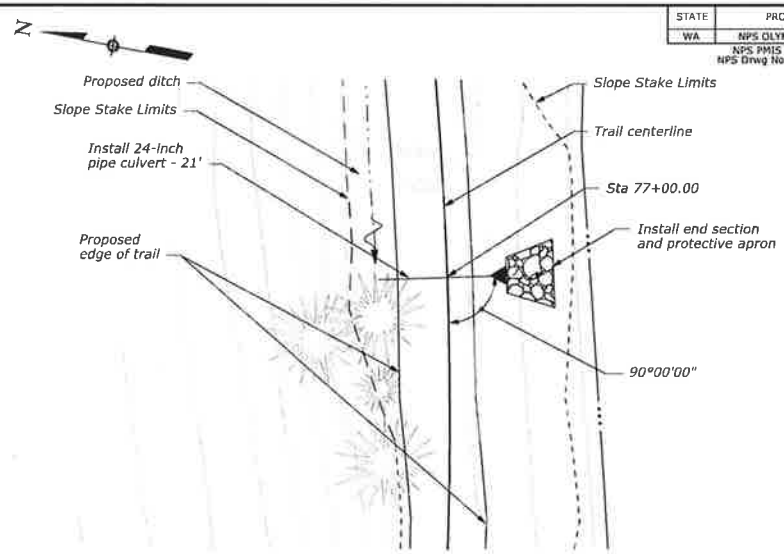
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	F.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822

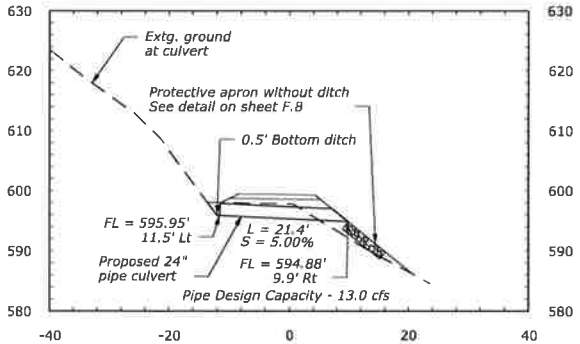


PIPE CULVERT AT STA. 66+39.00





PIPE CULVERT AT STA. 77+00.00

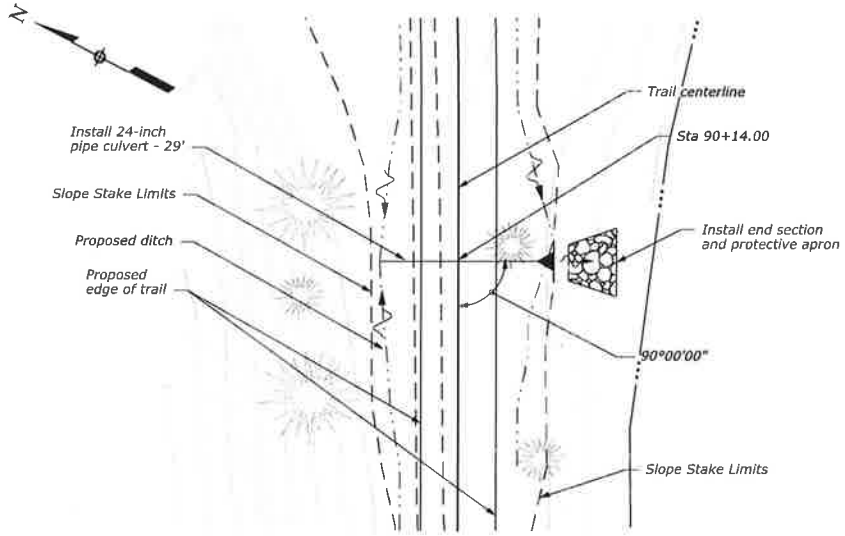


MINOR CULVERTS

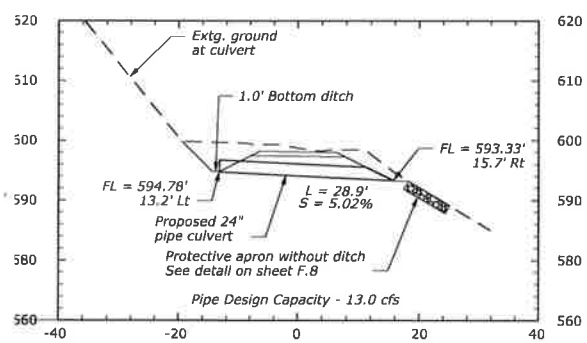
Designed by: T. Lê 04/2017 | Checked by: B. Hutchka 06/2019

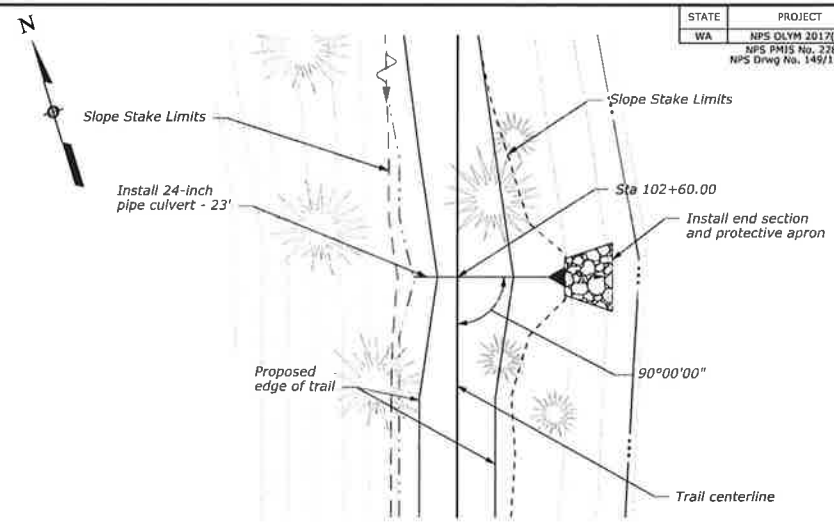
2 October 2019 3:19 PM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No. 149/130822	F.3

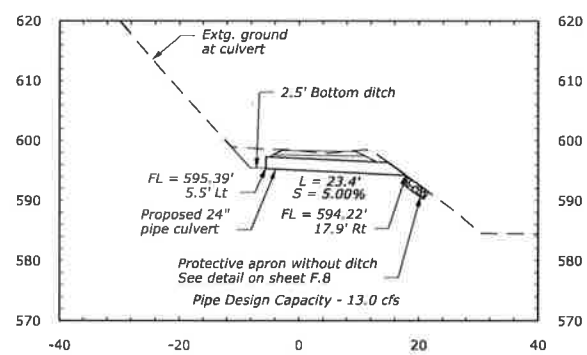


PIPE CULVERT AT STA. 90+14.00





PIPE CULVERT AT STA. 102+60.00



MINOR CULVERTS

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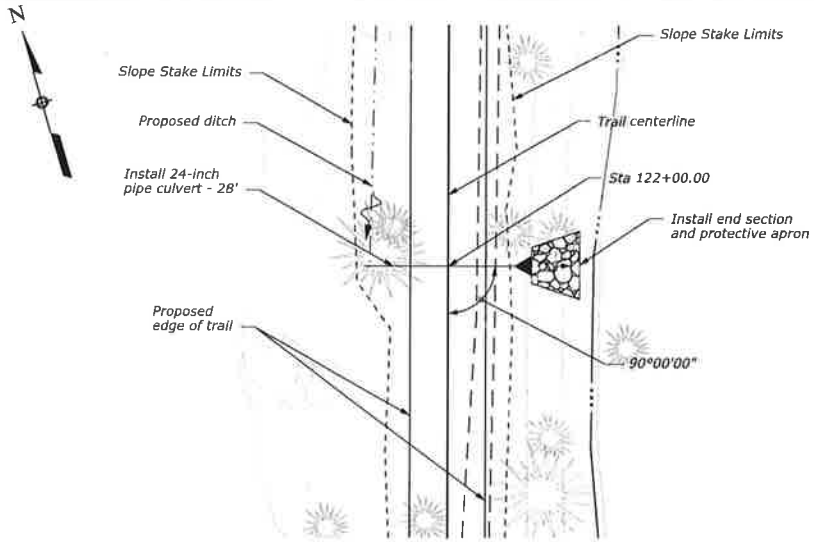

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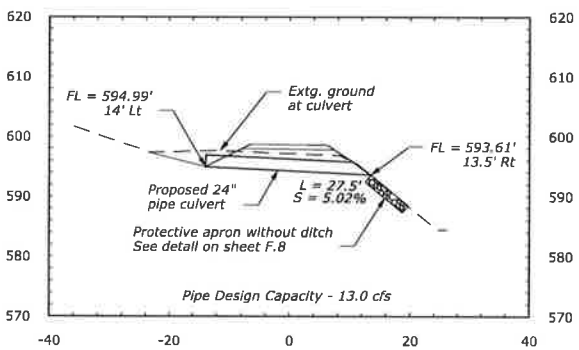

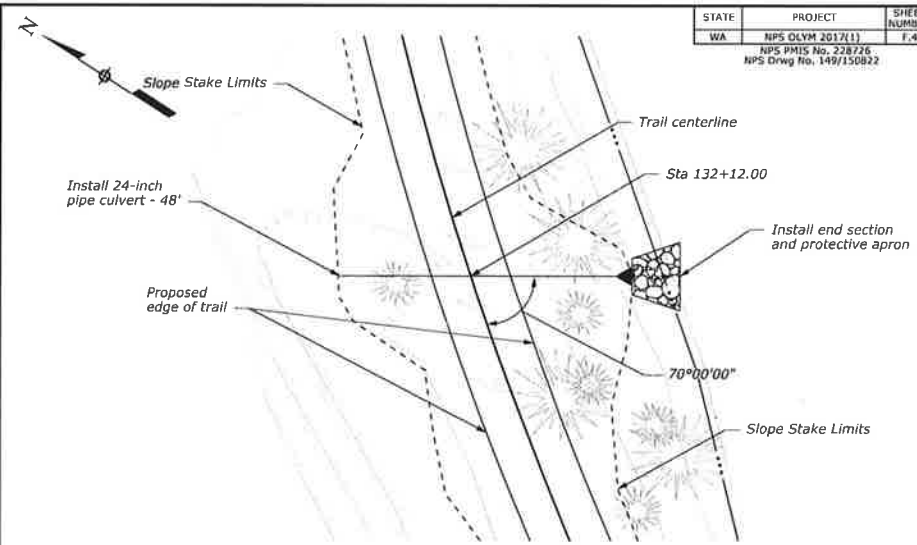

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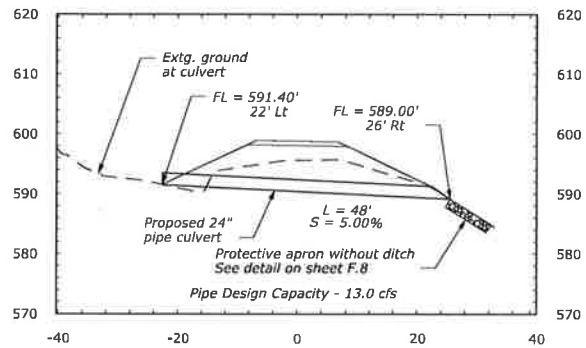
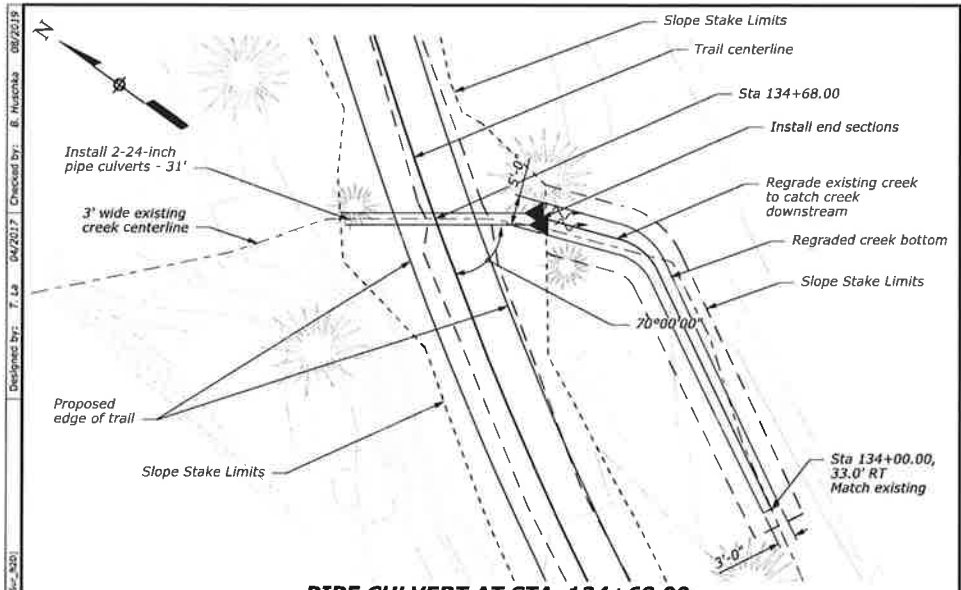


MINOR CULVERTS

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No. 149/150822	F.5



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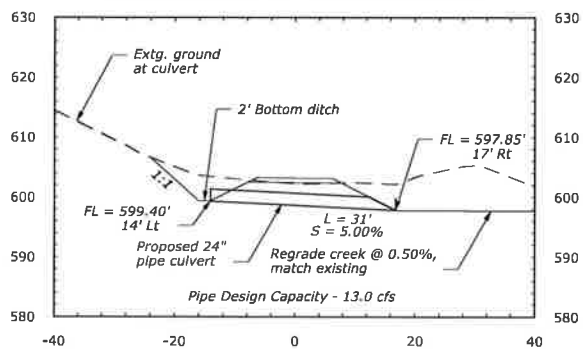
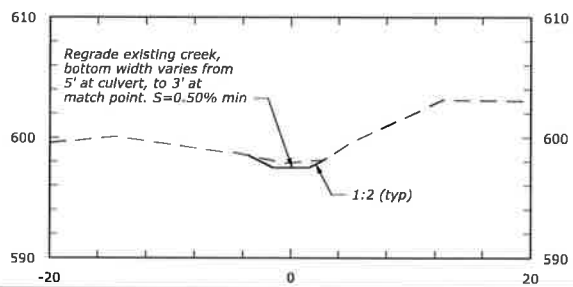
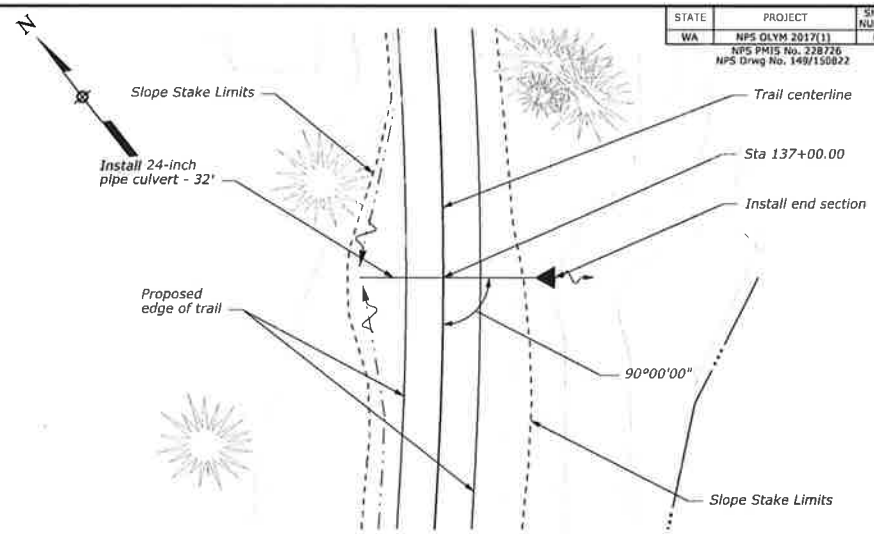
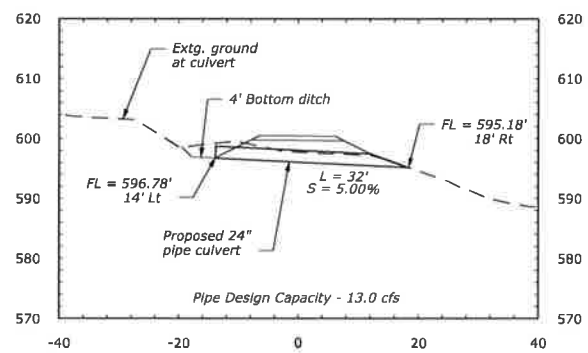






PIPE CULVERT AT STA. 137+80.00



MINOR CULVERTS

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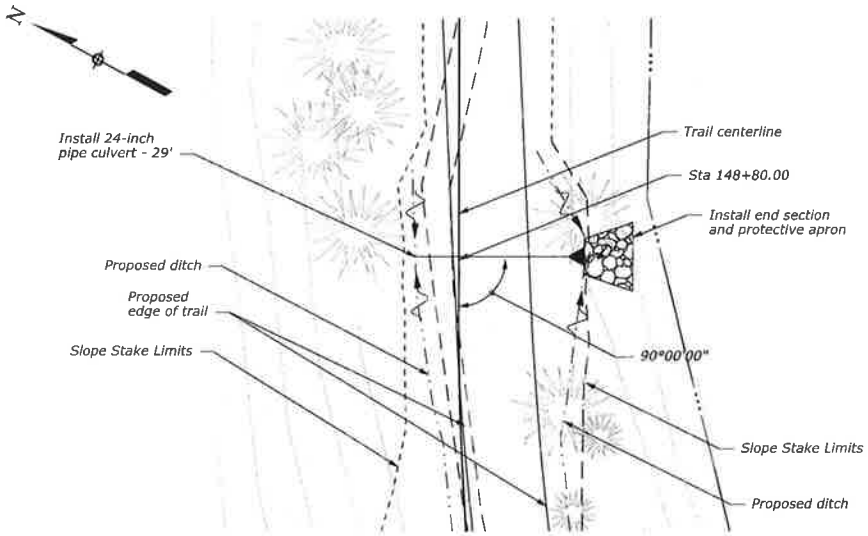
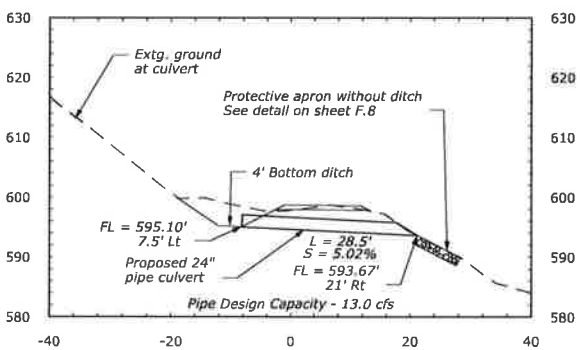
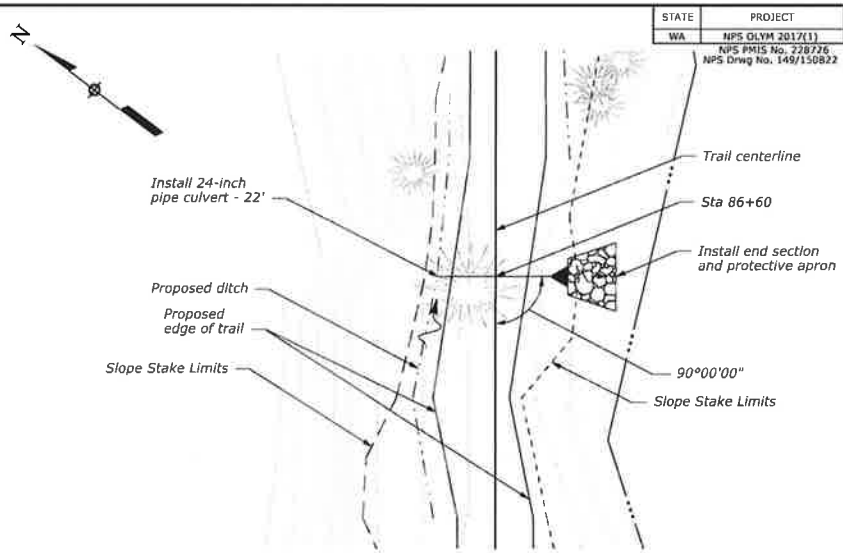
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No. 149/150822	F.6

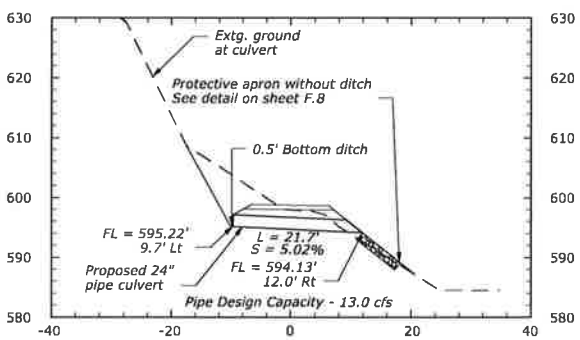


PIPE CULVERT AT STA. 148+80.00





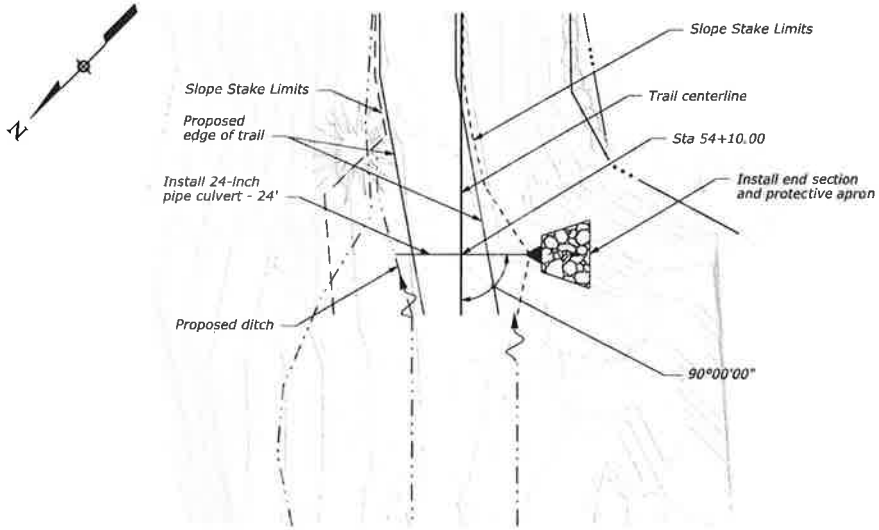
PIPE CULVERT AT STA. 86+60.00



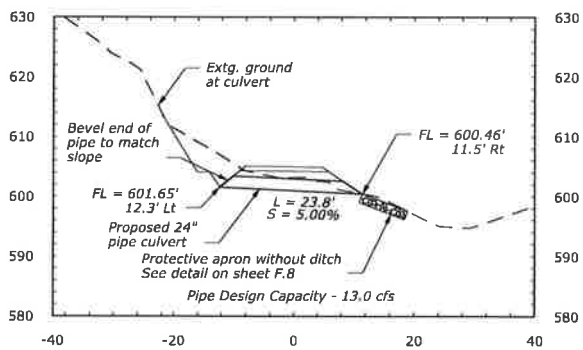
MINOR CULVERTS

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	F.7

NPS PMIS No. 228726
NPS Drwg No. 149/150822



PIPE CULVERT AT STA. 54+10.00



MINOR CULVERTS

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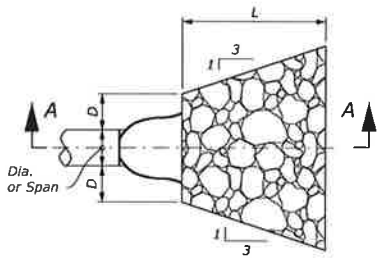
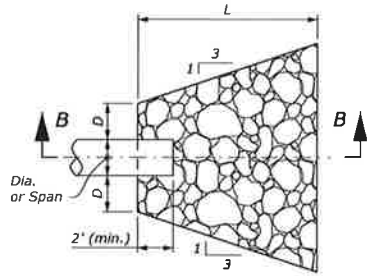
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	F.8



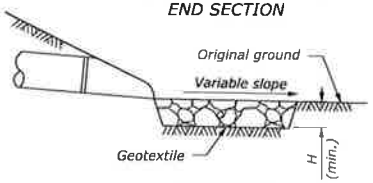
PLAN VIEW

CULVERT WITH STANDARD END SECTION

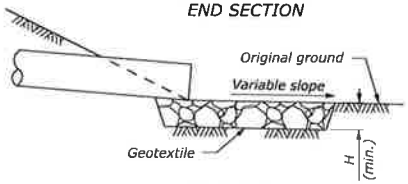


PLAN VIEW

CULVERT WITHOUT STANDARD END SECTION



SECTION A-A



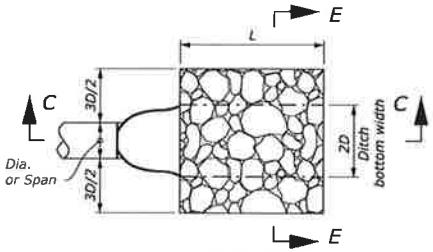
SECTION B-B

PROTECTIVE APRON AT CULVERT OUTLET WITHOUT DITCH

OUTLET WITHOUT DITCH PROTECTIVE APRON DIMENSIONS AND QUANTITIES FOR INFORMATION ONLY						
	CULVERT SIZE D (INCHES)	RIPAP CLASS	APRON LENGTH L (FEET)	APRON DEPTH H (INCHES)	ESTIMATED RIPRAP QUANTITY (CUYD)	ESTIMATED GEOTEXTILE QUANTITY (SQYD)
WITH END SECTION	12	2	4	18	1.0	5
	18	2	6	18	2.2	9
	24	2	8	18	3.9	13
	30	3	12.5	24	10.8	27
	36	3	15	24	15.6	37
	42	4	21	30	34.0	63
	48	4	24	30	44.4	78
WITHOUT END SECTION	12	2	6	18	1.7	7
	18	2	8	18	3.2	12
	24	2	10	18	5.2	17
	30	3	14.5	24	13.2	32
	36	3	17	24	18.5	42
	42	4	23	30	38.7	70
	48	4	26	30	49.8	86

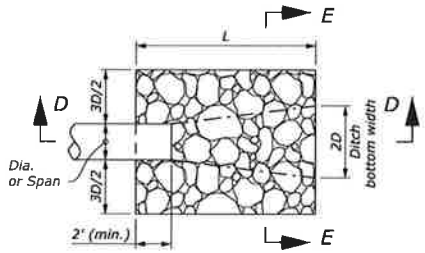
NOTE:

1. Use for aprons serving culverts with slopes less than 10%.
2. Furnish separation and stabilization geotextile.
3. Do not measure riprap placement excavation for payment.



PLAN VIEW

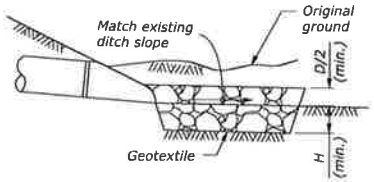
CULVERT WITH STANDARD END SECTION



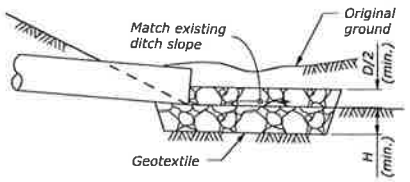
PLAN VIEW

CULVERT WITHOUT STANDARD END SECTION

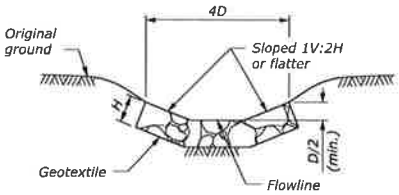
OUTLET WITH DITCH PROTECTIVE APRON DIMENSIONS AND QUANTITIES FOR INFORMATION ONLY						
	CULVERT SIZE D (INCHES)	RIPAP CLASS	APRON LENGTH L (FEET)	APRON DEPTH H (INCHES)	ESTIMATED RIPRAP QUANTITY (CUYD)	ESTIMATED GEOTEXTILE QUANTITY (SQYD)
WITH END SECTION	12	2	4	18	0.9	4
	18	2	6	18	2.0	8
	24	2	8	18	3.6	12
	30	3	12.5	24	9.3	24
	36	3	15	24	13.3	32
	42	4	21	30	27.2	52
	48	4	24	30	35.6	65
WITHOUT END SECTION	12	2	6	18	1.3	6
	18	2	8	18	2.7	10
	24	2	10	18	4.4	15
	30	3	14.5	24	10.7	27
	36	3	17	24	15.1	36
	42	4	23	30	29.8	56
	48	4	26	30	38.5	70



SECTION C-C



SECTION D-D



SECTION E-E

PROTECTIVE APRON AT CULVERT OUTLET WITH DITCH

NO SCALE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

PLACED RIPRAP AT CULVERT OUTLETS

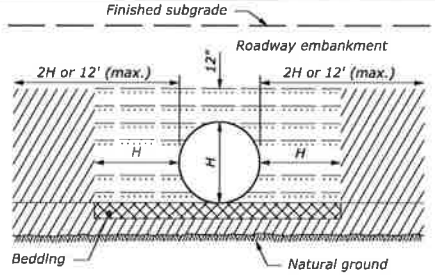
DETAIL APPROVED FOR USE

REVISED: 8/2016

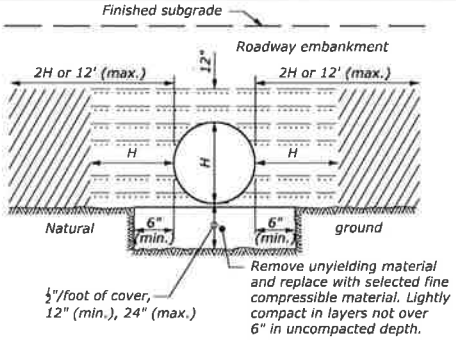
DETAIL W251-1

21 August 2019 10:01 AM J:\DCS\Projects\TRN\60547135_WFLSpruce8\900-CAD-GIS\910-CAD\20-SHEETS\77_dlvn201701_eh.dgn [USC]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	F.9

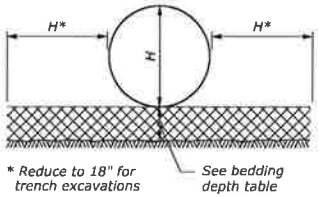


ABOVE NATURAL GROUND



ON UNYIELDING MATERIAL

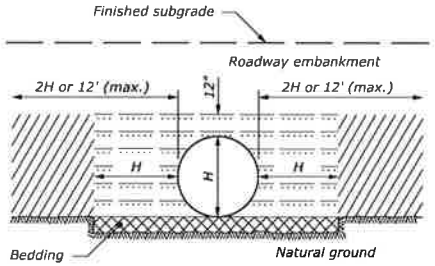
BEDDING DEPTH	
PIPE SIZE (H)	DEPTH
12" to 54"	4"
> 54"	6"



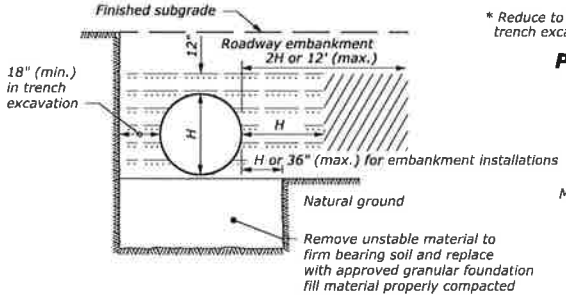
PIPE BEDDING

NOTE:

1. When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
2. H equals the diameter of all round pipe culverts or the rise dimension of all pipe arch culverts.
3. See Section 704 for bedding and backfill requirements.

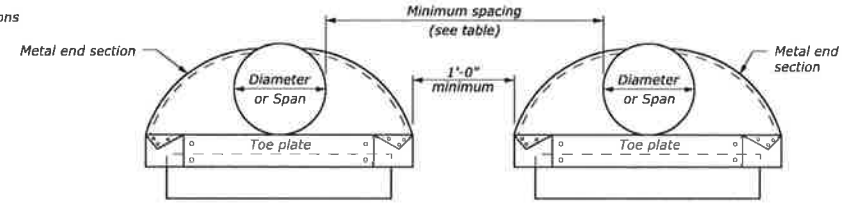


ON NATURAL GROUND



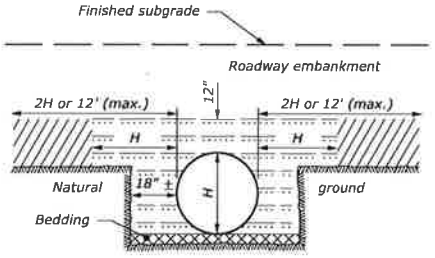
ON UNSTABLE MATERIAL

MINIMUM SPACING	
DIAMETER or SPAN	SPACING
Up to 48"	24"
48" and Up	Half diameter or span or 36", whichever is less

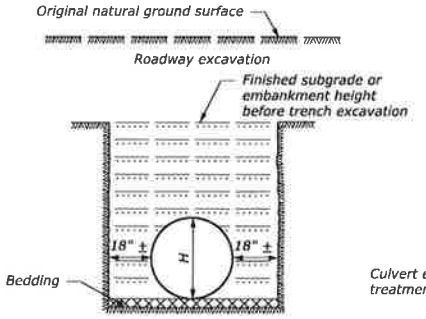


ELEVATION

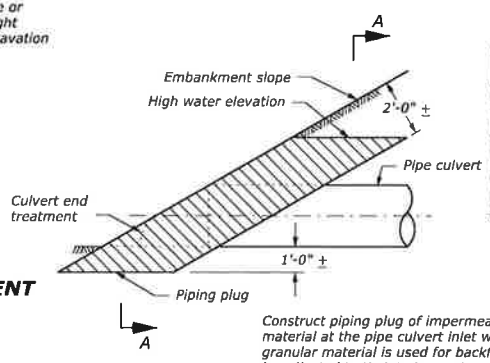
MULTIPLE PIPE INSTALLATION



ABOVE AND BELOW NATURAL GROUND

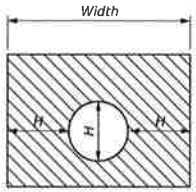


BELOW NATURAL GROUND OR TRENCH EXCAVATION IN EMBANKMENT



Construct piping plug of impermeable backfill material at the pipe culvert inlet where granular material is used for backfill. Width may be adjusted to tie into impervious material.

PIPING PLUG



SECTION A-A

NO SCALE

LEGEND:

- Bedding material (uncompacted)
- Embankment material placed in layers not exceeding 6" compacted depth.
- Compacted backfill material placed in layers not exceeding 6" compacted depth. Or lean concrete backfill in accordance with Section 614.
- Impermeable backfill material.

NPS Drwg. No. 149/60519

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD

METAL AND PLASTIC PIPE CULVERT BEDDING

STANDARD APPROVED FOR USE 12/1993
REVISED: 4/1994 6/2005
DRAFT: 10/2014

STANDARD 602-3

John Maloney | Steffi McDonald | Designed by: | Checked by:
2 October 2019 3:35 PM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	F.10

POLYETHYLENE (PE) PLASTIC ROUND PIPE CULVERT

FILL HEIGHT TABLE AND MINIMUM CELL CLASSIFICATION NUMBER PER ASTM D 3350

SMOOTH WALL (SOLID WALL)

PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASSIFICATION NUMBER 335434C — MINIMUM WALL THICKNESS (INCHES) 0.607	0.857	0.923	1.154	1.385	1.292	1.477
		MAXIMUM FILL HEIGHT (FEET)						
12	12	57						
18	12		52					
24	12			38				
30	12				38			
36	12					38		
42	12						27	
48	12							27

CORRUGATED

PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 435400C MAXIMUM FILL HEIGHT (FEET)
12	12	10
15	12	10
18	12	10
24	12	10
30	12	10
36	12	10

RIBBED

PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 334433C MAXIMUM FILL HEIGHT (FEET)	CELL CLASS. NO. 335434C
18	12	18	24
24	12	22	28
30	12	22	28
36	12	25	31
42	12	21	27
48	12	21	26

NOTE:

1. When directed, camber pipe culverts upward from a chord through the inlet and outlet inverts an ordinate amount equal to 1% of the pipe length. Develop camber on a parabolic curve. If the midpoint elevation on the parabolic curve as designed exceeds the elevation of the inlet invert, reduce the amount of camber or increase the pipe culvert gradient.
2. Measure minimum cover from the top of the pipe culvert to the subgrade for flexible pavements, and to the top of the pavement for rigid pavements. Measure maximum fill height from the top of the pipe to the top of the pavement for both flexible and rigid pavement.

POLYVINYL CHLORIDE (PVC) PLASTIC ROUND PIPE CULVERT

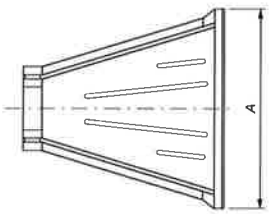
FILL HEIGHT TABLE AND MINIMUM CELL CLASSIFICATION NUMBER PER ASTM D 1784

SMOOTH WALL (SOLID WALL)

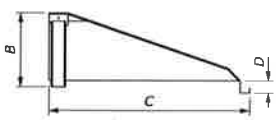
PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 12454 — MINIMUM WALL THICKNESS (INCHES) 0.358	0.438	CELL CLASS. NO. 12364 — 0.358	0.438
		MAXIMUM FILL HEIGHT (FEET)			
12	12	65		69	
15	12		62		66

RIBBED

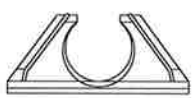
PIPE SIZE DIAMETER INCHES	MINIMUM COVER INCHES	CELL CLASS. NO. 12454C MAXIMUM FILL HEIGHT (FEET)	CELL CLASS. NO. 12364C
12	12	37	26
15	12	32	22
18	12	33	23
24	12	29	21
30	12	28	20
36	12	27	19
42	12	26	18
48	12	24	17



TOP



SIDE



FRONT

PLASTIC PIPE END SECTION

END SECTION DIMENSIONS				
PIPE SIZE DIAMETER INCHES	A	B	C	D
12	42	14.5	33	6
15	46	24.5	45.5	6
18	54	29	55	6
24	64	37	65	6
30	88	36	63.5	6
36	88	43	66.5	6

NO SCALE

NPS Drwg. No. 149/60519

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

PLASTIC PIPE CULVERT

STANDARD DETAIL APPROVED FOR USE 12/1993

REVISED: 4/1994 6/2005
DRAFT: 2/2009

STANDARD 602-5

John Maloney | Steff McDonald | Checked by: | Designed by: | 16 July 2010 5:21 PM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No. 149/150822	G.1

TUNNEL QUANTITIES

ITEM	DESCRIPTION	UNITS	QUANTITY	REMARKS
26002-0000	ROCK DOWELS (TRANSITION)	LNFT	100	FOR PINNING PORTAL EXTERIOR ROCKFALL MESH TO TUNNEL INTERIOR
26002-0000	ROCK DOWELS (INTERIOR)	LNFT	1600	TUNNEL SUPPORT AND MESH DRAIN ANCHORS
55706-1000	STRUCTURAL TIMBER AND LUMBER, UNTREATED	LPSM	1	
56601-0000	SHOTCRETE (MIN 3-INCH)	SQYD	360	INTERIOR, INCIDENTAL TO SHOTCRETE IS THE INSTALLATION OF APPROXIMATELY 710 LNFT OF DRAINAGE WEEP HOLES
56601-0000	SHOTCRETE (MIN 4-INCH)	SQYD	480	INTERIOR, INCIDENTAL TO SHOTCRETE IS THE INSTALLATION OF APPROXIMATELY 710 LNFT OF DRAINAGE WEEP HOLES
60504-0000	GEOCOMPOSITE SHEET DRAIN SYSTEM	SQYD	40	AS NEEDED IN TUNNEL
62302-0100	SPECIAL LABOR, SLOPE SCALING	HOUR	40	ROCK SCALING TUNNEL
65501-0000	ANCHORED WIRE MESH SYSTEM	SQYD	120	FOR TUNNEL DRAINAGE OF SHEAR ZONE WITH HIGH WATER INFLOW

NOTES

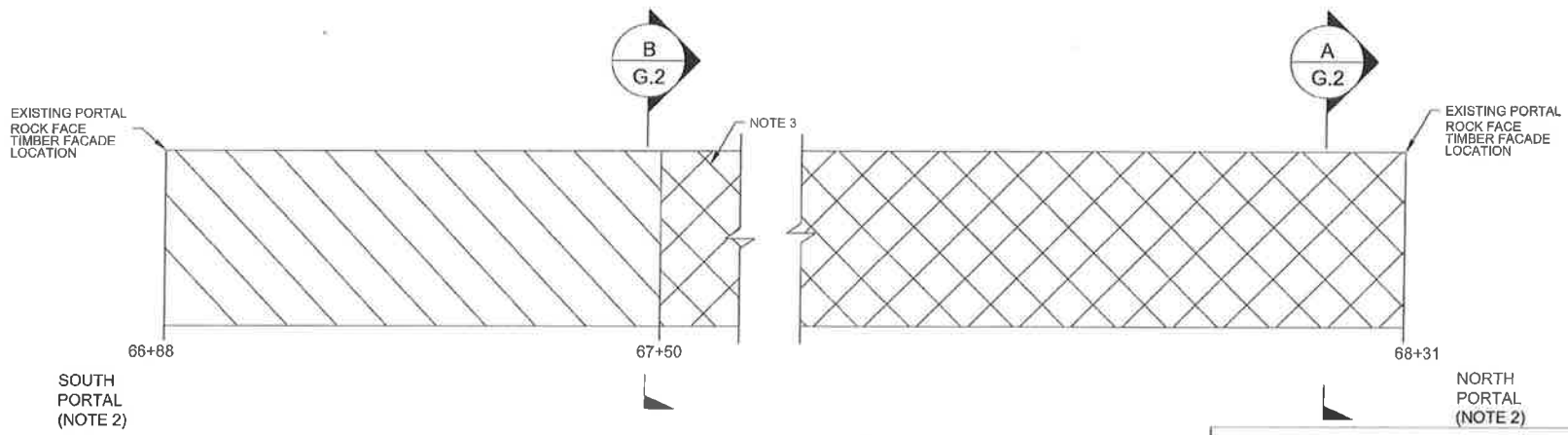
1. ALL DIMENSIONS ARE APPROXIMATE AND NEED TO BE VERIFIED IN THE FIELD.
2. PORTAL STRUCTURES AND PORTAL AREA ROCKFALL MITIGATION MEASURES ARE NOT SHOWN ON THIS SHEET.
3. DO NOT APPLY SHOTCRETE IN AREA OF WATER INFLOW ALONG SHEAR ZONE. INSTALL ANCHORED WIRE MESH SYSTEM IN AREA OF WATER INFLOW ALONG SHEAR ZONE AT THE DIRECTION OF CO. DETAILS ARE SHOWN ON SHEETS G.3 AND G.6.
4. TUNNEL SUPPORT DETAILS ARE SHOWN ON SHEET G.2. TUNNEL DRAINAGE DETAILS ARE SHOWN ON SHEET G.3 AND G.6.
5. ROCK DOWELS (TRANSITION) ARE SHOWN ON SHEET G.4.

RISHENG PIAO
STATE OF WASHINGTON
53378
REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 5/13/2021

LEGEND

4 INCHES SYNTHETIC FIBER REINFORCED SHOTCRETE (NOTE 3, G.2) FROM SPRING LINE TO SPRING LINE + 10 TO 15 FOOT LONG ROCK DOWELS ON AN 8 FOOT BY 8 FOOT SPACING FROM SPRING LINE TO SPRING LINE + SPOT ROCK DOWELS

3 INCHES SYNTHETIC FIBER REINFORCED SHOTCRETE (NOTE 3, G.2) FROM SPRINGLINE TO SPRINGLINE + SPOT ROCK DOWELS

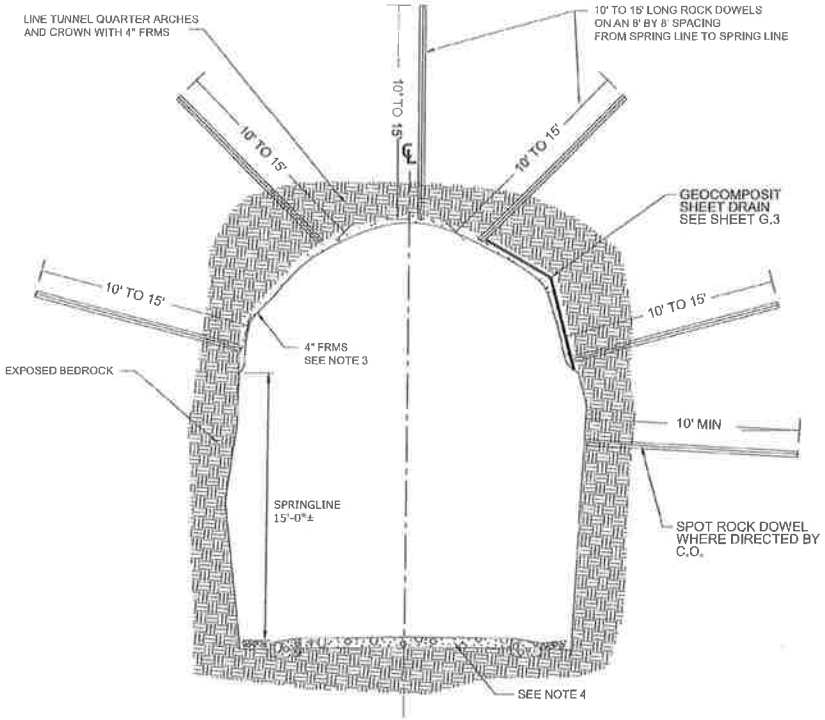


1 / - TUNNEL PLAN
SCALE: NTS

TUNNEL PLAN

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	G.2

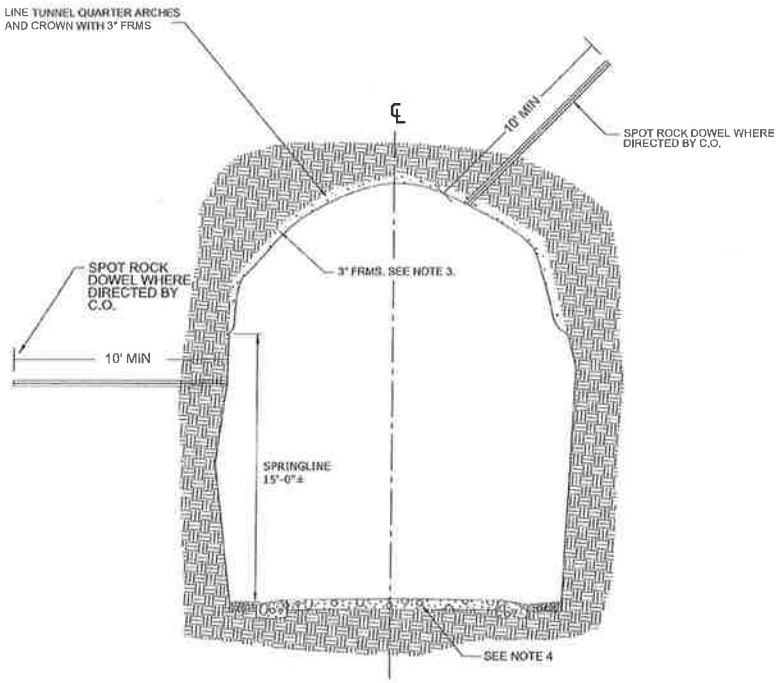
NPS PMIS No. 228726
NPS Drwg No. 149/150822



A PARTIAL FIBER REINFORCED MICROSILICA SHOTCRETE (FRMS) AND SPOT/PATTERN ROCK DOWEL SECTION

NOT TO SCALE

STA 67+50 TO 68+31



B PARTIAL FRMS AND SPOT ROCK DOWEL SECTION

NOT TO SCALE

STA 66+88 TO 67+50

NOTES

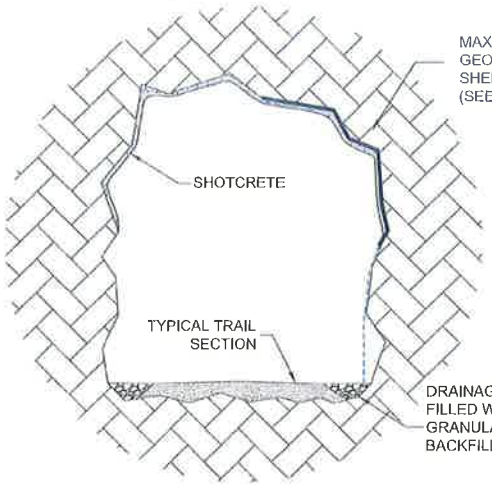
1. ROCK DOWEL LENGTHS AND LOCATIONS ARE APPROXIMATE. ADJUST ROCK DOWEL LENGTHS AND LOCATIONS BASED ON FIELD CONDITIONS. WHERE PATTERN DOWELS ARE INDICATED, INSTALL AS MANY DOWELS AS ARE NEEDED TO CREATE AN 8' BY 8' SPACING ALONG THE IRREGULAR TUNNEL SHAPE. THE MINIMUM NUMBER OF DOWELS IN A ROW IS 5. PROVIDE A MINIMUM EMBEDMENT DEPTH OF 15 FT FOR ROCK DOWELS WITHIN 5 FT OF THE PROMINENT SHEAR ZONE. PROVIDE A MINIMUM EMBEDMENT DEPTH OF 10 FT FOR ROCK DOWELS ELSEWHERE IN THE TUNNEL. ROCK DOWEL LENGTHS AND LOCATIONS WILL BE DETERMINED IN THE FIELD BY THE CO.
2. SCALE ENTIRE TUNNEL CIRCUMFERENCE PRIOR TO INSTALLING ROCK DOWELS AND SHOTCRETE. ROCK DOWEL INSTALLATION PLAN TO BE SUBMITTED AND APPROVED BY THE CO PRIOR TO STARTING ROCK DOWELING. COMPLETE ROCK DOWEL INSTALLATION PRIOR TO WEEP HOLE DRILLING AND SHOTCRETE PLACEMENT UNLESS ALTERNATIVE SEQUENCE IS APPROVED BY CO.
3. SHOTCRETE TO BE REINFORCED WITH SYNTHETIC FIBERS. FRMS COVERAGE WILL VARY LONGITUDINALLY DEPENDING ON SPRING LINE HEIGHT, TO BE DIRECTED BY THE CO.
4. FOR INNER TUNNEL TRAIL DETAILS, REFER TO SHEET C.2.
5. FOR DRAINAGE DETAILS, REFER TO SHEET G.3 AND G.6.
6. FEATURE LOCATIONS, FEATURE ORIENTATIONS, AND TUNNEL DIMENSIONS ARE APPROXIMATE.
7. FOR ROCK DOWEL DETAILS, REFER TO SHEET G.6.

EXPIRES: 5/13/2021

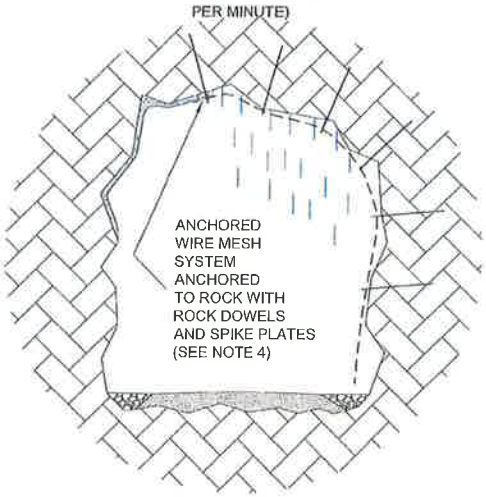
INTERIOR TUNNEL SECTIONS

22 Jun 2019 10:16 AM | C:\Projects\Spruce Bluff\50170_TB.dgn [US_Sur_ADS] | Designed by: R. Whipple 08/2019 | Checked by: R. Piao 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1) NPS PMIS No. 228726 NPS Drwg No. 149/150822	G.3

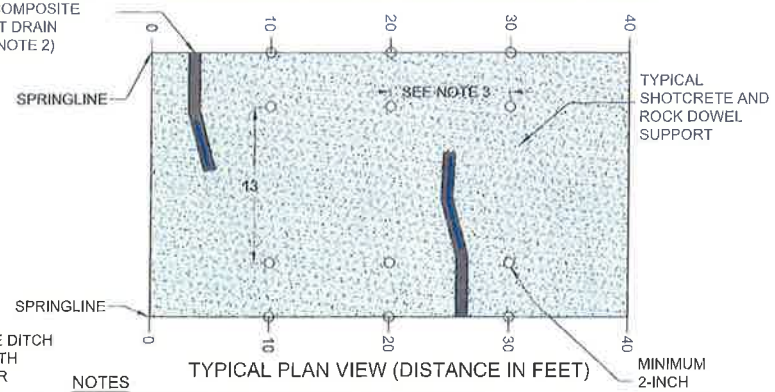


GEOCOMPOSITE SHEET DRAIN
(FOR OBSERVED OR SUSPECTED FLOWS UP TO ABOUT 2 GALLONS PER MINUTE)

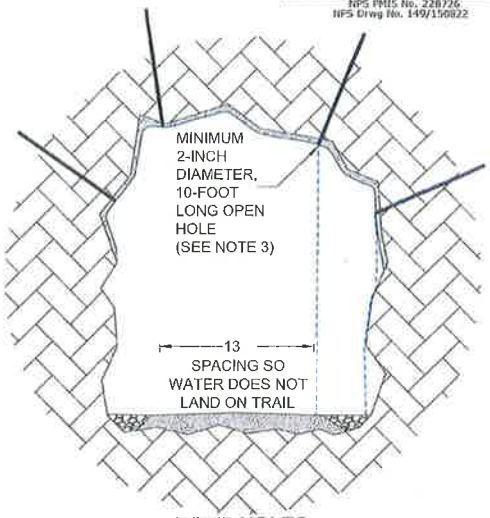


ANCHORED WIRE MESH SYSTEM
(FOR DRAINING HEAVY FLOWS OF SEVERAL GALLONS PER MINUTE)

GEOCOMPOSITE SHEET DRAIN AND WEEP HOLES

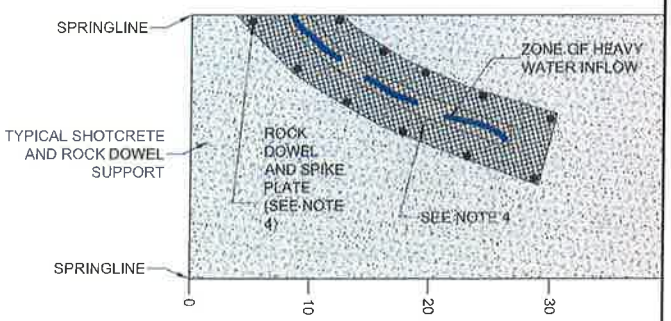


TYPICAL PLAN VIEW (DISTANCE IN FEET)



WEEP HOLES
(FOR TYPICAL SHOTCRETE DRAINAGE)

ANCHORED WIRE MESH SYSTEM



TYPICAL PLAN VIEW (DISTANCE IN FEET)

NOTES

1. FEATURE LOCATIONS, FEATURE ORIENTATIONS, AND TUNNEL DIMENSIONS ARE APPROXIMATE.
2. LOCATIONS FOR GEOCOMPOSITE SHEET DRAIN WILL BE IDENTIFIED BY THE CO. FIT GEOCOMPOSITE SHEET DRAIN TO IRREGULAR ROCK SURFACES PRIOR TO SHOTCRETE PLACEMENT, WITH MINIMAL WRINKLING OR FOLDING. THE MAXIMUM WIDTH OF GEOCOMPOSITE SHEET DRAIN STRIPS IS 12 INCHES AND THE MINIMUM DISTANCE BETWEEN TWO ADJACENT GEOCOMPOSITE SHEET DRAIN STRIPS IS 24 INCHES. INSTALL GEOCOMPOSITE SHEET DRAIN STRIPS IN ACCORDANCE WITH THE MANUFACTURER'S GUIDELINES.
3. DRILL WEEP HOLES ON A PATTERN FROM SPRINGLINE TO SPRINGLINE THROUGHOUT THE TUNNEL (AFTER ROCK DOWEL INSTALLATION BUT BEFORE SHOTCRETE PLACEMENT). FROM STATION 66+88 TO STATION 67+50, SPACE THE WEEP HOLE ROWS EVERY 10 FEET ALONG THE TUNNEL AXIS. FROM STATION 67+50 TO 68+31, SPACE THE WEEP HOLE ROWS EVERY 8 FEET ALONG THE TUNNEL AXIS, OPPOSITE THE PATTERN ROCK DOWEL SPACING. MAKE THE SPACING OF HOLES PERPENDICULAR TO THE TUNNEL AXIS SIMILAR TO THE SPACING ALONG THE AXIS BUT EXTEND IT UP TO 13 FEET IN THE CROWN SO THAT WATER DOES NOT DRIP DIRECTLY ONTO THE FINISHED TRAIL. THE MINIMUM NUMBER OF WEEP HOLES PER ROW IS 4. PROTECT WEEP HOLES DURING SHOTCRETE APPLICATION (SUCH AS WITH SHORT SECTIONS OF CAPPED PVC PIPE) AND UNCOVER THEM AFTER SHOTCRETE APPLICATION IS COMPLETE.
4. APPLY ANCHORED WIRE MESH SYSTEM OVER AREAS LOCATED BY CO OF HEAVY INFLOW (SEVERAL GALLONS PER MINUTE). ATTACH THE MESH TO ROCK DOWELS WITH A MINIMUM EMBEDMENT LENGTH OF 5 FEET THAT ARE OTHERWISE THE SAME AS THE DOWELS USED FOR TUNNEL SUPPORT. INSTALL THE ROCK DOWELS APPROXIMATELY 2 FEET AWAY FROM THE EDGES OF THE WATER-BEARING FEATURE, WHICH IS ANTICIPATED TO BE 1 TO 2 FEET WIDE. SPACE THE ROCK DOWELS ALONG THE FEATURE EVERY 4 TO 6 FEET, ADJUSTED AS NECESSARY SO THAT THE MESH, ONCE ATTACHED, WILL BE TIGHT AND CONTOURED TO THE TUNNEL SHAPE. PROTECT THE ROCK DOWELS DURING SHOTCRETE APPLICATION AND THEN UNCOVER THEM. APPLY THE SHOTCRETE UP TO THE EDGES OF THE WATER BEARING FEATURE. AFTER THE SHOTCRETE HAS HARDENED, ATTACH THE MESH TO THE ROCK DOWELS USING NUTS AND SPIKE PLATES AS RECOMMENDED BY THE MESH MANUFACTURER. OVERLAP THE SHOTCRETE AT LEAST 2 FEET WITH THE MESH. CONNECT ALL MESH SEAMS USING HARDWARE AS RECOMMENDED BY THE MESH MANUFACTURER. SEE THIS SHEET AND SHEET G.6 FOR THE ANCHORED WIRE MESH SYSTEM DETAIL.
5. FINAL LOCATIONS OF DRAINAGE MEASURES WILL BE DETERMINED BY THE CO.

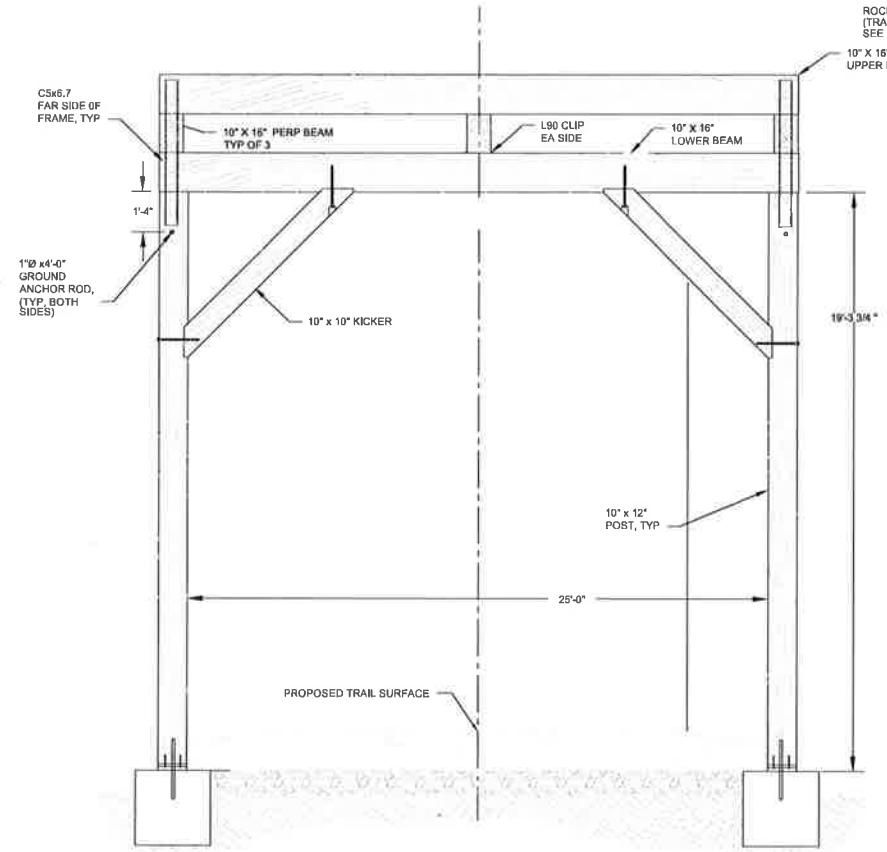
RISHENG PLAO
STATE OF WASHINGTON
53518
REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 5/13/2021

NO SCALE

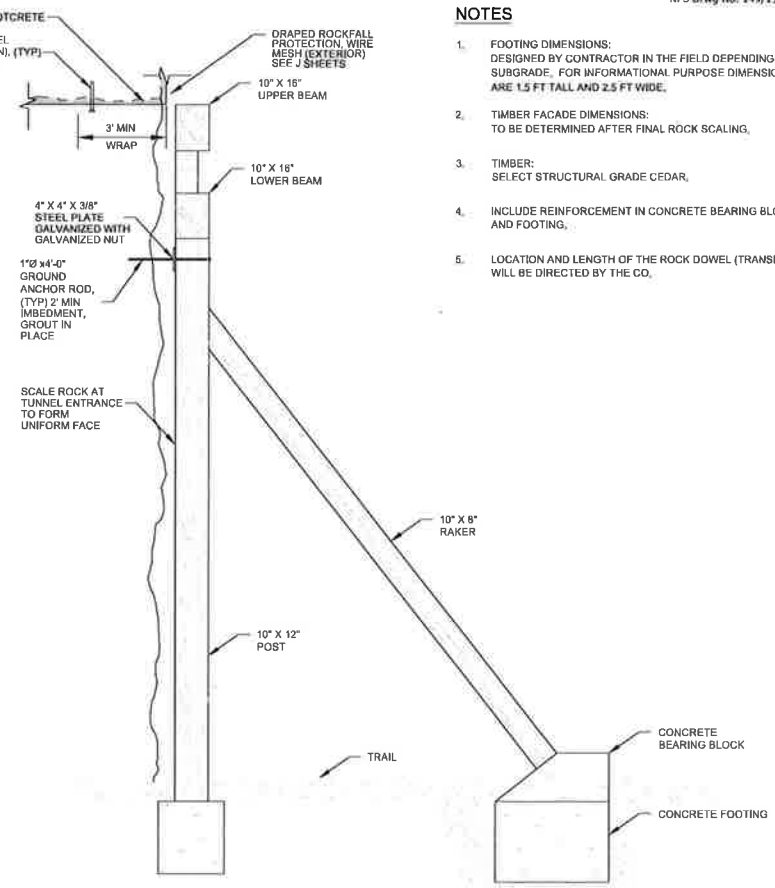
TUNNEL DRAINAGE

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	G.4

NPS PMIS No. 228726
NPS Drwg No. 149/150822



ELEVATION VIEW



SECTION VIEW

NOTES

1. FOOTING DIMENSIONS:
   DESIGNED BY CONTRACTOR IN THE FIELD DEPENDING ON NATIVE SUBGRADE. FOR INFORMATIONAL PURPOSE DIMENSIONS SHOWN ARE 1.5 FT TALL AND 2.5 FT WIDE.
2. TIMBER FACADE DIMENSIONS:
   TO BE DETERMINED AFTER FINAL ROCK SCALING.
3. TIMBER:
   SELECT STRUCTURAL GRADE CEDAR.
4. INCLUDE REINFORCEMENT IN CONCRETE BEARING BLOCK AND FOOTING.
5. LOCATION AND LENGTH OF THE ROCK DOWEL (TRANSITION) WILL BE DIRECTED BY THE CO.

TIMBER FACADE

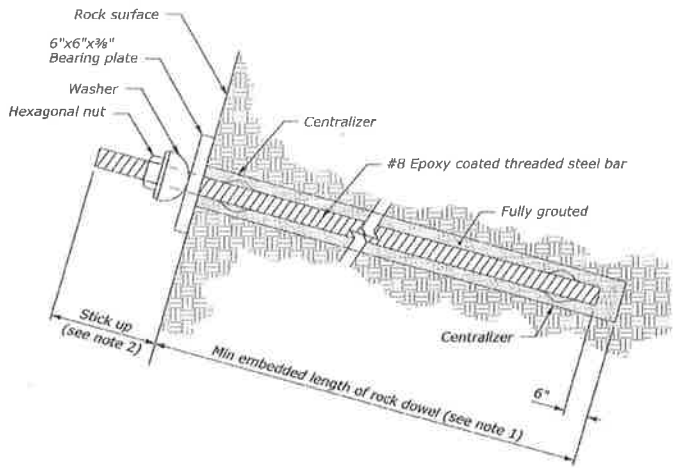
NO SCALE

TIMBER FACADE ELEVATION AND SECTION

3 October 2019 8:03 AM | J:\DCS\Projects\TRAN\60547131_WFLSpruce@\000-CAD-GIS\910-CAD\25-SHEETS\93_JA=2019\D_TD.dgn [US_Sq] Designed by: R. Whistler 08/2019 | Checked by: P. Palo 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	G.5

NPS PMIS No. 228726
NPS Dwg No. 149/150822



ROCK DOWEL (INTERIOR)

NOTES:

1. Minimum embedded length of tunnel support rock dowels is 10-feet (15-feet within 5-feet of shear zone). Minimum embedded length of anchored wire mesh system is 5-feet.
2. Minimum 1-foot stick up for rock dowels and 1.5-feet for anchored wire mesh system dowels.
3. Rock dowels (interior) are continuous, #8 threadbar (Grade 75), epoxy coated, untensioned, and cement grouted full length in rock.
4. Rock dowel design load is 47 kips.
5. Rock dowels to conform with Specification Section 260 and associated SCR's. Torque nuts to manufacturer's recommendation.
6. Maximum spacing between centralizers is 10-feet. Minimum two centralizers per dowel.
7. For anchored wire mesh system rock dowels, bearing plate consists of a spike plate consistent with the mesh manufacturer's recommendations.

RISHENG PIAO
STATE OF WASHINGTON
53678
REGISTERED
PROFESSIONAL ENGINEER

EXPIRES: 5/13/2021

NO SCALE

ROCK DOWEL (INTERIOR) DETAIL

Designed by: R. Whisler | Checked by: R. Piao | 08/2019 | 08/2019

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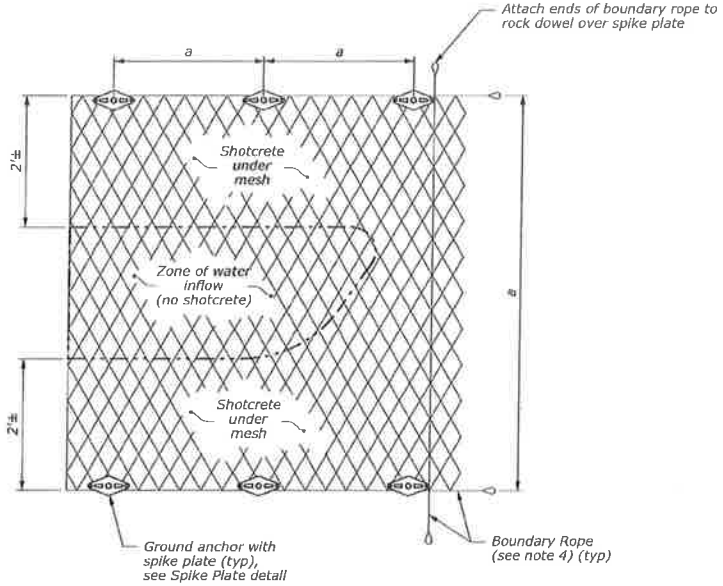
25 August 2019 11:43 AM

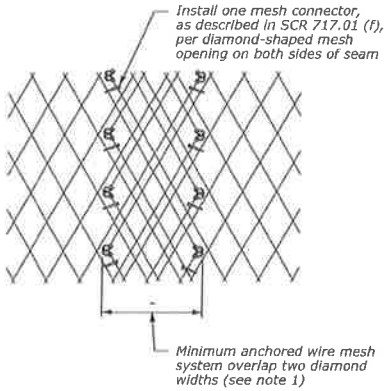
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	G.6

NPS PMIS No. 228726
NPS Drwg No. 149/150822

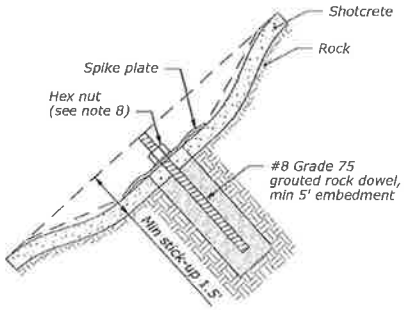
EXPIRES: 5/13/2021



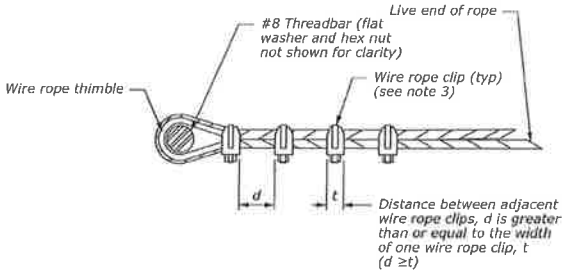
ANCHORED WIRE MESH SYSTEM DETAIL



ANCHORED WIRE MESH SYSTEM DETAIL



ROCK DOWEL (INTERIOR) WITH SPIKE PLATE DETAIL



BOUNDARY ROPE TERMINAL EYE SPLICE DETAIL

NOTES:

1. For non-symmetric layouts, use minimum overlap at widest point and increase overlap as required.
2. Mesh overlap and penetration details in accordance with manufacturer's requirements.
3. Minimum of four wire rope clips are required for splices on wire ropes smaller than 22 millimeters (approximately 7/8 inch).
4. Install boundary ropes as described in SCR Section 709.03, around the full perimeter of the mesh.
5. Deviations of up to 10 percent of the specified anchor spacing are acceptable to accommodate surface irregularities and existing ground anchors.
6. The maximum rock dowel spacing (a) is 6-feet along the mesh perimeter. The minimum rock dowel length is 5-feet fully grouted and embedded, with a minimum of 1.5-feet stick up prior to shotcrete placement.
7. Spike plates to be used with mesh, SCR Section 722.03 (c)(l).
8. Hex nuts to be used with spike plates to secure mesh in accordance with manufacturer's recommendation.

NO SCALE

ANCHORED WIRE MESH SYSTEM DETAIL

2 October 2019 3:53 PM | I:\OCS\Projects\TRN\A0547135_WFL\Services\900-CAD-CSD\010-CAD\20-SHEETS\G6_dgn=251701_TT.dgn [G5_3d] | BBS/Grid by: R. Whitcher | 08/2019 | Checked by: F. Piao | 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.1

NPS PMIS No. 228726
NPS Drwg No. 149/150822

MSE WALL QUANTITIES

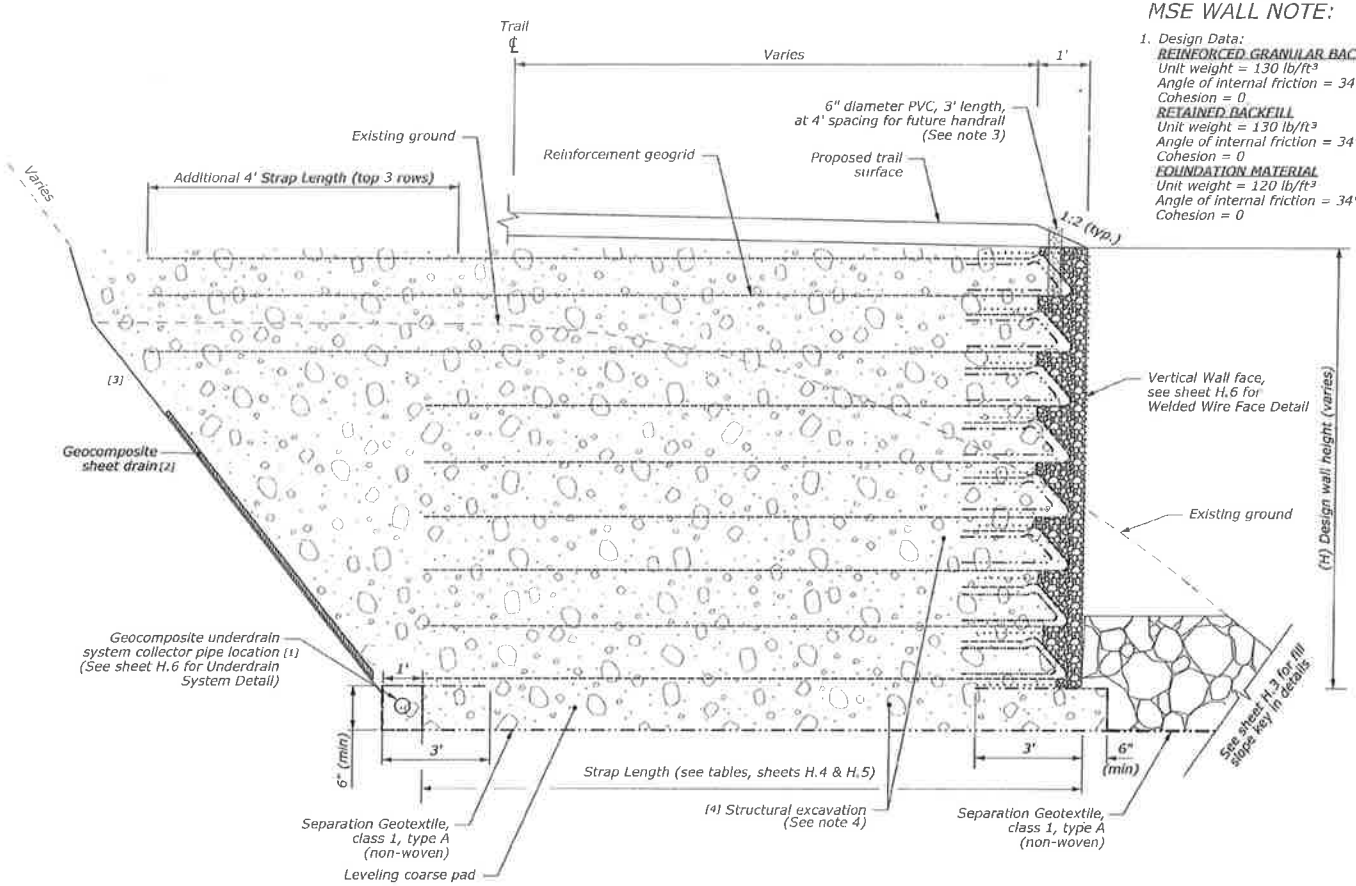
LOCATION	WALL NO.	25101-0300 PLACED RIPRAP METHOD A, CLASS 3 (CUYD)	25501-1000 MECHANICALLY STABILIZED EARTH WALL, WELDED WIRE FACE (CONTRACTOR DESIGNED) (SQFT)	FOR INFORMATION ONLY						
				SELECT GRANULAR BACKFILL (CUYD)	GABION ROCK AT WALL FACE (CUYD)	ROCK EXCAVATION (CUYD)	REINFORCEMENT GEOGRID (SQYD)	SEPARATION GEOTEXTILE CLASS 1, TYPE A (NON-WOVEN) (SQYD)	GEOCOMPOSITE SHEET DRAIN (SQYD)	DRAINAGE COLLECTOR SYSTEM (LNFT)
64+30 to 65+70	4	0	957	495	27	0	933	342	92	188
103+50 to 104+00	9	23	400	155	11	47	358	111	32	62
105+70 to 106+90	10	62	1,260	511	35	155	933	293	138	158
113+50 to 115+10	12	159	2,000	949	56	155	1,600	480	207	204
118+80 to 120+10	14	101	1,300	575	36	0	809	274	146	166
TOTALS		**345**	**5,917**	**2,685**	**165**	**357**	**4,633**	**1,500**	**615**	**778**

TABULATION OF MSE WALL QUANTITIES

18 September 2019 3:13 PM | J:\DCS\Projects\TRANS\60547139_WA\Sprint\900-CAD-GIS\910-CAD\20-SHEETS\130_dwh-051701_wa.dgn | US_Sp Designed by: R. Acosta | 08/2019 | Checked by: P. Pavo 08/2019

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.2

NPS PMIS No. 228726
NPS Dwg No. 149/150822



TYPICAL SECTION

MSE WALL NOTE:

1. Design Data:

REINFORCED GRANULAR BACKFILL
Unit weight = 130 lb/ft³
Angle of internal friction = 34°
Cohesion = 0

RETAINED BACKFILL
Unit weight = 130 lb/ft³
Angle of internal friction = 34°
Cohesion = 0

FOUNDATION MATERIAL
Unit weight = 120 lb/ft³
Angle of internal friction = 34°
Cohesion = 0

DESIGN SURCHARGE LOAD
125 on top of the retaining wall

FACTORED BEARING RESISTANCE
Pa=2.7+0.235(B-8)(ksf), B is equal to, or greater than 8-feet

Refer to Geotechnical Report GR 12-18, June 2019

GENERAL NOTES:

SPECIFICATIONS:

DESIGN:
FHWA Publication No. FHWA-NHI-10-24 & 10-25 Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guide Lines, and AASHTO, Association of State Highway and Transportation Official (AASHTO).

CONSTRUCTION:
Conform to the following: LRFD AASHTO Bridge Design Specifications, Eighth Edition

1. Mirror detail as appropriate.
2. Top of wall will be as shown on the wall profiles, sheets H.4 & H.5
3. The exact retaining wall heights, footing step dimensions, footing elevations, 6" diameter PVC, and all other necessary final details shall be based on the final design by the contractor and shall be part of the final shop plans submitted to the CO.
4. Furnish select granular backfill meeting the requirements of 704.08.
5. Terminate wire-face wall at the beginning and end of each lift with a return of wall facing materials. The returns are not measured for payment.
6. Maximum reinforcement spacing is 1.5 feet.
7. Extend select granular backfill a minimum of 12-inches past the reinforcement length.

FOOTNOTE:

[1] Daylight outlet drain pipe through fill in embankment sections. Cover the end of the MSE drain outlet with screen according to Subsection 605.03. Hold the screen in place with standard coupling bands or by other approved means. Connect collector pipes to outlet pipes using t-connector and outlet at low points of wall and at 50-foot maximum spacing, minimum 2 outlet pipes at each wall. Mark the outlet of the outlet pipe with a 4-foot long post or other suitable marker. Place within 12-inches of the end of the pipe.

[2] Place 5-foot wide geocomposite drains 10-feet on center to a minimum of two-thirds of wall height.

[3] Shoring and bracing as dictated by the contractor's means and methods, in accordance with Section 208.

[4] As directed by CO at walls 4 and 12, excavate the previously placed log crib material. Backfill and compact with select granular backfill.

LEGEND

- Select granular backfill
- Wall face fill
- Riprap, class 3

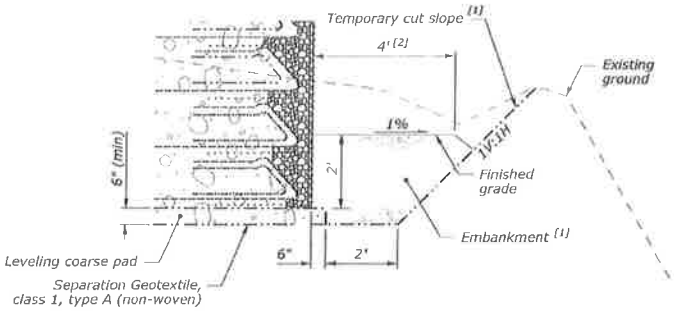
R. SHENG PIAO
STATE OF WASHINGTON
REGISTERED PROFESSIONAL ENGINEER
EXPIRES: 5/13/2021

NO SCALE

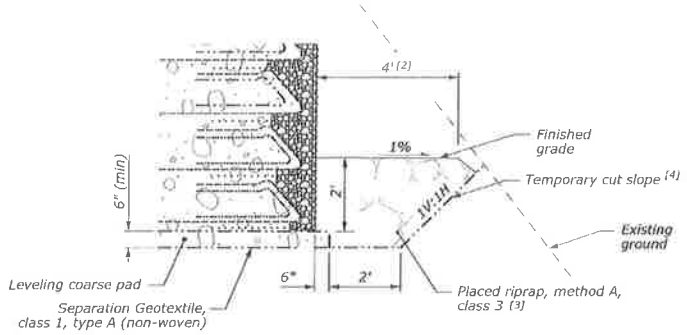
MSE WALL TYPICAL SECTION

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.3

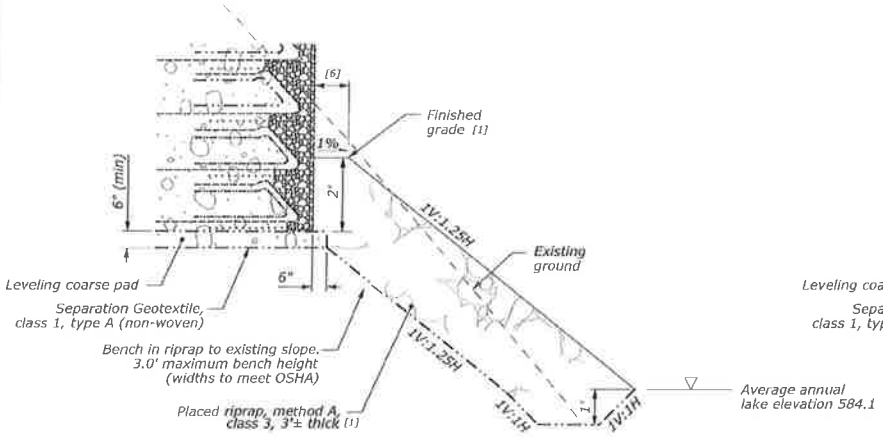
NPS FMIS No. 228726
NPS Drwg No. 149/150822



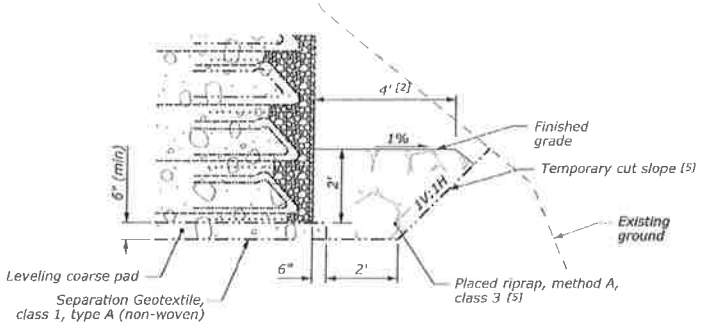
WALL 4



WALL 9 AND WALL 10



WALL 12



WALL 14

FOOTNOTE:

[1] Excavation extents may vary depending on extent of log crib wall material; all crib wall material must be removed and replaced with compacted select granular backfill consisting of soil meeting the requirements of 704.08. If existing slope below face of wall must be rebuilt depending on extents of log crib wall material removal, a riprap slope may be required, as shown on for Wall 12 or on Sheet C.3, Benching For Riprap Slope With Toe Above Lake Level.

[2] Site conditions may require decreased bench width at some wall sections. Temporary cut slopes may vary from what is shown in the details on this sheet. Final details shall be based on current cross sections taken in the field by the contractor and shall be part of the final shop plans submitted to the CO.

[3] Resulting excavation configuration may or may not require riprap, per the direction of the CO, embankment fill may be used instead.

[4] Preserve existing vegetation by limiting excavation as shown.

[5] Existing dry stacked stone to remain in place where stable. Place additional riprap in front of wall face to provide adequate toe embedment.

[6] Expect decreased bench width from the standard 4-foot width at this wall section. Final details shall be based on current cross sections taken in the field by the contractor and shall be part of the final shop plans submitted to the CO.

LEGEND

- Embankment
- Select granular backfill
- Wall face fill
- Riprap, class 3

RISHENG PLAO
STATE OF WASHINGTON
31978
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES: 5/13/2021

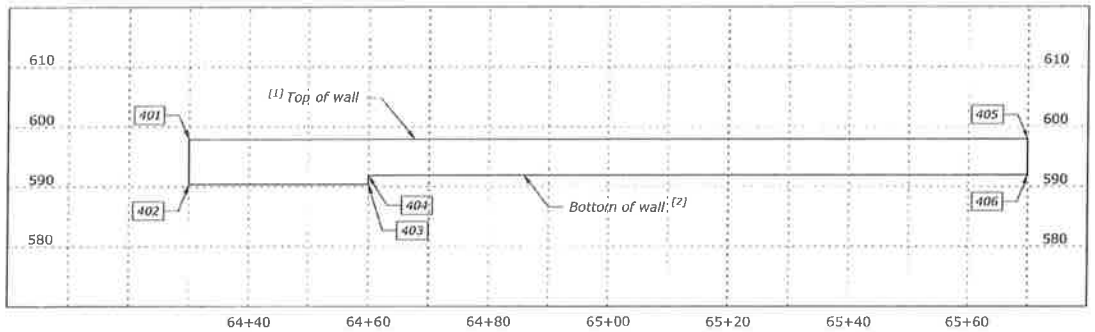
NO SCALE

MSE WALL TOE EMBEDMENT DETAILS

Designed by: R. Acosta
Checked by: P. Pao
06/2019
08/2019
24 August 2019 5:31 PM
E:\Projects\Sprue Bluff\m20193_wall.dgn [05_Sw_A20]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.4

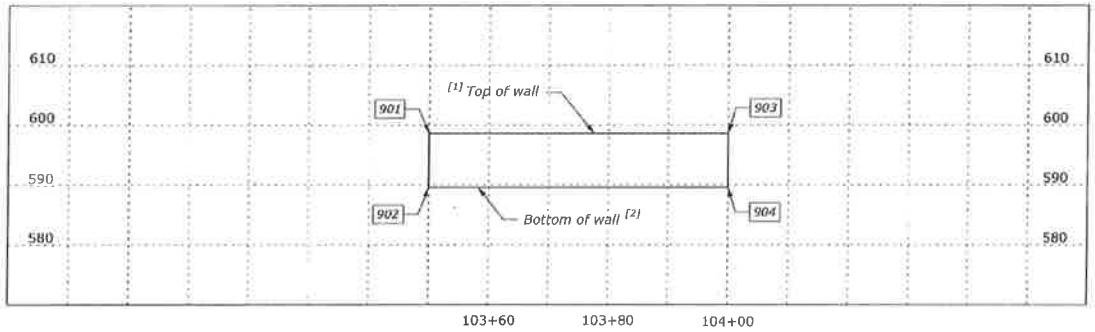
NPS PMIS No. 228776
NPS Dwg No. 149/150622



WALL 4

POINT	WALL 4	
	STATION	ELEV
401	64+30	597.94
402	64+30	590.46
403	64+60	590.46
404	64+60	591.94
405	65+70	597.94
406	65+70	591.94
MINIMUM STRAP LENGTH (FT)		11
RIPRAP NEEDED		NO*

*RIPRAP MAY BE REQUIRED DEPENDING ON EXTENTS OF SLOPE OVEREXCAVATION TO REMOVE EXISTING LOG CRIB MATERIAL.



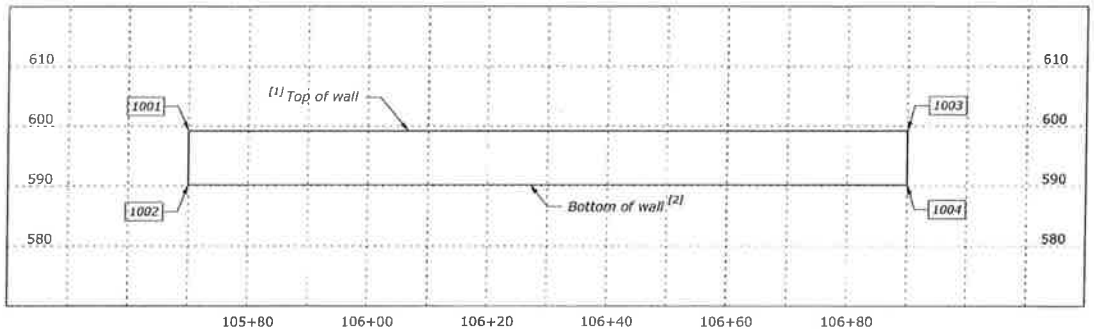
WALL 9

POINT	WALL 9	
	STATION	ELEV
901	103+50	598.60
902	103+50	589.60
903	104+00	598.60
904	104+00	589.60
MINIMUM STRAP LENGTH (FT)		10
RIPRAP NEEDED		YES

FOOTNOTES:

[1] Top of wall elevation defined as bottom of base material for paved trail surfacing.

[2] Bottom of wall elevation defined at the bottom level of wall reinforcement, at the top of the leveling pad.



WALL 10

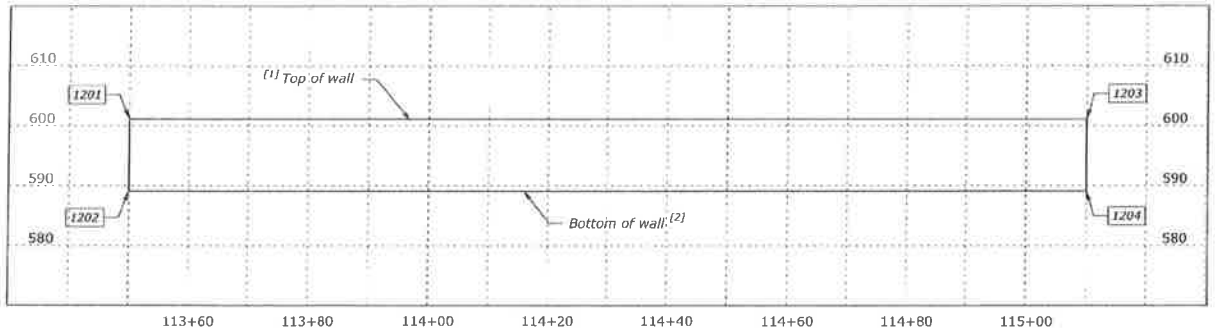
POINT	[6] WALL 10	
	STATION	ELEV
1001	105+70	599.21
1002	105+70	590.22
1003	106+90	599.21
1004	106+90	590.22
MINIMUM STRAP LENGTH (FT)		11.5
RIPRAP NEEDED		YES

EXPIRES: 5/12/2021

MSE WALL PROFILES AND TABLES

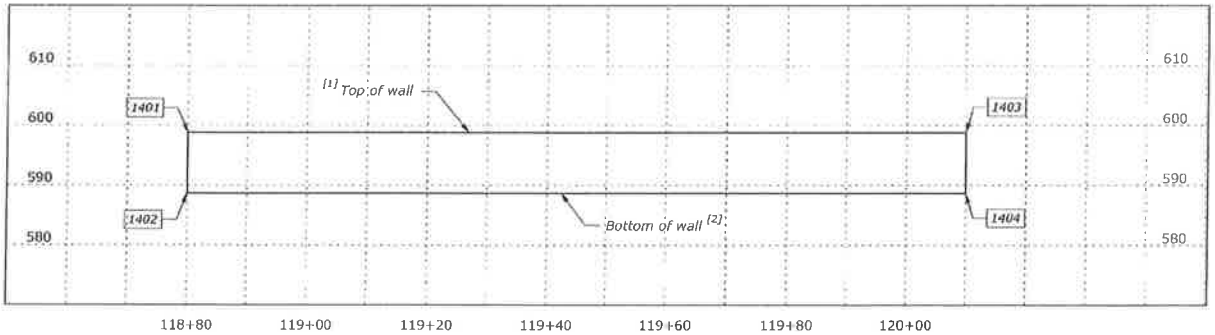
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.5

NPS PMIS No. 228726
NPS Dwg No. 149/150022



WALL 12

POINT	WALL 12	
	STATION	ELEV
1201	113+50	601.12
1202	113+50	589.12
1203	115+10	601.12
1204	115+10	589.12
MINIMUM STRAP LENGTH (FT)		10
RIPRAP NEEDED		YES



WALL 14

POINT	WALL 14	
	STATION	ELEV
1401	118+80	598.80
1402	118+80	588.67
1403	120+10	598.80
1404	120+10	588.67
MINIMUM STRAP LENGTH (FT)		8
RIPRAP NEEDED		YES

FOOTNOTES:

[1] *Top of wall elevation defined as bottom of base material for paved trail surfacing.*

[2] *Bottom of wall elevation defined at the bottom level of wall reinforcement, at the top of the leveling pad.*

RISHENG PIAO
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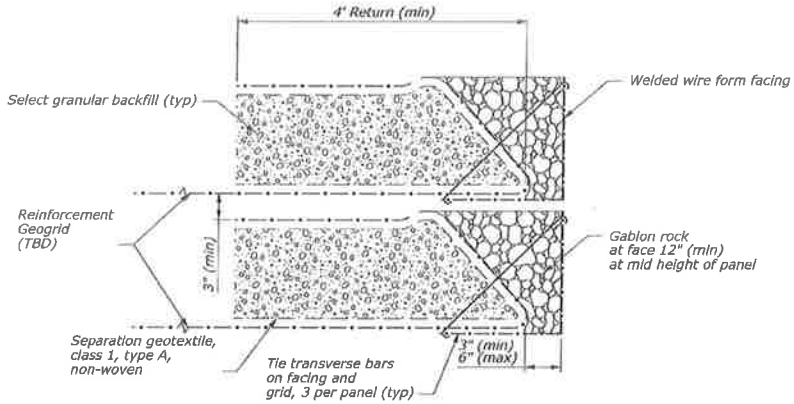
REGISTERED PROFESSIONAL ENGINEER

EXPIRES: 5/13/2021

MSE WALL PROFILES AND TABLES

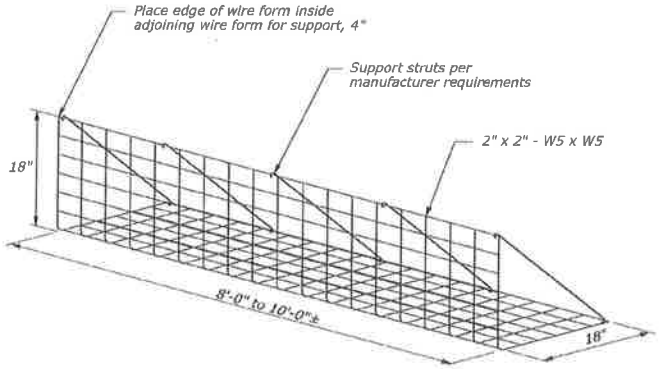
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	H.6

NPS PMIS No. 228726
NPS Drwg No. 14W150822

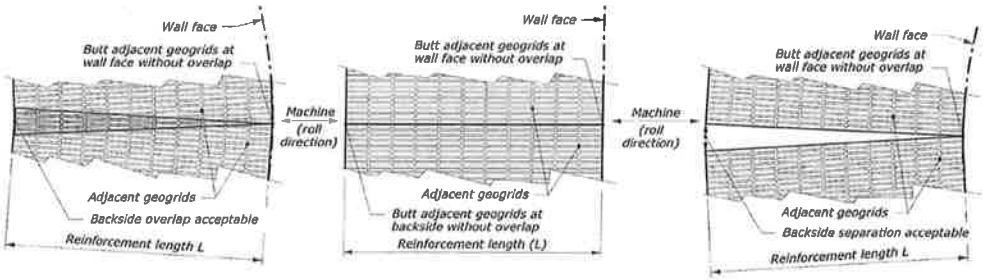


FACING DETAIL - ROCK FILL TO WELDED WIRE FACE DETAIL

Note: Select granular backfill between geogrid reinforcement is omitted for clarity.



WELDED WIRE FORM

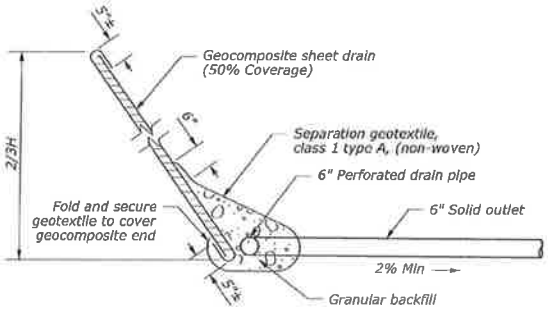


CURVE LEFT WALL FACE

TANGENT WALL FACE (PLAN VIEWS)

CURVE RIGHT WALL FACE

GEOGRID DETAIL



6" PERFORATED PIPE UNDERDRAIN SYSTEM DETAIL

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STATE OF WASHINGTON
33818
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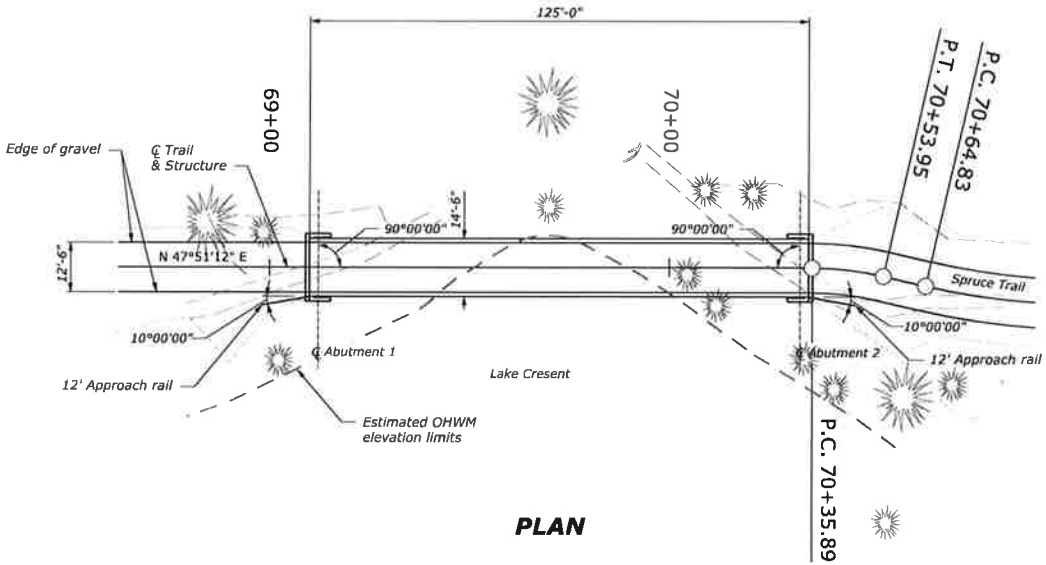
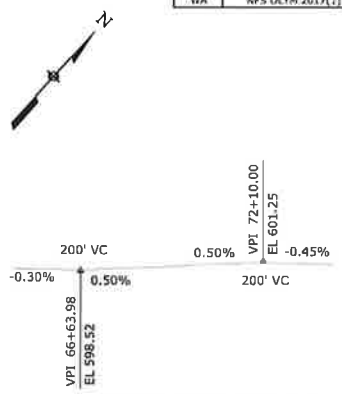
EXPIRES: 5/13/2021

MSE WALL AND GEOGRID DETAILS

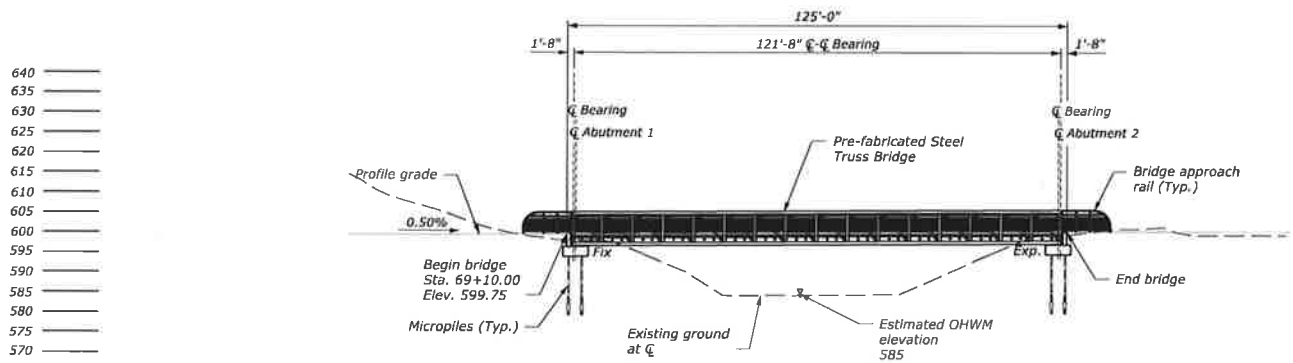
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.1



PLAN



PROFILE GRADE



ELEVATION

Key

Fix. = fixed end bearing
Exp. = expansion end bearing

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

SEGMENT B BRIDGE
SPRUCE RAILROAD TRAIL
OLYMPIC NATIONAL PARK
CLALLAM COUNTY, WASHINGTON

PLAN & ELEVATION

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	1:30	B. SHAFFER	1 of 10	AUGUST 2019	RG3161-A

13-Sep-2019 04:53 PM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	I.2

GENERAL NOTES

SPECIFICATIONS:

Construction:
Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-14 (U.S. Customary Units).

Design:
AASHTO LRFD Bridge Design Specifications 2017, 8" edition.
AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2009 with 2015 Interim Revision.

DESIGN LOADS:

Dead loads:
Concrete: 150 pcf
Lateral Earth Pressure: equivalent fluid weight of soil, 38 pcf

Live loads:
Pedestrian live load = 90 psf
AASHTO H-12; no live load impact

Wind loads:
Design Wind Speed = 110 MPH
Exposure Category D

Seismic design parameters:
Seismic Design Category C
Site Class B per Geotechnical Recommendations
Peak Ground acceleration (PGA) = 0.38g
Mapped Spectral Accelerations: S_s= 0.86g S_1= 0.37g
Spectral Response Coefficients: S_{DS}= 0.86g S_{D1}= 0.37g

MATERIALS:

Cast-in-place Concrete:
Furnish class A(AE) for abutments
f'c = 4,500 psi at 28 days.
Chamfer exposed edges of all concrete 3/4" unless noted otherwise on the plans.

Reinforcing Steel:
Furnish reinforcing steel conforming to AASHTO M31, Grade 60 deformed.
Provide 2" cover for reinforcing steel unless otherwise noted.

Structural steel:
Furnish high-strength low alloy structural steel conforming to AASHTO M270 (ASTM A709 Grade 50W) weathered truss steel and floor beam system unless otherwise noted.
Furnish shear connectors conforming to AASHTO M169 (ASTM A108).
Furnish main load carrying member components subjected to tensile stress conforming to the ASTM A847 Supplemental Requirements, S83 (for Zone 2), and S93.
These member components consist of all plate girder web plates and flange splice plates, and all bottom flange plates.
Furnish slip critical, friction type, Class A, field connections conforming to AASHTO M164, type 1, (ASTM A325 TYPE 1) with ASTM A563 Grade C nuts and ASTM F463 washer unless otherwise noted on the plans.

Structural Timber
Furnish structural timber conforming to AASHTO M 168.
Galvanize hardware according AASHTO M 232.
Provide treated Douglas Fir for all structural timber used for timber plank deck.
Treat structural timber according to AWPA U1. Use Copper Naphthenate and treat to Use Category UC3B.

Miscellaneous Structural Steel:
Furnish diaphragm anchor bolts conforming to ASTM A307.
Furnish structural metal for guard angles and beveled sole plates conforming to ASTM A36, galvanize guard angle assemblies after fabrication.
Furnish welded anchors conforming to AASHTO M169.

Bridge rail, hand rail, and approach rails:
Provide hot dip galvanized fasteners conforming to ASTM A307.
Provide steel tubes conforming to ASTM A709.
Provide treated Douglas Fir for all lumber used for timber handrails.

Painting:
Perform painting according to Section 563.

Welding:
Perform all welding in accordance with the current AASHTO/AWS D1.5 Bridge Welding Code.
Perform welding process manual shielded metal arc welding (SMAW) using low hydrogen electrodes classified E7028.
Non-destructive testing of welds shall be performed as follows:
Fillet welds - Visual - 100%
- MT. - 10% min.

Bearings:
Provide elastomeric bearing pads conforming to the requirements of Section 18.2 of the AASHTO LRFD Bridge Construction Specifications with 60 durometer hardness.
Follow AASHTO LRFD design Method A.

GEOTECHNICAL REPORT:
For boring logs and other geotechnical information, see "Spruce Railroad Trail Segment B Geotechnical Report GR 12-18".

SOIL PARAMETERS FOR MICROPILE DESIGN:

SOIL PARAMETERS FOR MICROPILE DESIGN

SOIL TYPE	γ' (pcf)	Phi (deg)	Qu (psi)
COLLUVIUM (GM)	120	34	--
BASALT (ABOVE WATER TABLE)	175	--	2000
BASALT (BELOW WATER TABLE)	113	--	2000

γ' = soil effective unit weight
Phi = angle of internal friction
Qu = unconfined compressive strength
For additional micropile design parameters, see sheet I.4, MICROPILE DETAILS.

ESTIMATE OF QUANTITIES

ITEM NO.	ITEM	QUANTITY	UNIT	NOTES
20801-0000	STRUCTURE EXCAVATION	80	CUYD	
55201-0200	STRUCTURAL CONCRETE, CLASS A(AE)	26	CUYD	CONTRACT QUANTITY
55401-1000	REINFORCING STEEL	2634	LBS	CONTRACT QUANTITY
55504-0000	PRE-FABRICATED STEEL BRIDGE	ALL	LPSM	
55601-0900	BRIDGE RAILING, STEEL (APPROACH)	24	LNFT	
56701-0000	MICROPILES (7" OD X 0.5" WT, INSTALLED IN 10" Ø BORED HOLE)	128	LNFT	
56705-0000	MICROPILE LOAD VERIFICATION TEST	1	EACH	
56706-0000	MICROPILE PROOF LOAD TEST	2	EACH	

SHEETS INDEX

SHEET NO.	DRAWING TITLE
I.1	Plan & Elevation
I.2	General Notes
I.3	Foundation Plan
I.4	Micropile Details
I.5	Abutment Layout
I.6	Abutment Details
I.7	Typical Section
I.8	Miscellaneous Details
I.9	Railing Details
I.10	Rebar List (1 of 1)

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION
SEGMENT B BRIDGE
SPRUCE RAILROAD TRAIL
OLYMPIC NATIONAL PARK
CLALLAM COUNTY, WASHINGTON

GENERAL NOTES

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	NONE	B. SHAFFER	2 of 10	AUGUST 2019	RG3161-B

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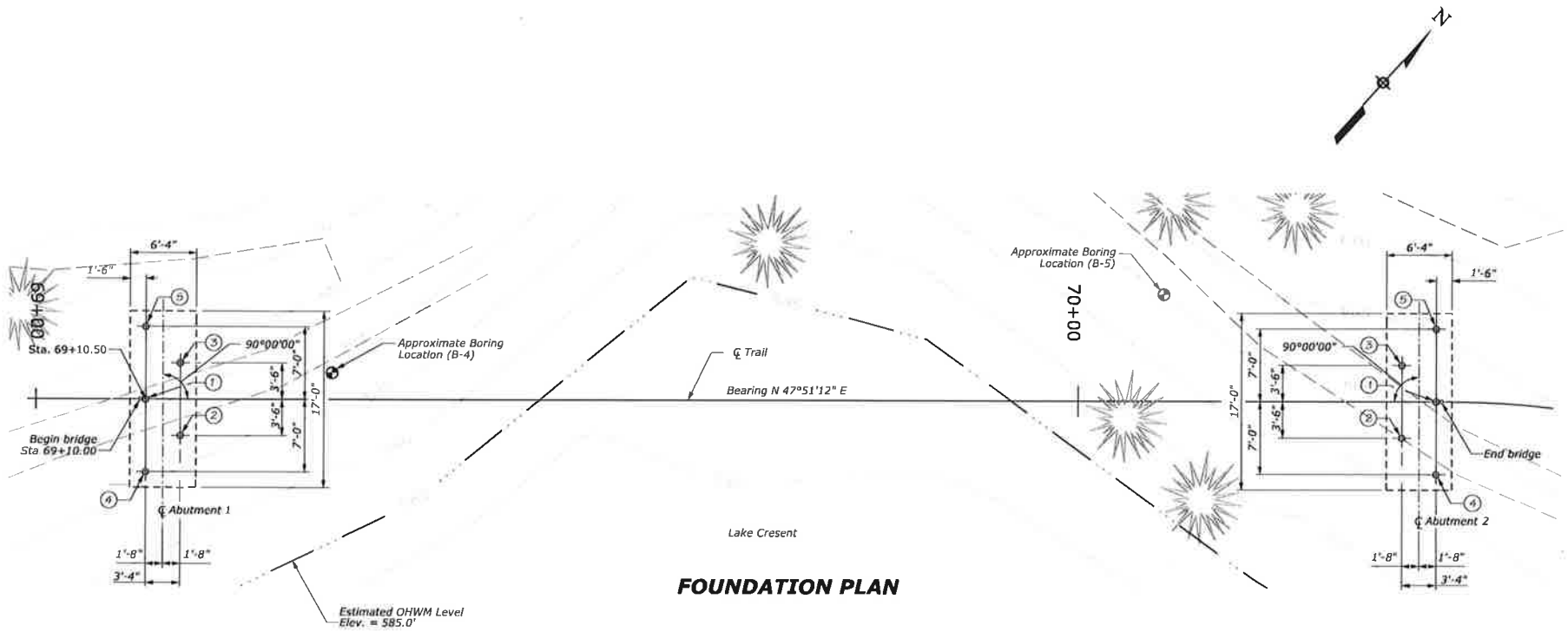
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	I.3



FOUNDATION PLAN

Notes:

1. For Typical Pile Layout, Table of Elevations, and Micropile Details, see sheet I.4.
2. Submit sacrificial pile location for verification testing for CO approval.

LEGEND

①,②,③,④ and ⑤ Micropile Location

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FOUNDATION PLAN

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	1:10	B. SHAFFER	3 of 10	AUGUST 2019	RG3161-C

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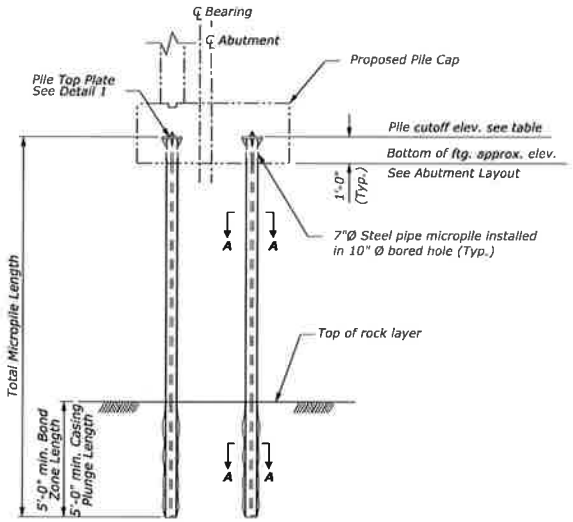
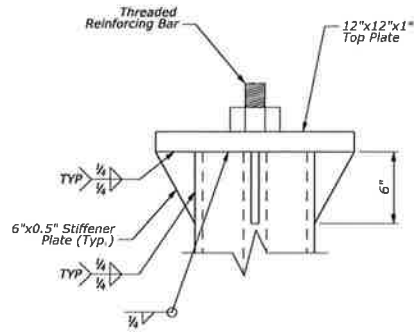
13-Sep-2019 04:54 PM

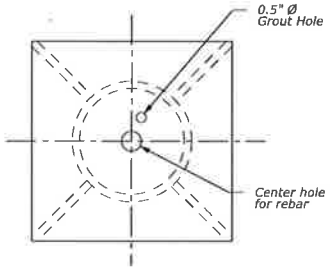
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.4



TYPICAL PILE LAYOUT

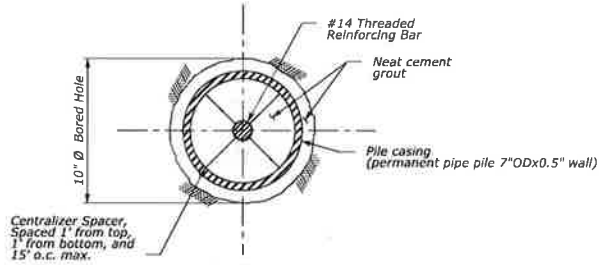
(Not to scale)





DETAIL 1

(Not to scale)



SECTION A-A

(Not to scale)

Notes:

1. The sketch of micropile details are for illustration only.
2. Submit detail of micropiles to the CO for approval.
3. See Section 567 for micropile testing and installation requirements.
4. Socket micropiles a minimum of 5' into rock per geotechnical recommendations. Plunge length is 5'.
5. For location of micropiles, see sheet 1.3, FOUNDATION PLAN.
6. Furnish micropile steel pipe casing conforming to ASTM A252 Grade 3, with a minimum yield strength of 45 ksi.
7. Furnish micropile threaded reinforcing bar conforming to ASTM A615 Grade 75.
8. Furnish grout conforming to a minimum grout strength of 2500 psi at 7 days and 5000 psi at 28 days per Section 725.13(a)1(b).
9. Furnish top and stiffener plates conforming to ASTM A572 Grade 50.

TABLE OF ELEVATIONS (*) AND BATTER

ABUTMENT NO.	(1) - (5) PILE CUTOFF ELEVATION	BATTER
1	594.99	0°
2	595.61	0°

(*) Elevations shown are based on bridge length shown on drawings. Elevations to be adjusted and verified during shop-drawing process and site conditions to match prefabricated truss.

MICROPILE DESIGN LOADS

ABUTMENT NO.	AXIAL DESIGN LOADS: DESIGN COMPRESSION	DESIGN TENSION	ALLOWABLE	DESIGN SHEAR	DESIGN MOMENT
1	68 KIPS	0	94 KIPS	0.64 KIPS	16 KIP-IN
2	68 KIPS	0	94 KIPS	0.64 KIPS	16 KIP-IN

LEGEND

(1), (2), (3), (4) and (5) Micropile Location

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MICROPILE DETAILS

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	NONE	B. SHAFFER	4 of 10	AUGUST 2019	RG3161-D

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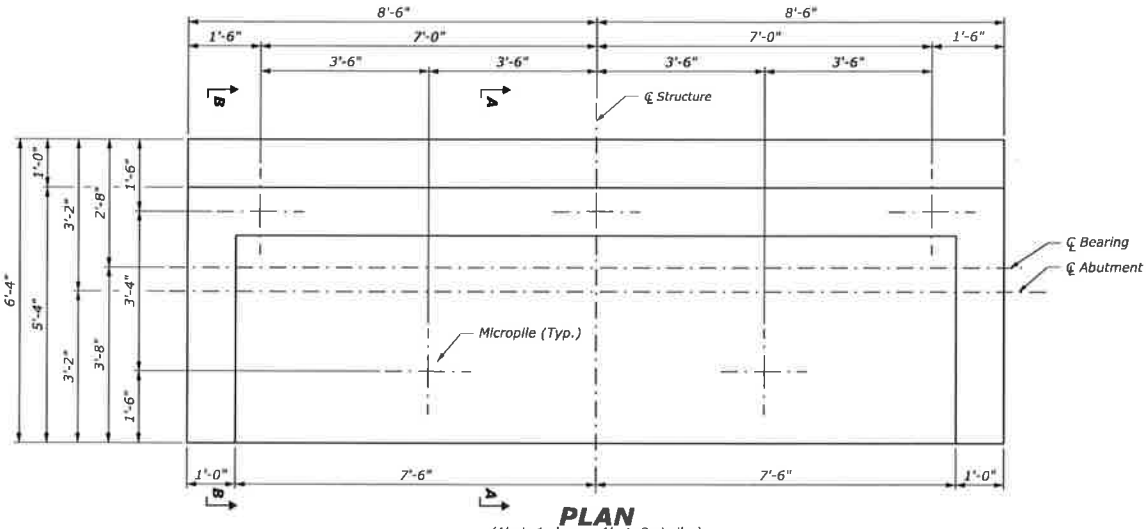
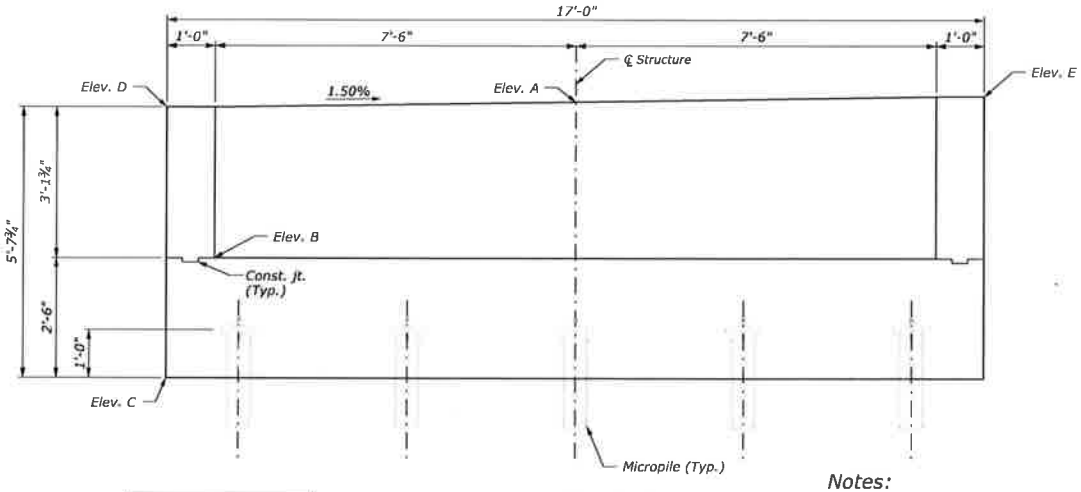
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.5

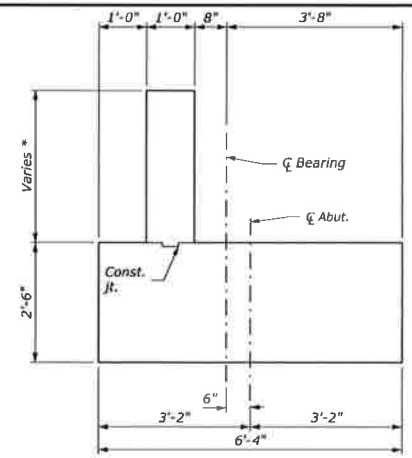


PLAN
(Abut. 1 shown, Abut. 2 similar)

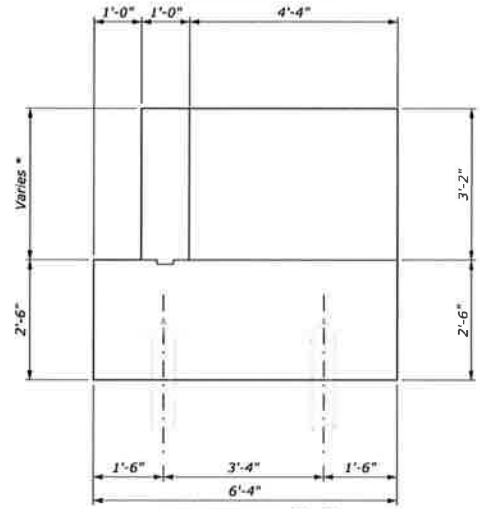


ELEVATION
(Abut. 1 shown, Abut. 2 similar)

ELEVATIONS**		
ELEV.	ABUT. 1	ABUT. 2
A	599.75	600.37
B	596.49	597.11
C	593.99	594.61
D	599.64	600.26
E	599.86	600.48



SECTION A-A



SECTION B-B

Notes:

1. (*) Backwall height to be adjusted during shop-drawing process to match prefabricated truss.
2. (**) Elevations shown are based on bridge length shown on drawings. Elevations to be adjusted and verified during shop-drawing process and site conditions to match prefabricated truss.

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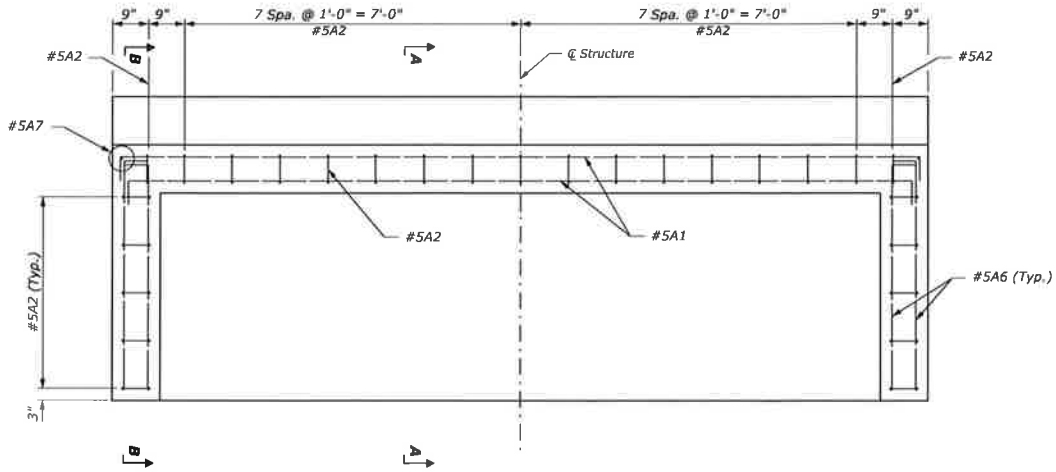
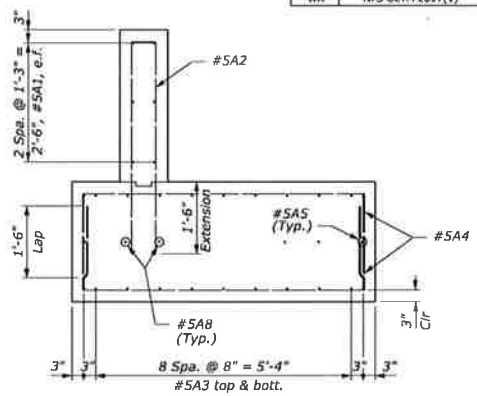
ABUTMENT LAYOUT

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	1:25	B. SHAFFER	5 of 10	AUGUST 2019	RG3161-E

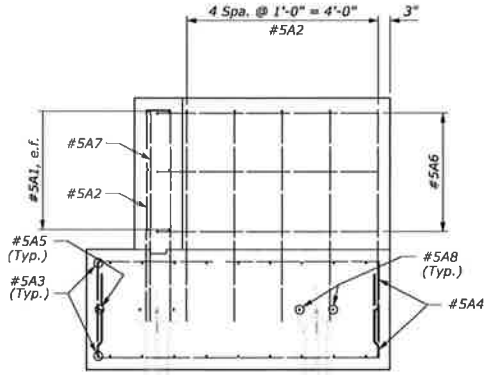
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.6



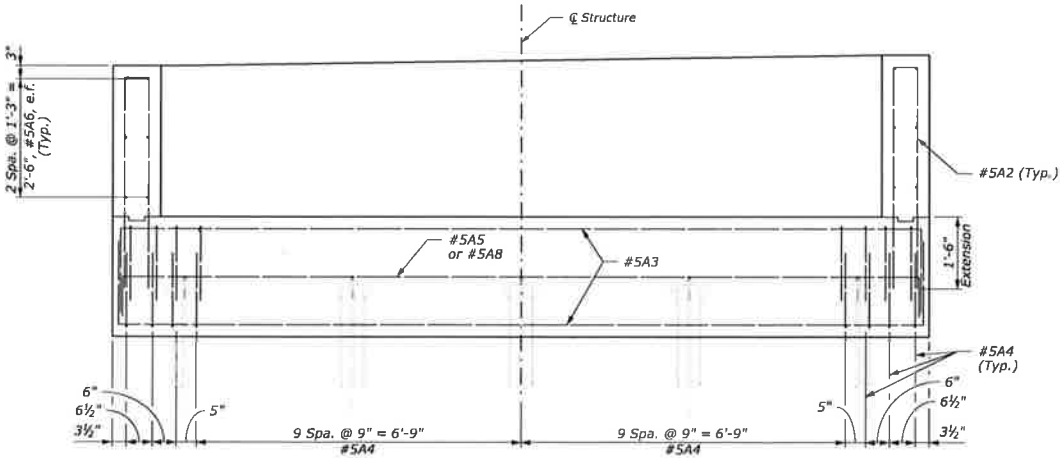
PLAN
(Abut. 1 shown, Abut. 2 similar)



SECTION A-A



SECTION B-B



ELEVATION
(Abut. 1 shown, Abut. 2 similar)

Key

n.f. = near face
f.f. = far face
e.f. = each face

Notes:

1. Field adjust bars to clear micropiles as necessary.

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SEGMENT B BRIDGE
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ABUTMENT DETAILS

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	1:25	B. SHAFFER	6 of 10	AUGUST 2019	RG3161-F

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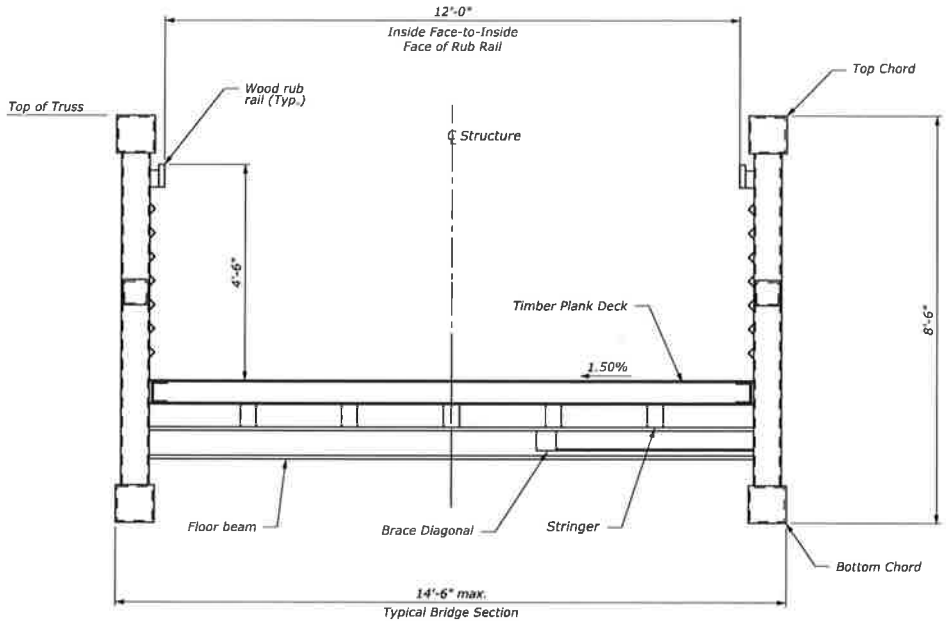
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.7



TYPICAL SECTION

Notes:

1. Submit shop drawings for approval before fabrication including truss type, member size and truss height in submittal according to Section 104.
2. Submit design calculations and detail shop drawing for trusses, and timber plank deck to the CO for approval according to Section 104.
3. After truss installation and timber plank deck placement, repair any damage to coating due to shipping, handling, and erecting the bridge.
4. See "Railing Details" sheet for additional details.

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TYPICAL SECTION

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	1:25	B. SHAFFER	7 of 10	AUGUST 2019	RG3161-G

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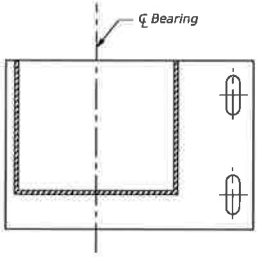
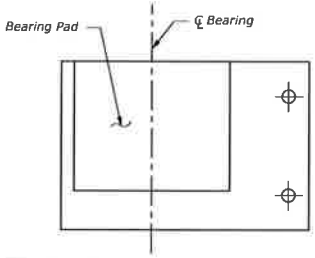
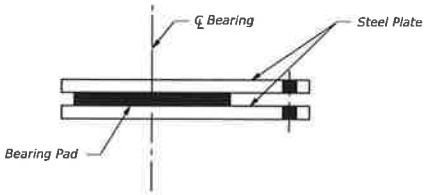
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.8



EXPANSION END - TOP PLATE



FIXED END- TOP & BOTTOM PLATE
EXPANSION END - BOTTOM PLATE



TRUSS BEARING

Bearing Notes:

1. The sketch of truss bearing is for illustration only.
2. Submit detail and design of bearing to the CO for approval, prior to installation.
3. Furnish weathering steel for all exposed surfaces of steel for truss bearing.
4. Furnish and install bearings.

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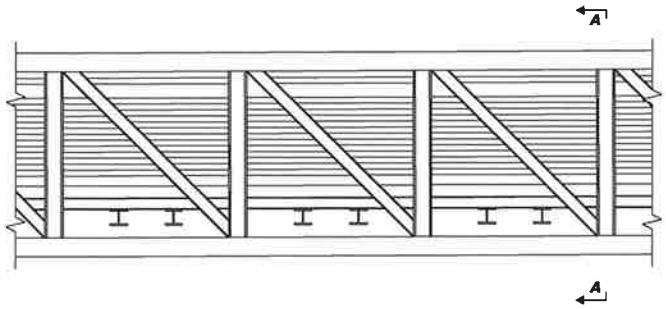
MISCELLANEOUS DETAILS

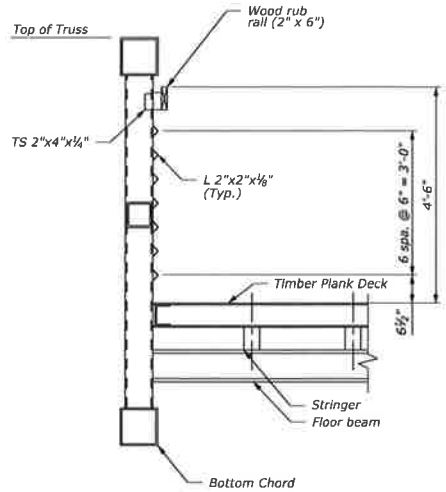
NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	NONE	B. SHAFFER	8 of 10	AUGUST 2019	RG3161-H

11-Sep-2019 03:56 PM

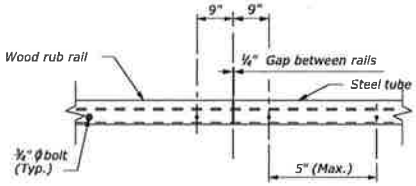
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	I.9



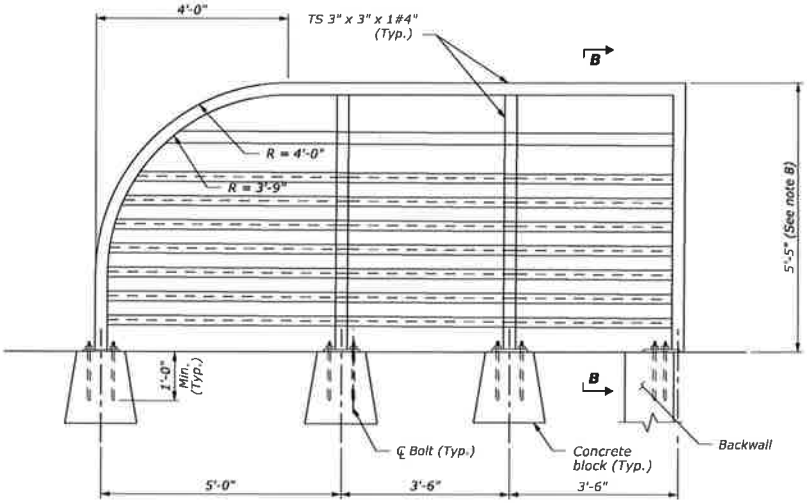
RAILING SYSTEM ELEVATION
No Scale



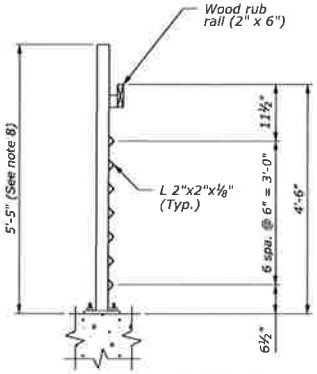
SECTION A-A
No Scale



TIMBER RAIL TO STEEL TUBE CONNECTION
No Scale



APPROACH RAIL ELEVATION
No Scale



SECTION B-B
No Scale

NOTES:

1. The sketch of the bridge and approach rails are for illustration only.
2. Shop fabricate structural steel angle L 2" x 2" to the horizontal and vertical alignment of the structure.
3. Provide ¾" radius quarter round on top corners of the wood rub rail; Treat all timber after fabrication.
4. Provide wood rub rails typically 15' in length with field adjustment to fit the length of the bridge. Stagger the joints of the rail at 5' offset.
5. Smooth and sand all exposed surface of the wood rub bridge rail.
6. Submit shop drawings to the CO for approval prior to fabrication. Provide drawings showing rail section lengths, splice and joint locations, edge and end distances, and fastener lengths.
7. Shop fabricate structural steel tubes to the horizontal and vertical alignment of the structure. Weld all tubular steel to the vertical truss members.
8. Match height of rail shown with approved shop drawing for the truss. Ensure top of rail matches top chord of truss.

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RAILING DETAILS

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
								GV/CY	JW	SR/BS	NONE	B. SHAFFER	9 of 10	AUGUST 2019	RG3161-I

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STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.10

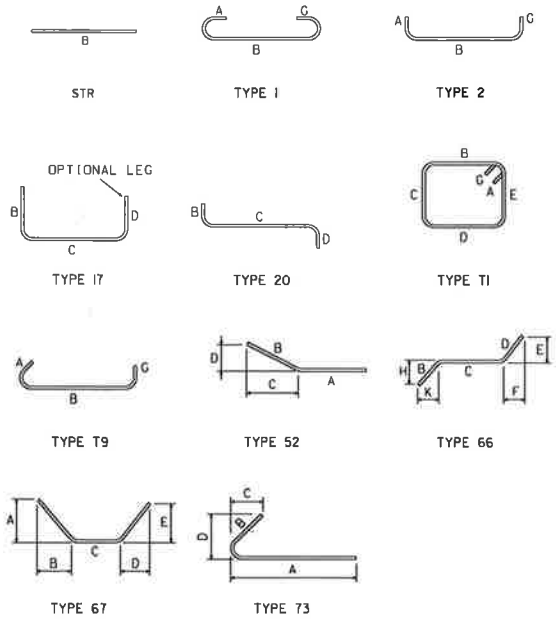
REINFORCING STEEL SCHEDULE — DIMENSION TABLE

ABUTMENT 1

BAR MK	SIZE	TYPE	PIN SZ	LOCATION	QTY	LENGTH	WEIGHT	A	B	C	D	E	F	G	H	J	K	O	R	V or N
*5A1	5	2	0'-3¾"	Horiz.in backwall																
*5A2	5	17	0'-3¾"	Vert.in all walls																
*5A3	5	17	0'-3¾"	Horiz.abutment top & bot.																
*5A4	5	17	0'-3¾"	Stirrups																
*5A5	5	17	0'-3¾"	Horiz.abutment sides																
*5A6	5	T9	0'-2½"	Horiz.in side walls																
*5A7	5	STR		Vert.@ corners																
*5A8	5	17	0'-3¾"	Horiz.over microplies																
				SUBTOTAL			LBS													

ABUTMENT 2

BAR MK	SIZE	TYPE	PIN SZ	LOCATION	QTY	LENGTH	WEIGHT	A	B	C	D	E	F	G	H	J	K	O	R	V or N
*5A1	5	2	0'-3¾"	Horiz.in backwall																
*5A2	5	17	0'-3¾"	Vert.in all walls																
*5A3	5	17	0'-3¾"	Horiz.abutment top & bot.																
*5A4	5	17	0'-3¾"	Stirrups																
*5A5	5	17	0'-3¾"	Horiz.abutment sides																
*5A6	5	T9	0'-2½"	Horiz.in side walls																
*5A7	5	STR		Vert.@ corners																
*5A8	5	17	0'-3¾"	Horiz.over microplies																
				SUBTOTAL			LBS													



NOTES

1. Dimensions in bending diagrams are out-to-out of bars
2. All "E" bars are epoxy coated.

ABBREVIATIONS:

f.f. = Fill face
o.f. = Other face
b.f. = Both faces

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CLALLAM COUNTY, WASHINGTON

REBAR LIST (1 OF 1)

NO.	DATE	BY	REVISIONS	NO.	DATE	BY	REVISIONS

DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	PROJECT TEAM LEADER	BRIDGE DRAWING	DATE	DRAWING NO.
GV/CY	JW	SR/BS	NONE	B. SHAFFER	10 of 10	AUGUST 2019	RG3161-J

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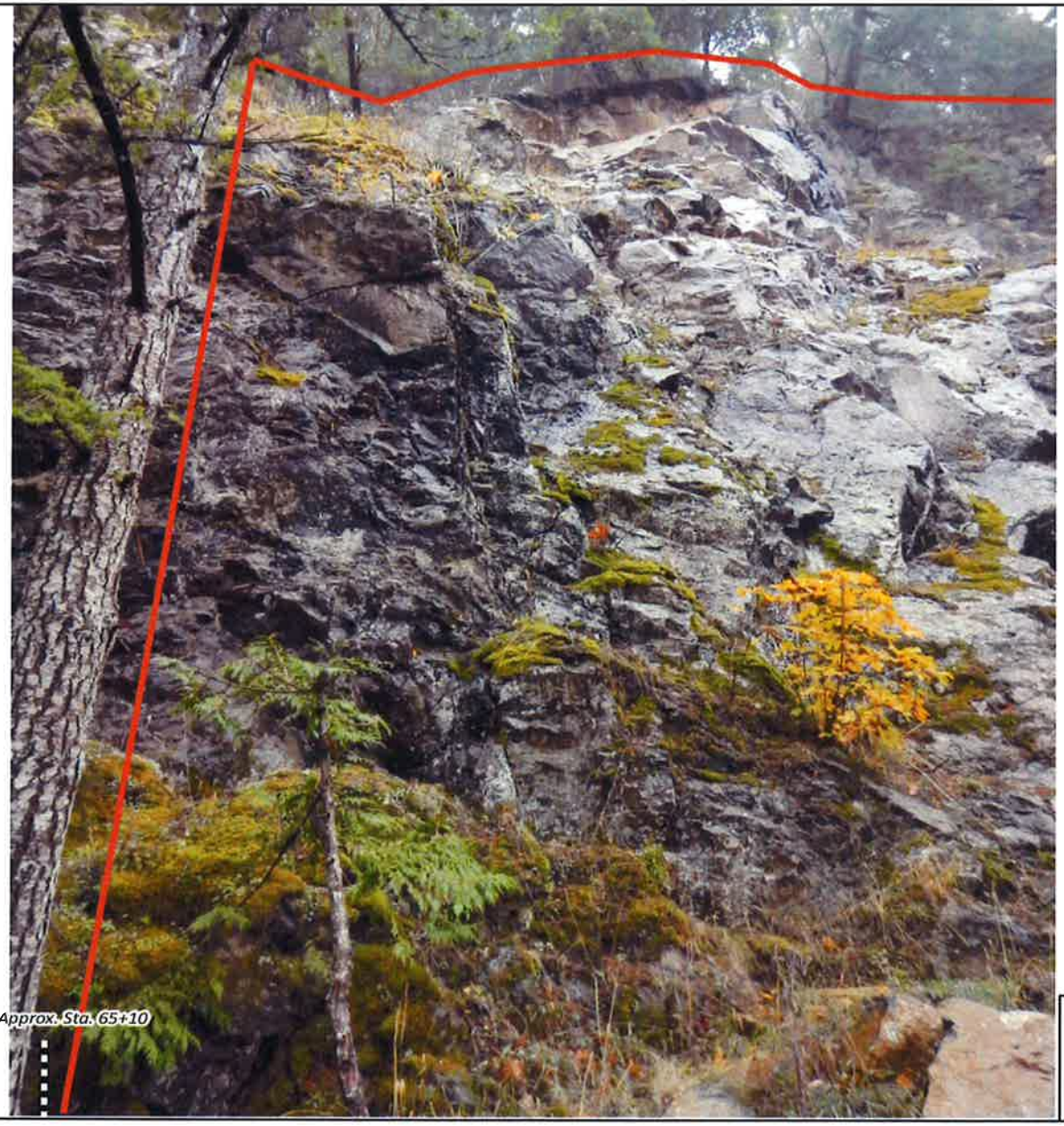
SFILES

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.1



Legend

General Scaling Limits

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

SHEET 1 of 9

13 May 2018 7:15 AM | c:\pw-work\d1397905\olym\d1701_ta.dgn (US_Sur_r20) | Designed by: --/---- | Checked by: --/----

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.2

Legend

Tree Removal

Anchor Type

Type

Dowel

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

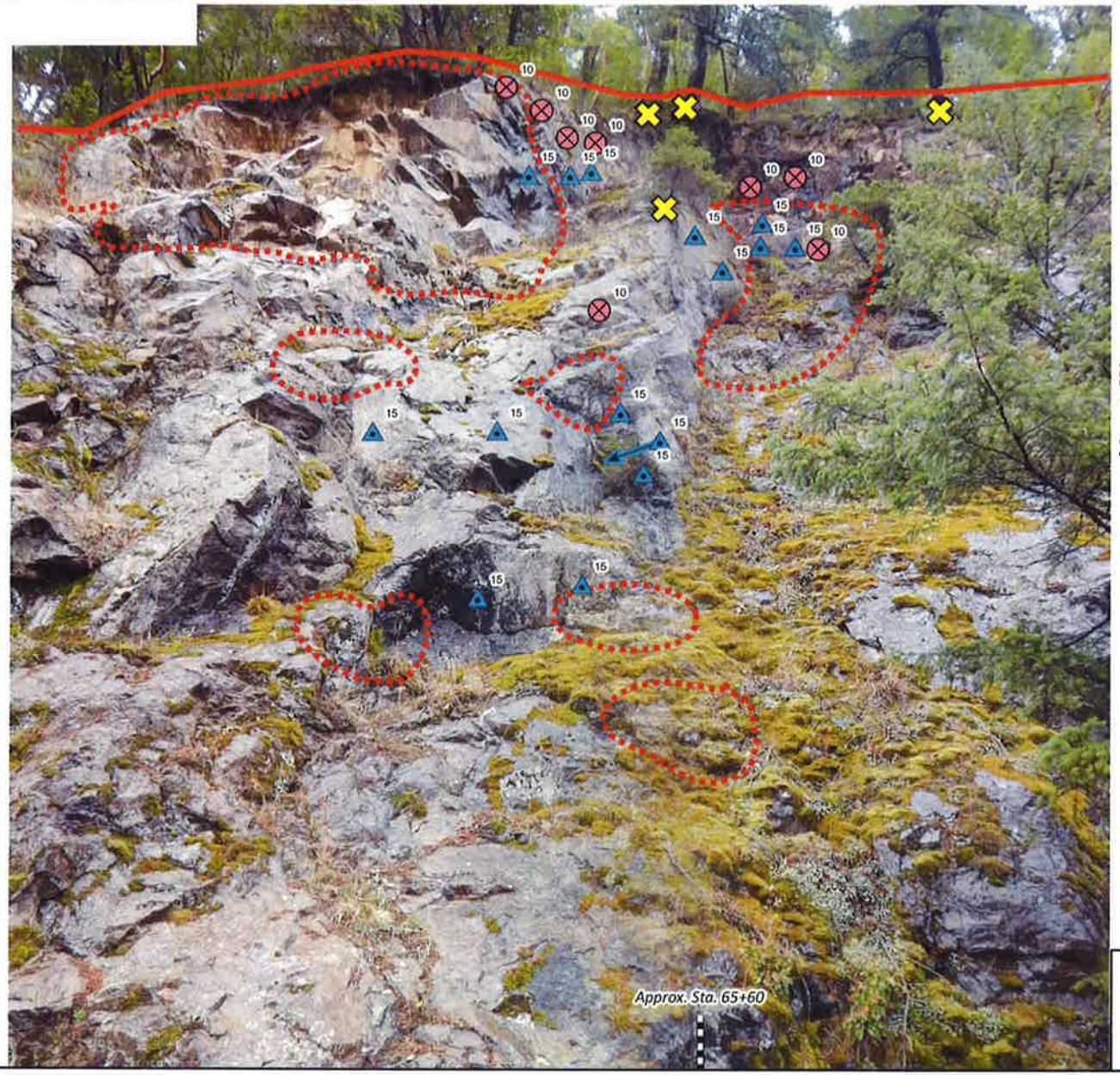
SHEET 2 of 9

Checked by:

Designed by:

13 May 2019 7:16 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1,3



Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

direction

Bolt, 25 kip

intensive scaling

General Scaling Limits

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

SHEET 3 of 9

Designed by: | Checked by:

13 May 2019 7:16 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.4

Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

SHEET 4 of 9

Checked by:

Designed by:

13 May 2019 7:17 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.5

Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

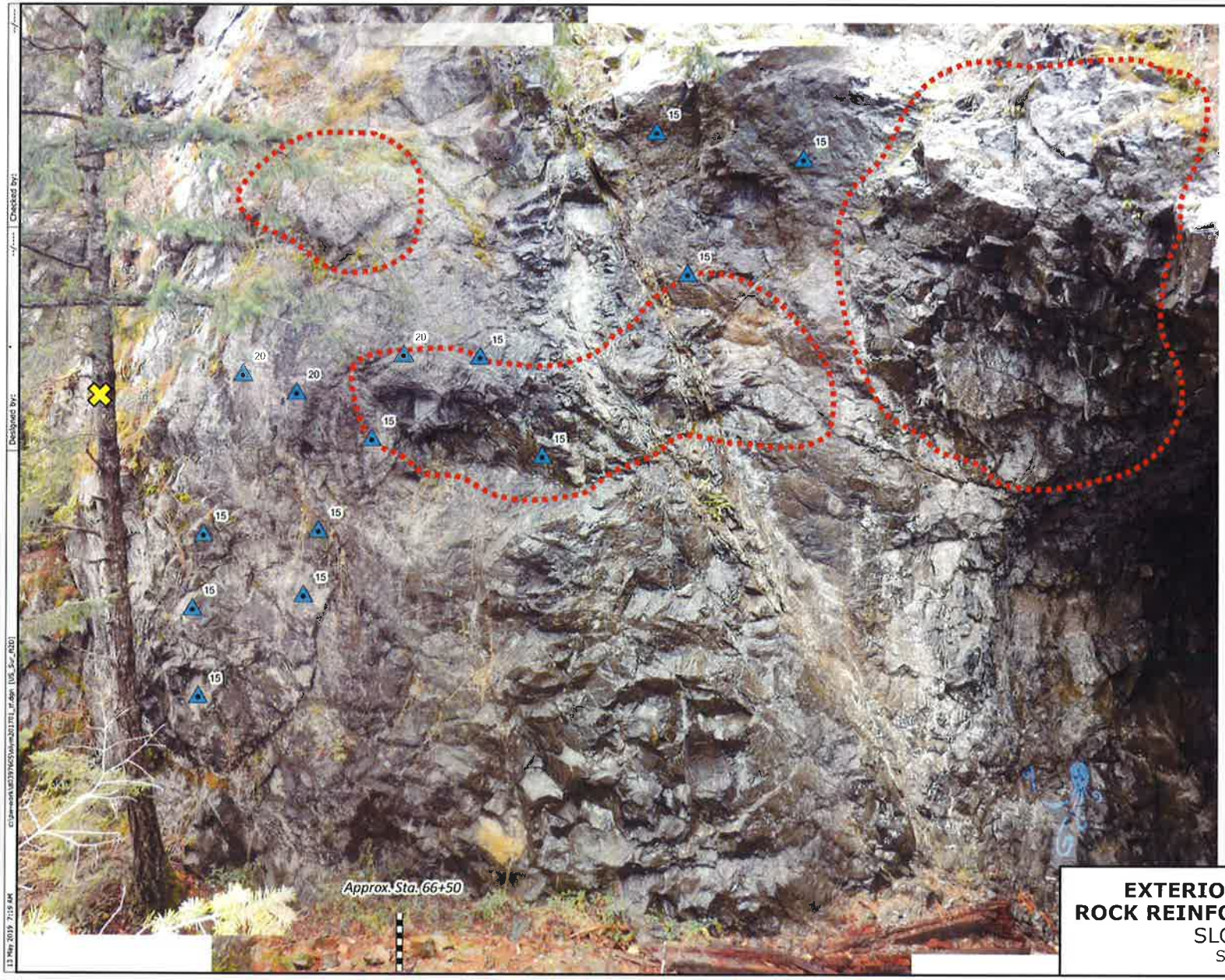
SHEET 5 of 9

Designed by:

Checked by:

13 May 2019 7:18 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	3.6



Legend

Tree Removal

Type

Bolt, 25 kip

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

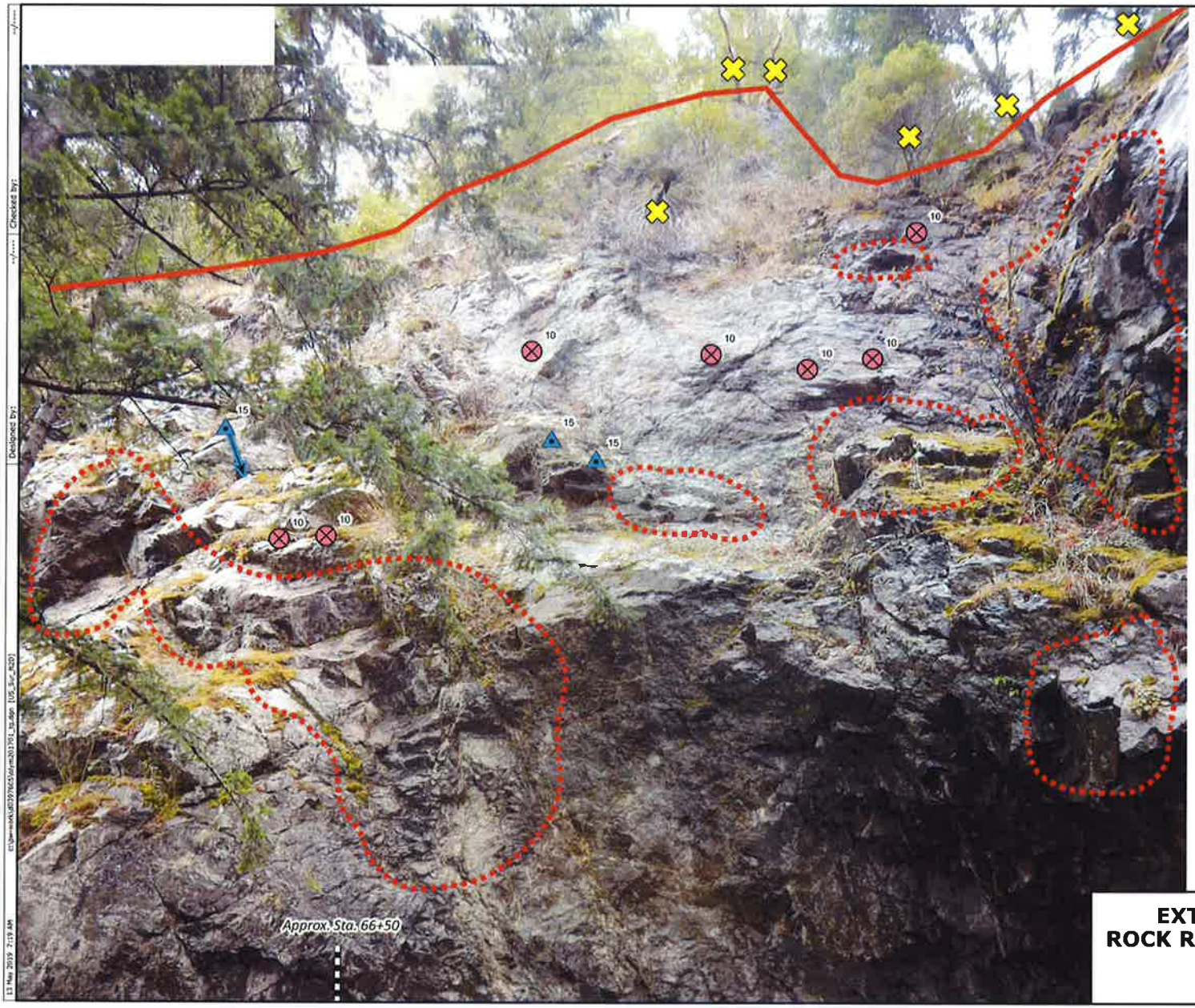
SHEET 6 of 9

Designed by:

Checked by:

13 May 2019 7:15 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.7



Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

direction

Bolt, 25 kip

General Scaling Line

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

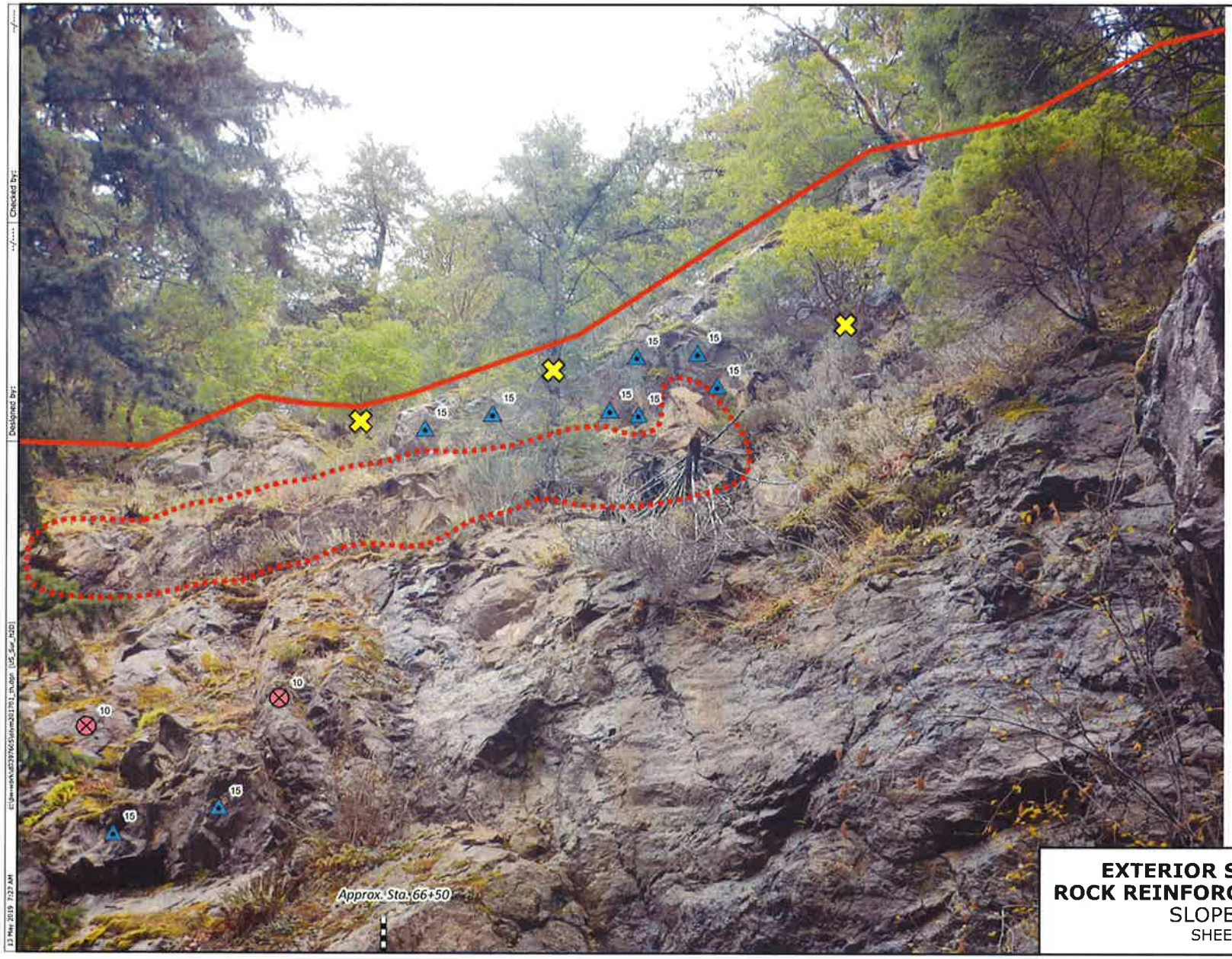
SHEET 7 of 9

Designed by:

Checked by:

13 May 2019 7:19 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1,8



Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

General Scaling Line

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

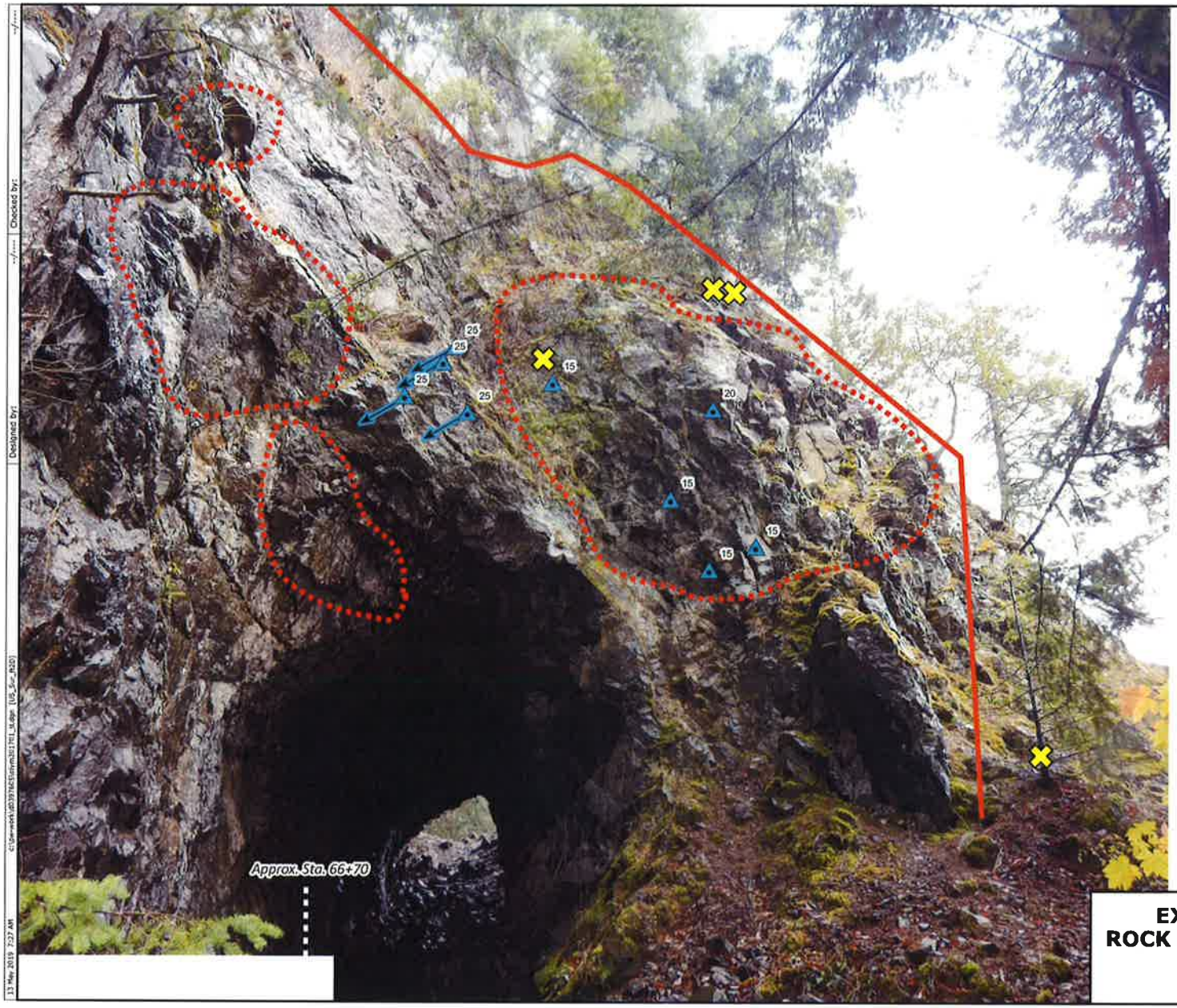
SHEET 8 of 9

Designed by:

Checked by:

13 May 2019 7:27 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.9



Legend

Tree Removal

Type

Bolt, 25 kip

direction

Bolt, 25 kip

General Scaling Line

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US16

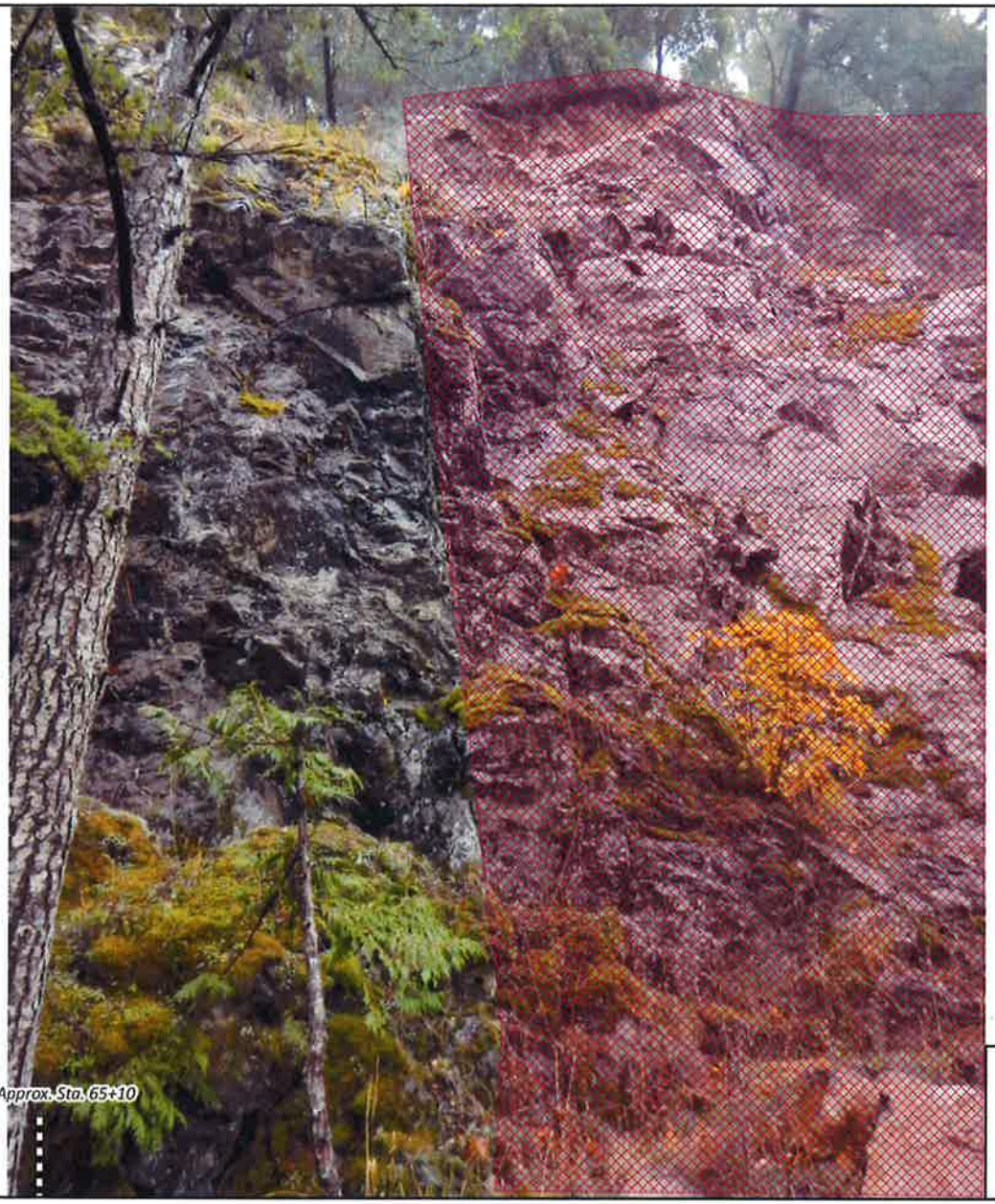
SHEET 9 of 9

Checked by:

Designed by:

13 May 2019 7:27 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.10



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

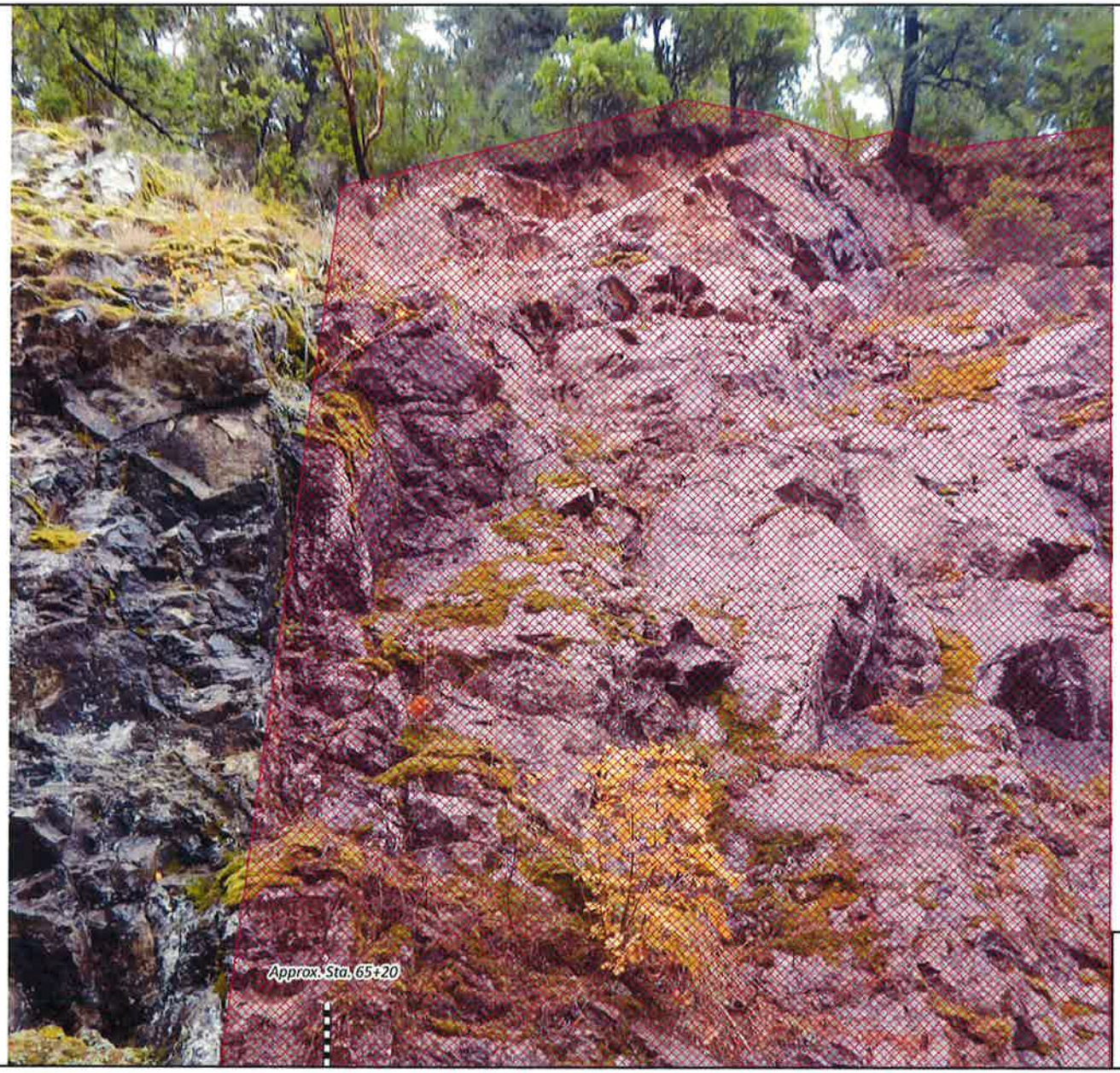
SHEET 1 of 9

Designed by:

Checked by:

13 May 2019 8:22 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.11



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

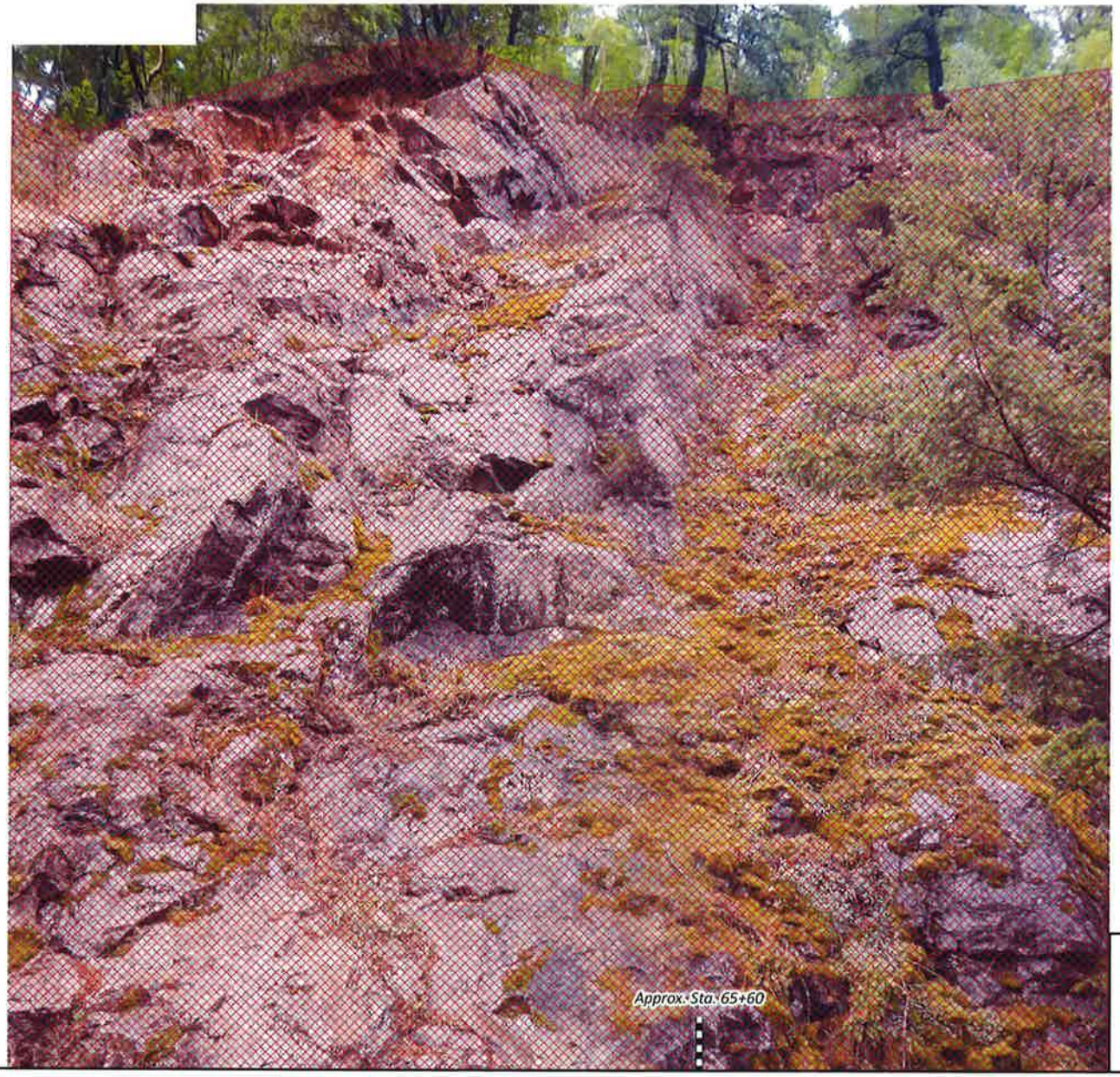
SHEET 2 of 9

Designed By:

Checked By:

13 May 2019 8:22 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	3.12



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

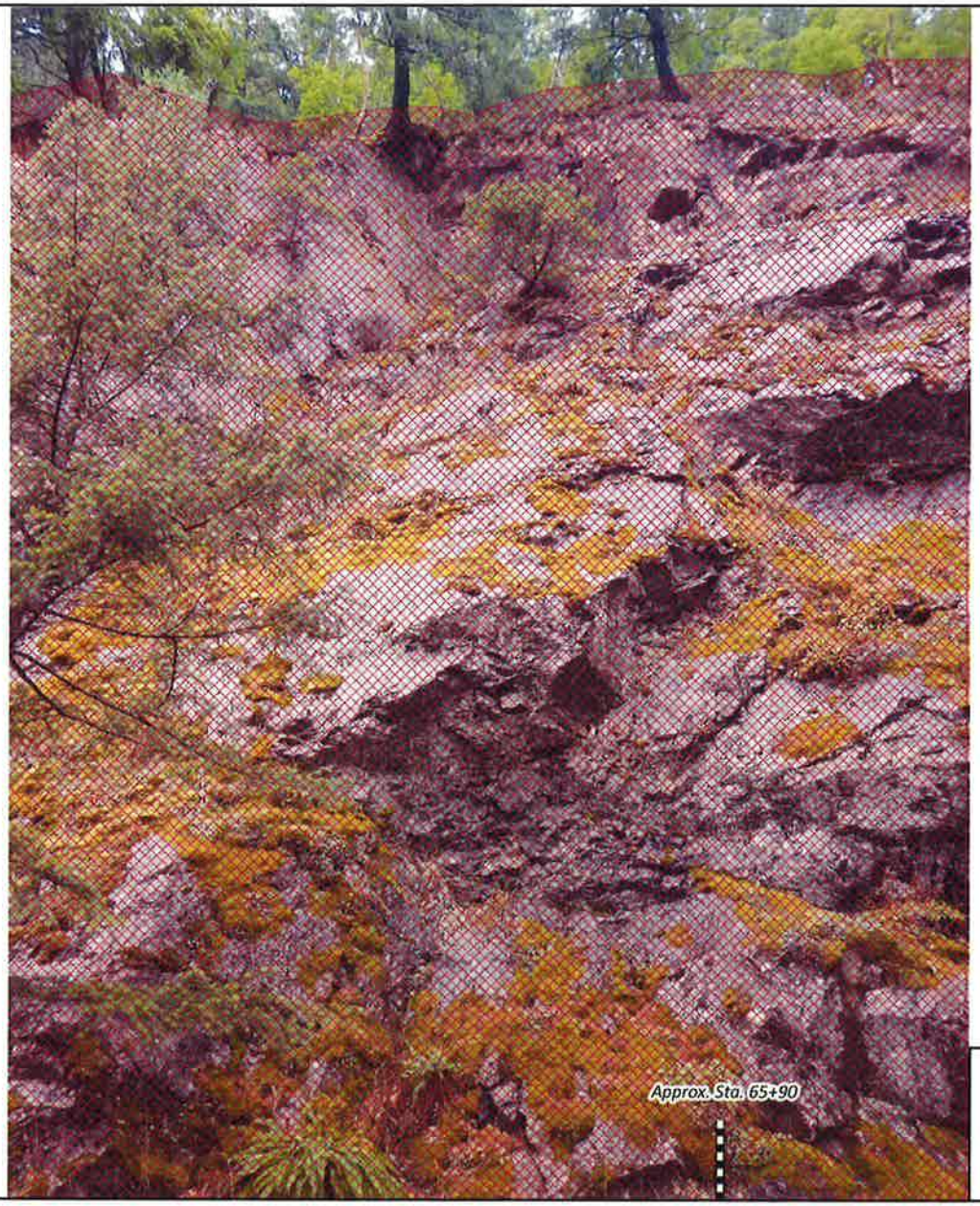
SHEET 3 of 9

Designed by:

Checked by:

11 May 2019 8:27 AM c:\pw-work\d0397605\olym201701_3.dgn (US_Sur_PQD)

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.13



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

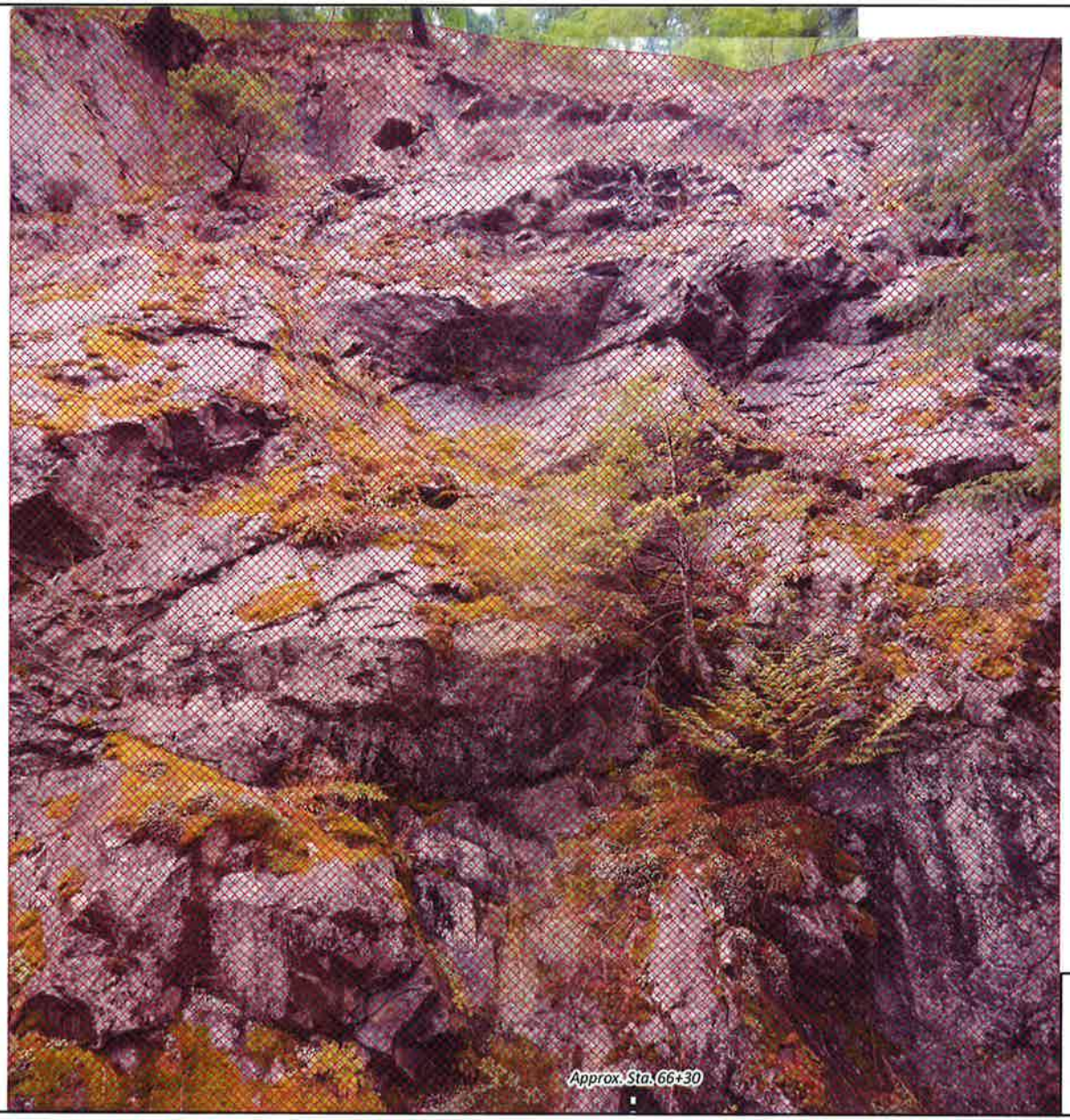
SHEET 4 of 9

Checked by:

Designed by:

13 May 2019 8:27 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.14



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

SHEET 5 of 9

Designed by: --/---- | Checked by: --/----

11 May 2016 8:28 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.15

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

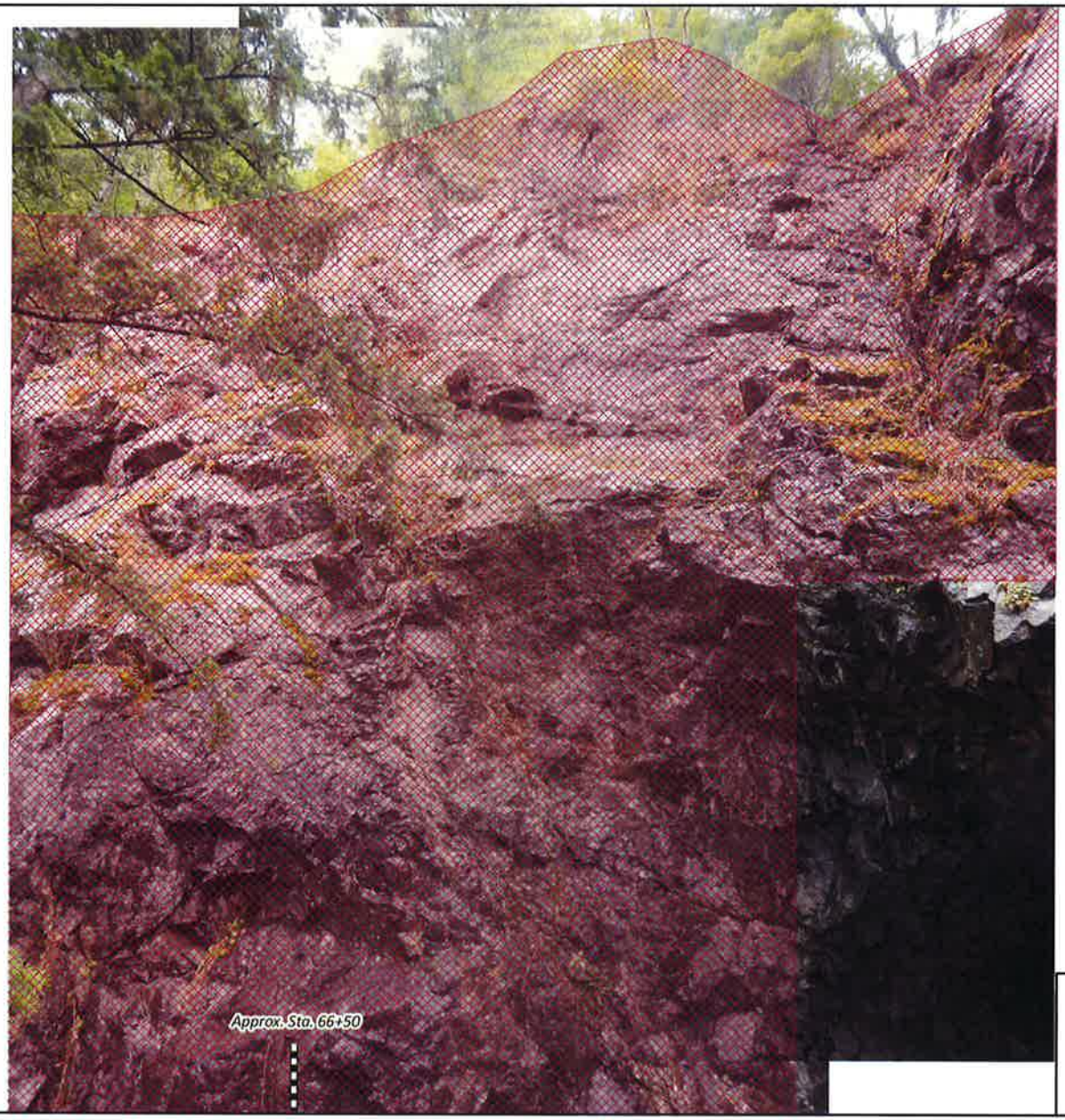
SHEET 6 of 9

Designed by:

Checked by:

13 May 2015 8:29 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.16



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

SHEET 7 of 9

Designed by:

Checked by:

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.17

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

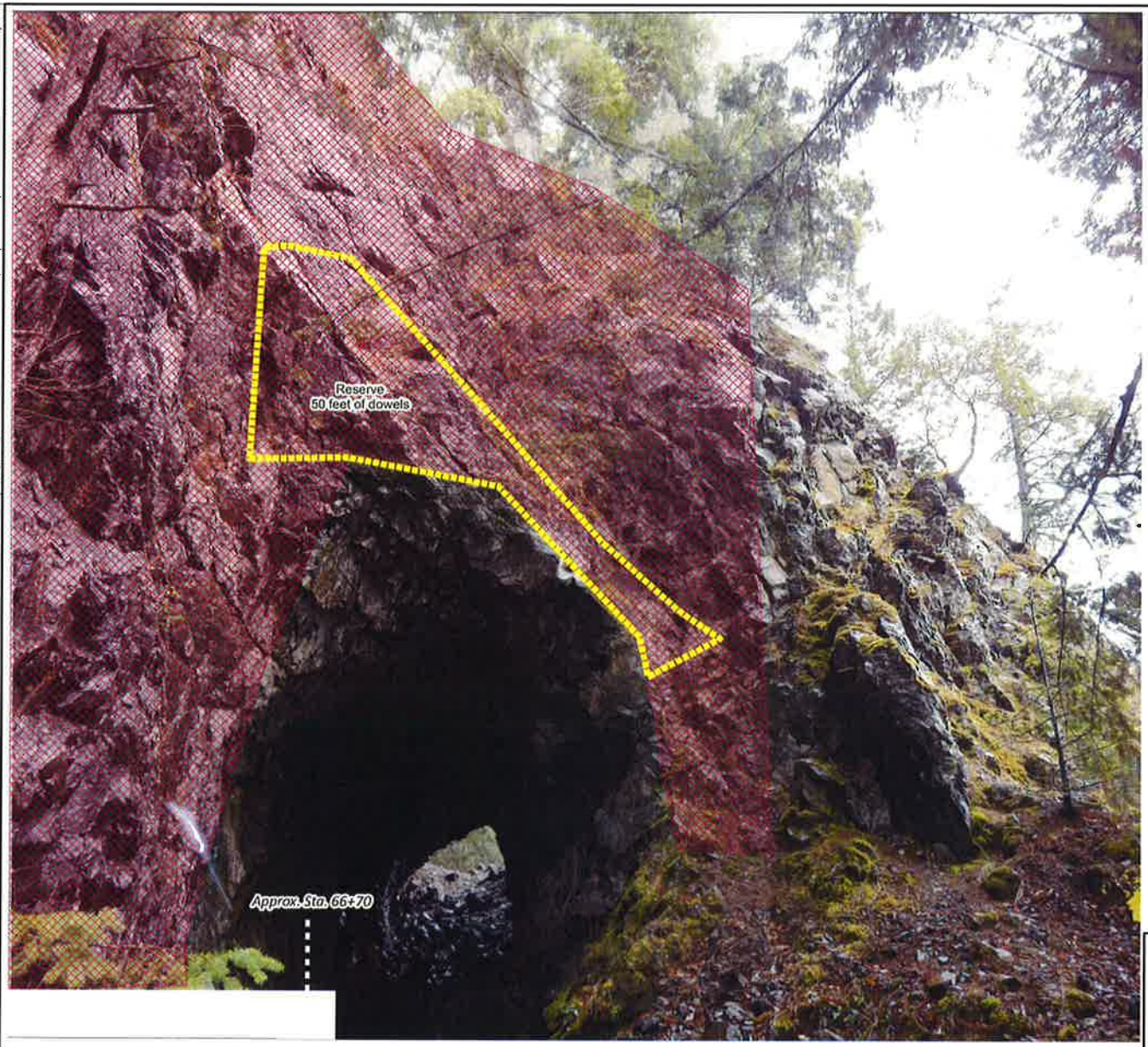
SHEET 8 of 9

Checked by:

Designed by:

15 May 2019 8:36 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.18



Legend

- Draped Rockfall Protection, Wire Mesh
- Potential Mesh Pinning Area

NOTE:

1. *Possible additional quantity of dowels, 5-feet long, shown inside Potential Mesh Pinning Area. These additional dowels will be installed at locations specified by the CO after the draped rockfall protection, wire mesh is installed. The dowels will pin the wire mesh tightly against the slope for the purpose of redirecting rockfall away from the tunnel protal.*

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US16

SHEET 9 of 9

Designed by: | Checked by:

17 May 2019 9:56 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.19

Legend

Type

- Dowel
- Bolt, 25 kip
- General Scaling Limits
- Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US17

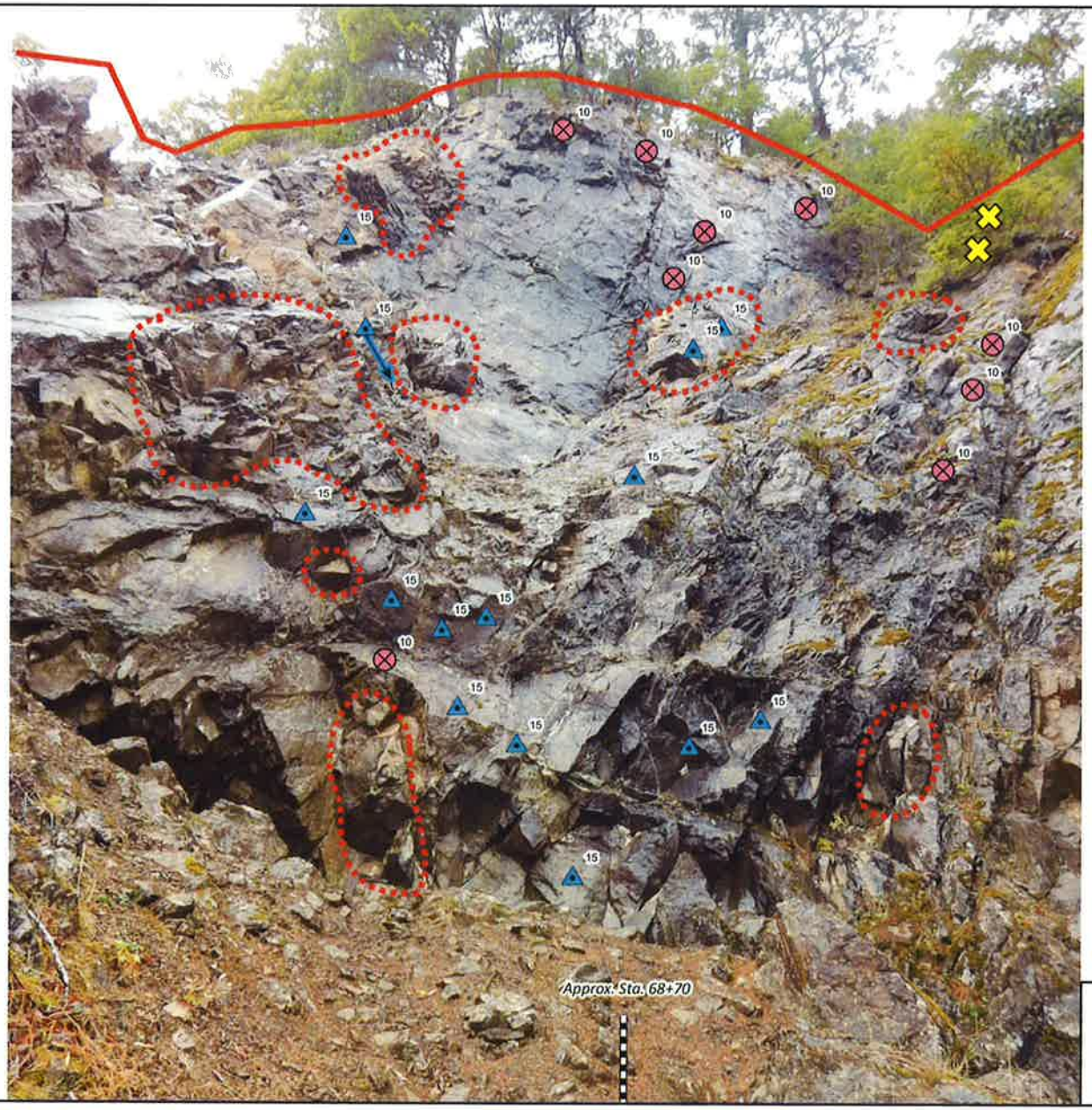
SHEET 1 of 5

Designed by:

Checked by:

13 May 2019 8:31 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.20



Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

direction

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US17

SHEET 2 of 5

Designed by: | Checked by: | --/--/--

13 May 2019 8:34 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.21

Legend

Tree Removal

Type

Dowel

Bolt, 25 klp

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US17

SHEET 3 of 5

Checked by:

Designed by:

13 May 2016 8:38 AM c:\pw-work\d0397605\olym201701_tu.dgn [US_Sur_PGD]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.22

Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

direction

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US17

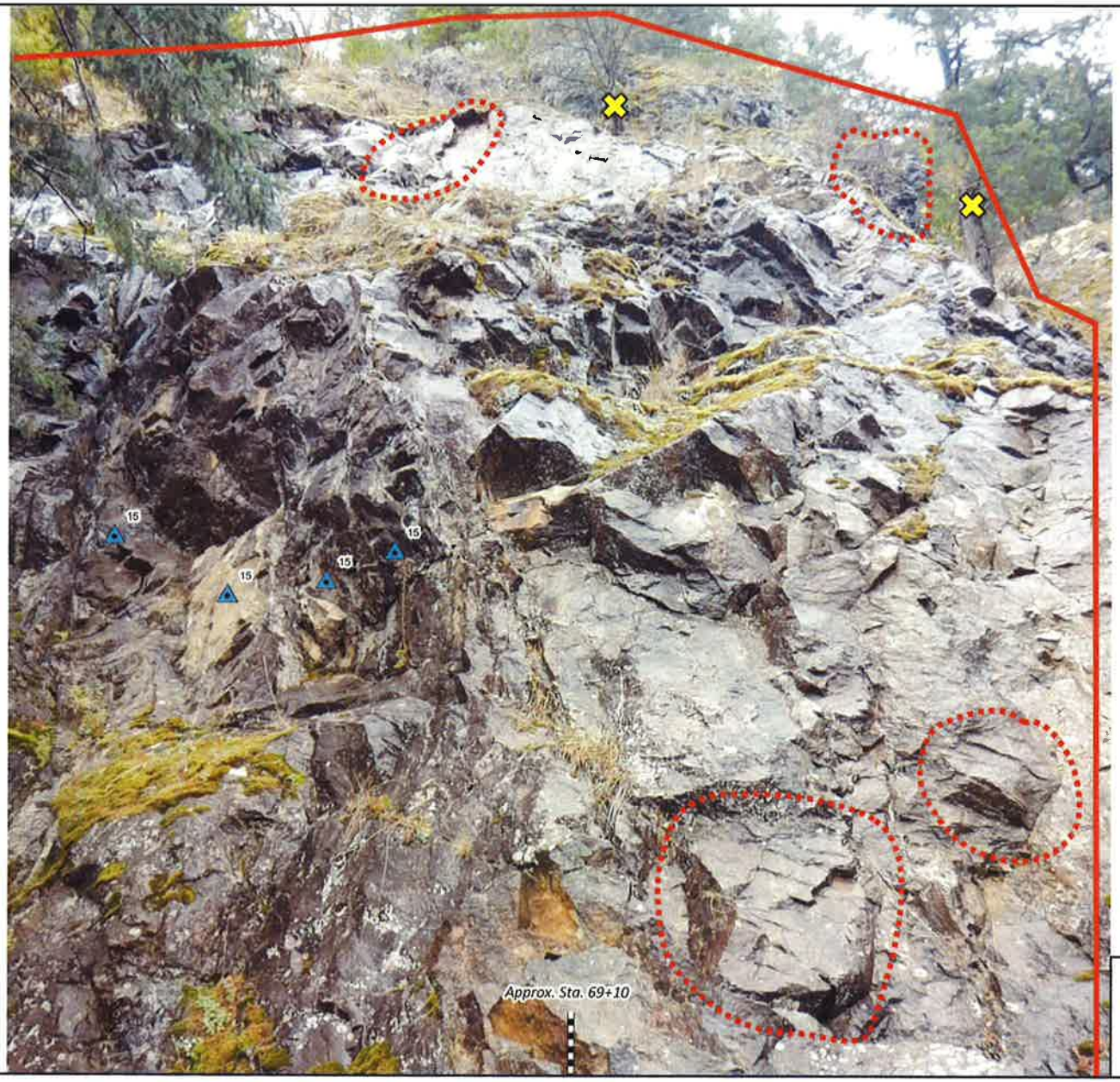
SHEET 4 of 5

Designed by:

Checked by:

13 May 2019 8:38 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.23



Legend

Tree Removal

Type

Bolt, 25 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US17

SHEET 5 of 5

Designed by:

Checked by:

13 May 2019 8:51 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.24

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US17

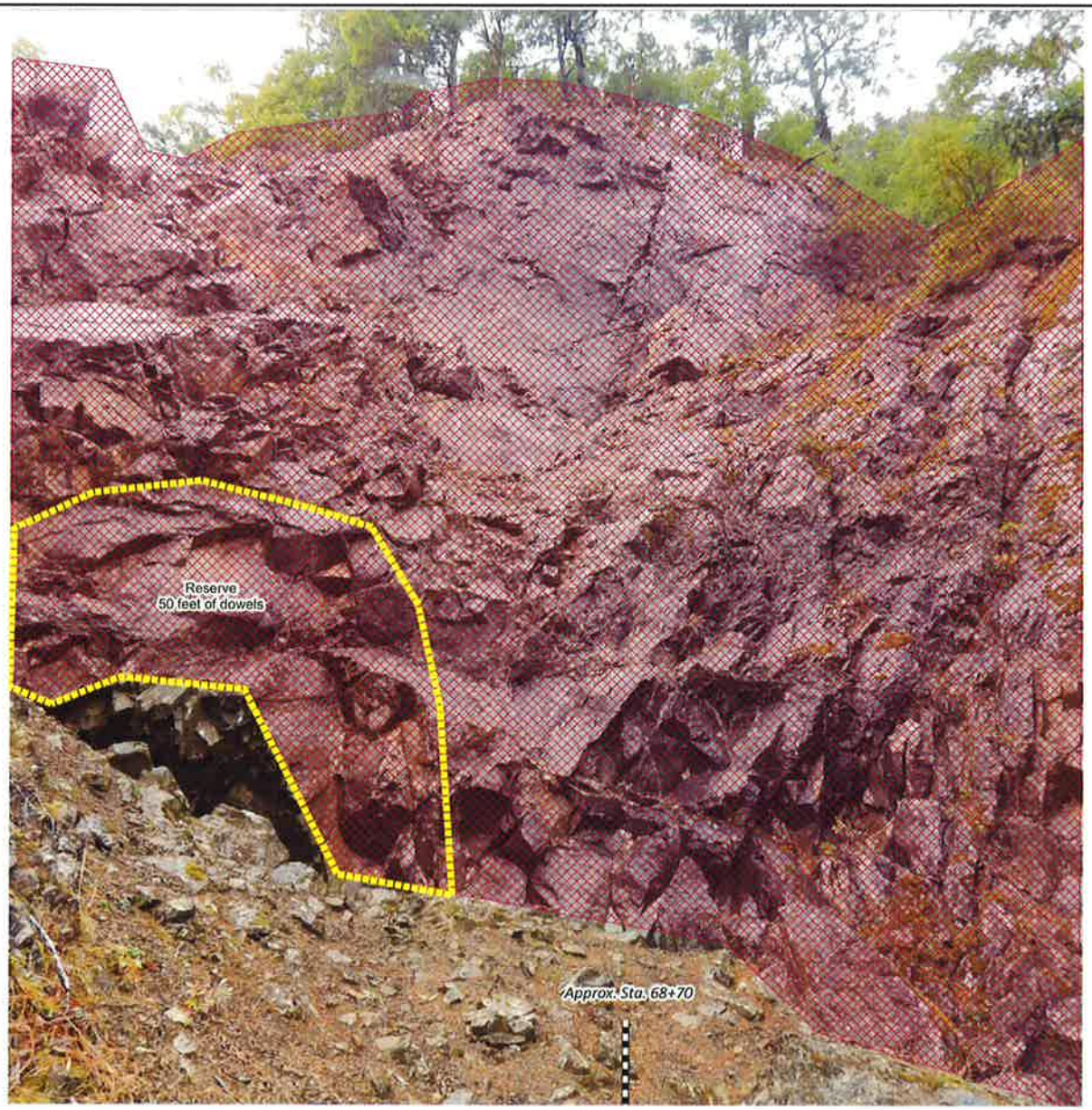
SHEET 1 of 5

Designed by:

Checked by:

13 Mar 2019 8:52 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.25



Legend

Draped Rockfall Protection, Wire Mesh

Potential Mesh Pinning Area

NOTE:

1. *Possible additional quantity of dowels, 5-feet long, shown inside Potential Mesh Pinning Area. These additional dowels will be installed at locations specified by the CO after the draped rockfall protection, wire mesh is installed. The dowels will pin the wire mesh tightly against the slope for the purpose of redirecting rockfall away from the tunnel protal.*

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US17

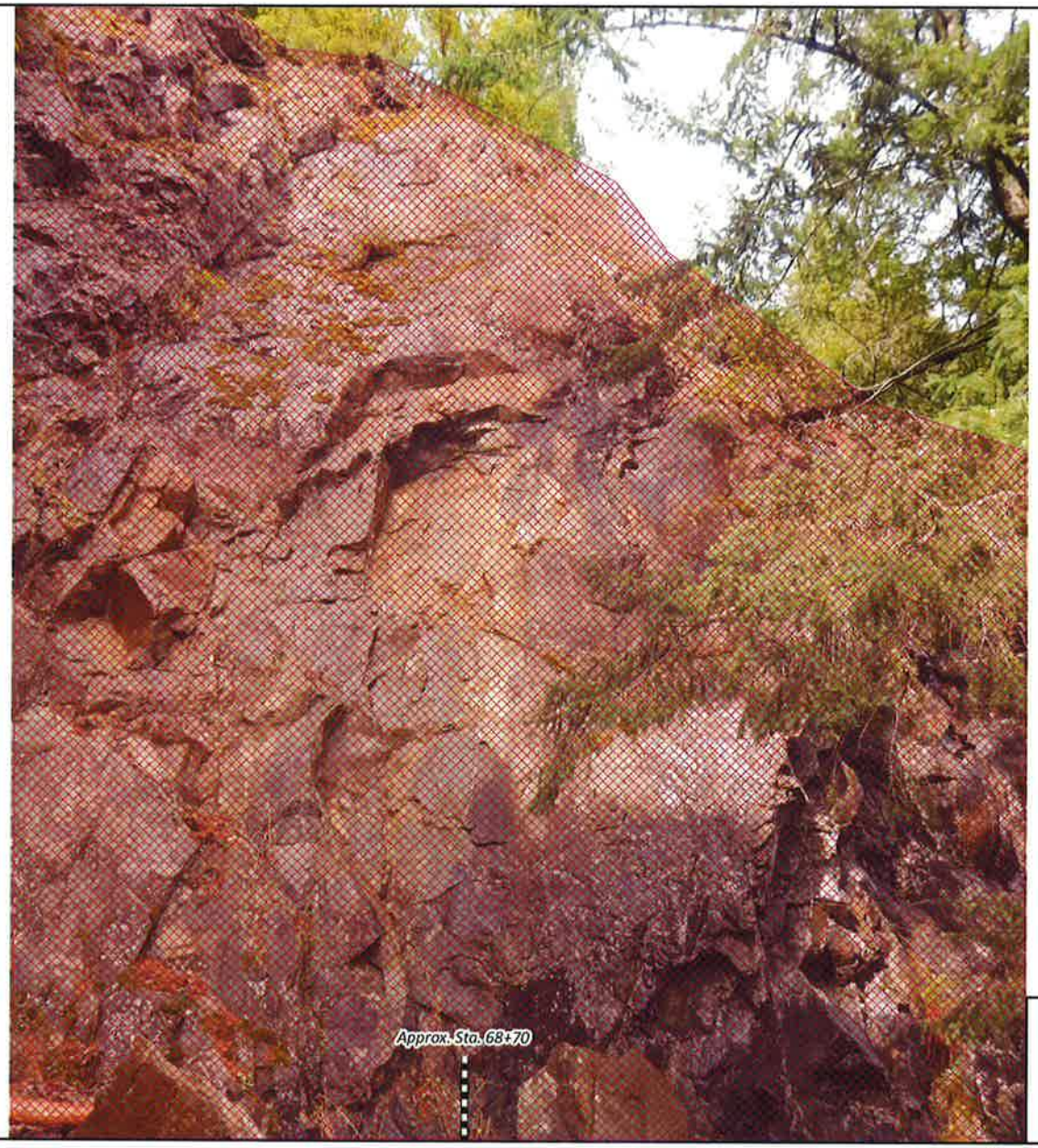
SHEET 2 of 5

Designed by:

Checked by:

17 May 2019 10:02 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.26



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US17

SHEET 3 of 5

Designed by: --/---- Checked by: --/----

11 May 2019 8:52 AM c:\pw-work\d039780\wynd2170_02.dgn [US_Sur_R20]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	3.27

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US17

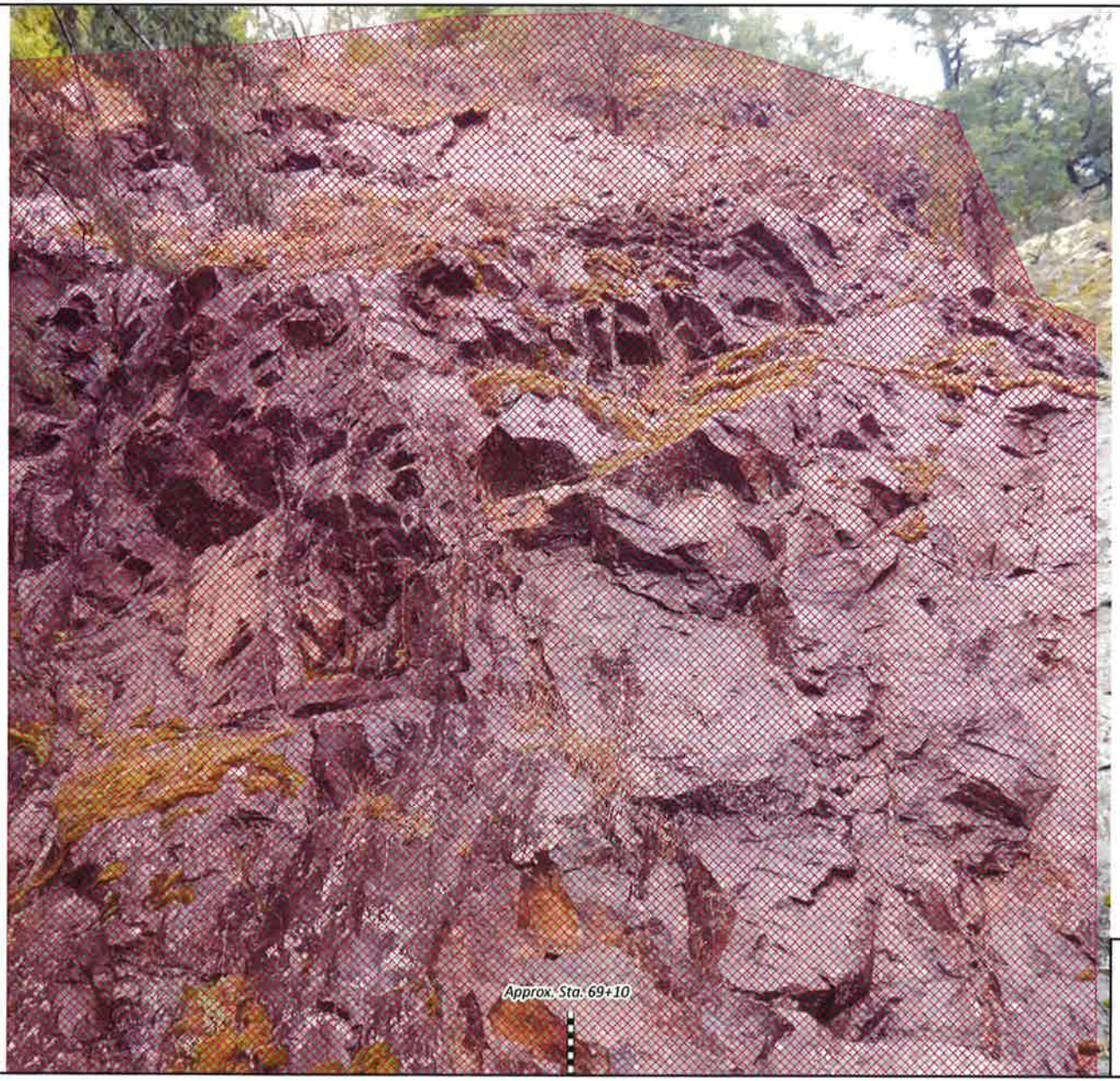
SHEET 4 of 5

Designed by:

Checked by:

13 May 2019 8:33 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.28



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US17

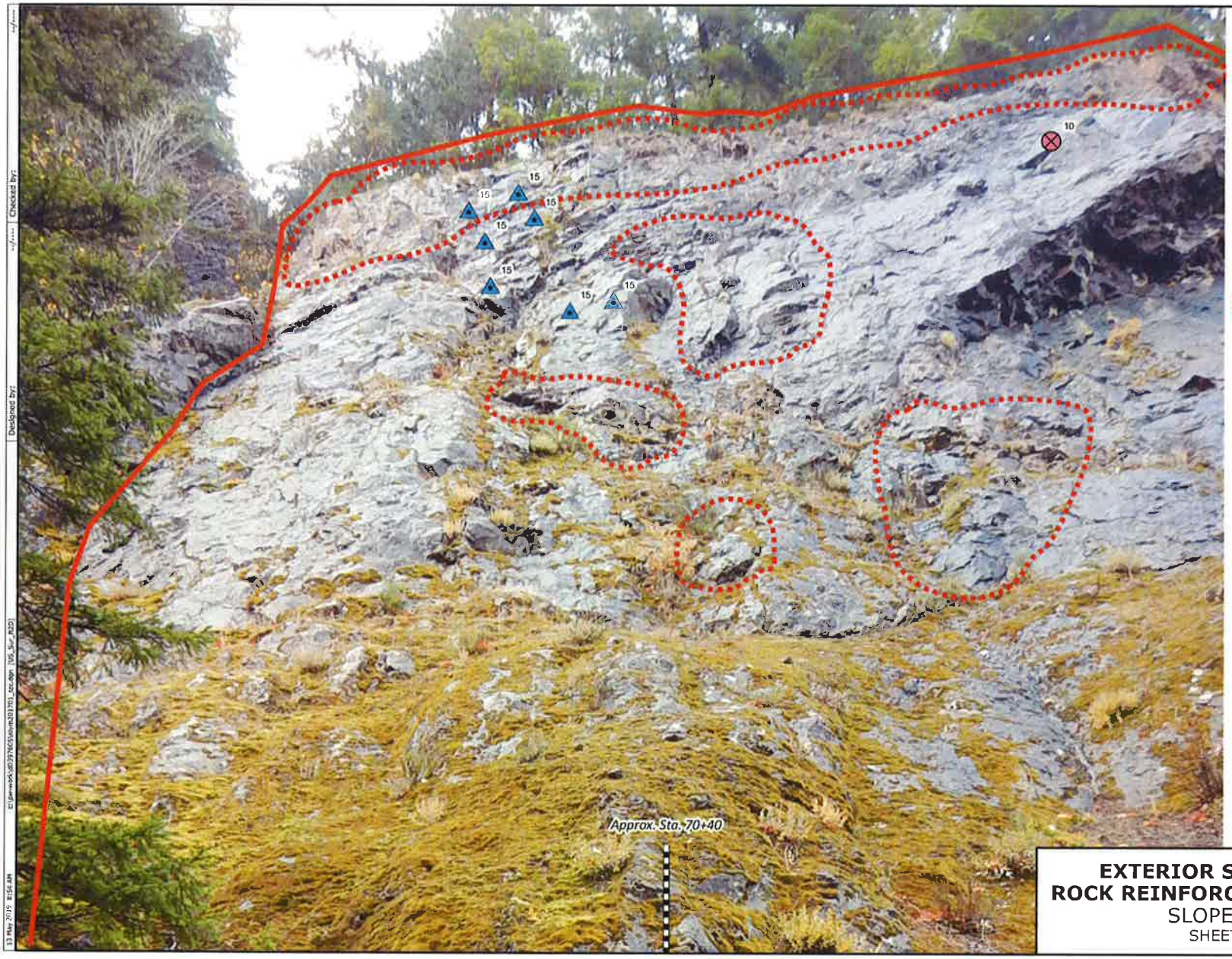
SHEET 5 of 5

Designed by:

Checked by:

13 May 2019 8:54 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.29



Legend

Type

- Dowel
- Bolt, 25 kip
- General Scaling Limits
- Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US40

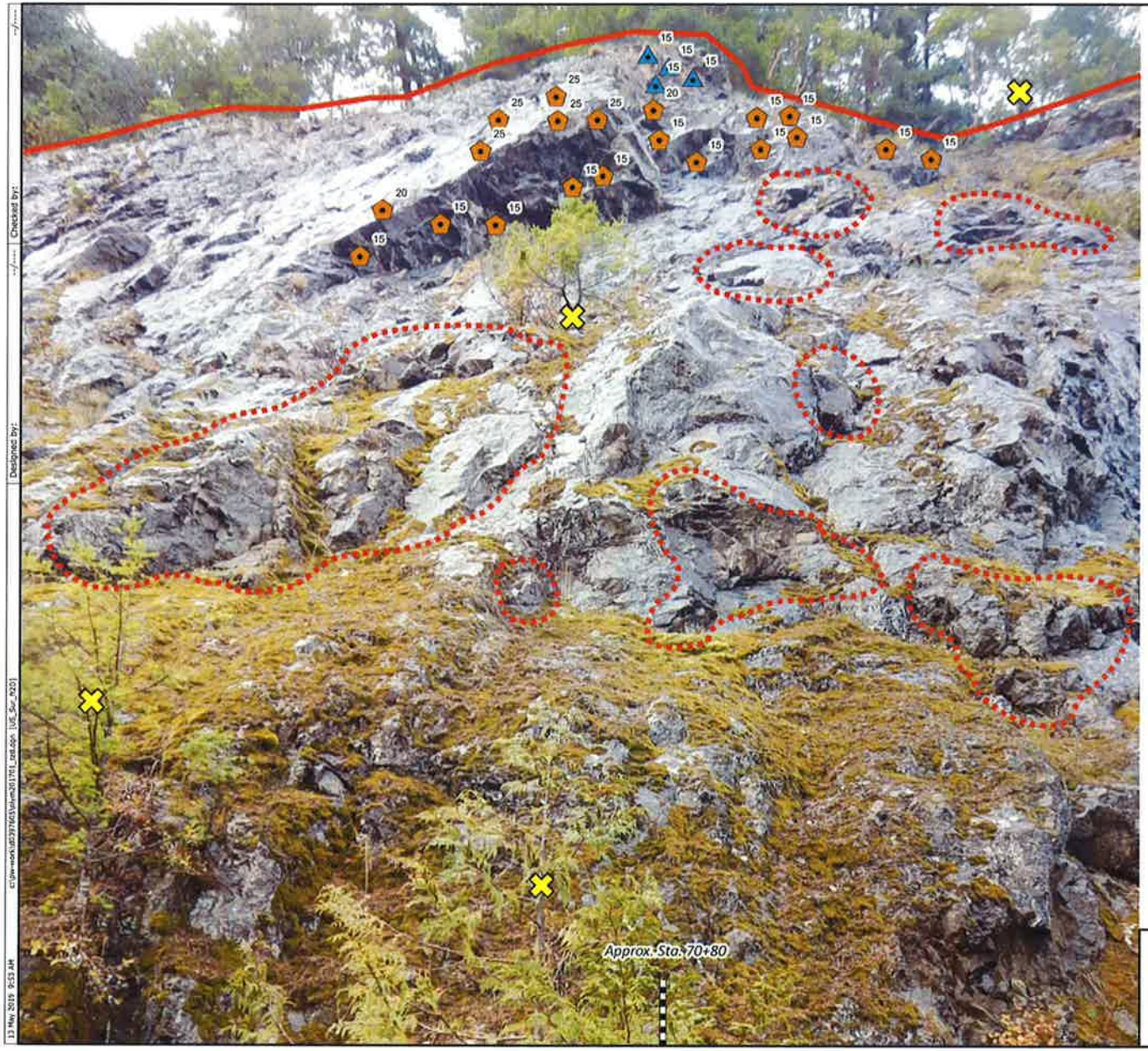
SHEET 1 of 5

Designed by:

Checked by:

13 May 2019 8:54 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.30



Legend

Tree Removal

Type

Bolt, 25 kip

Bolt, 50 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US40

SHEET 2 of 5

Designed by:

Checked by:

13 May 2019 9:53 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.31

Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

Bolt, 50 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US40

SHEET 3 of 5

Designed by:

Checked by:

13 May 2019 10:05 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.32

Legend

Tree Removal

Type

Dowel

Bolt, 25 kip

Bolt, 50 kip

General Scaling Limits

Intensive scaling

Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US40

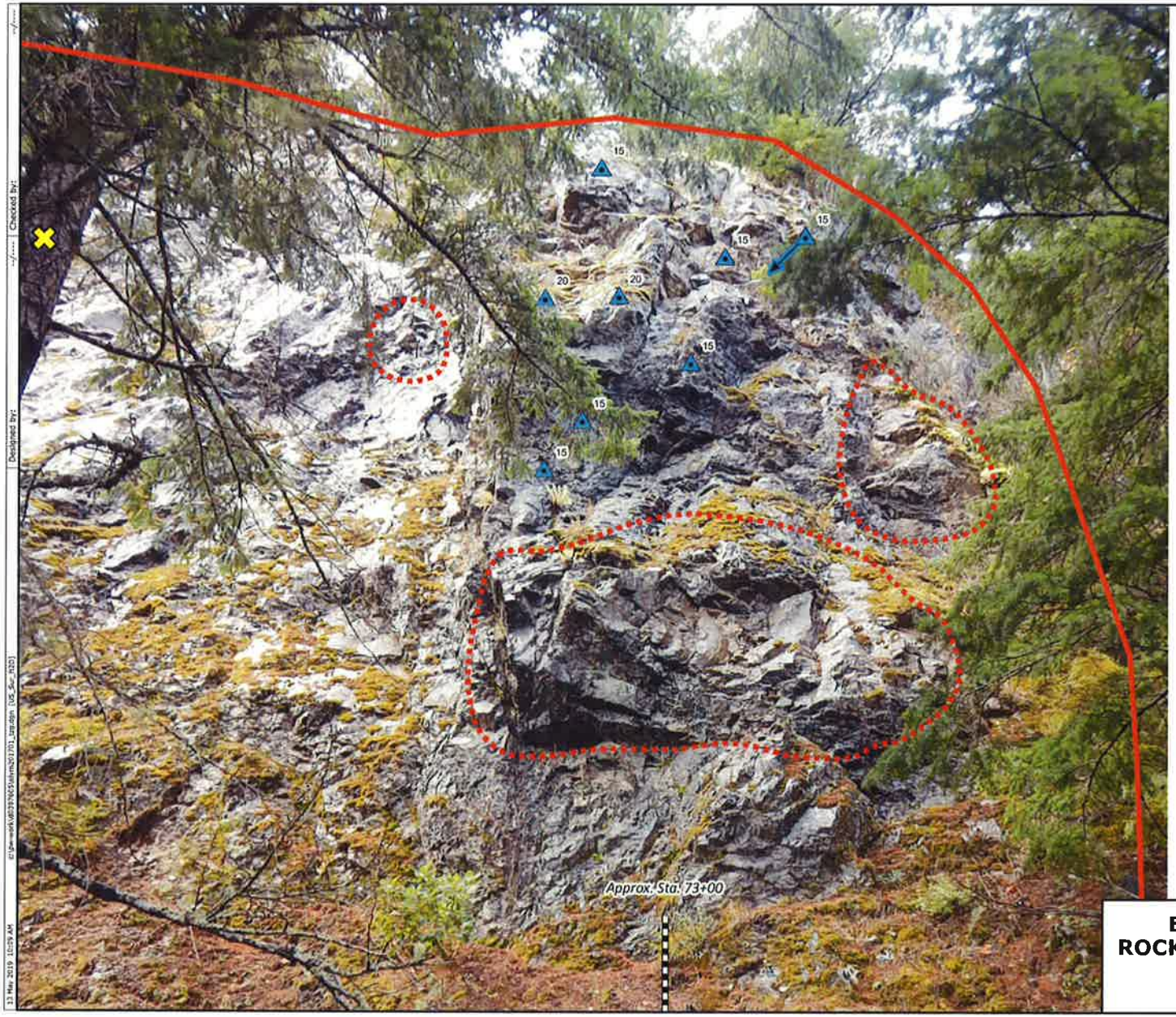
SHEET 4 of 5

Designed by:

Checked by:

13 Mar 2019 12:08 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	0.33



Legend

Tree Removal

Type

Bolt, 25 kip

direction

Bolt, 25 kip

General Scaling Limits

Intensive scaling

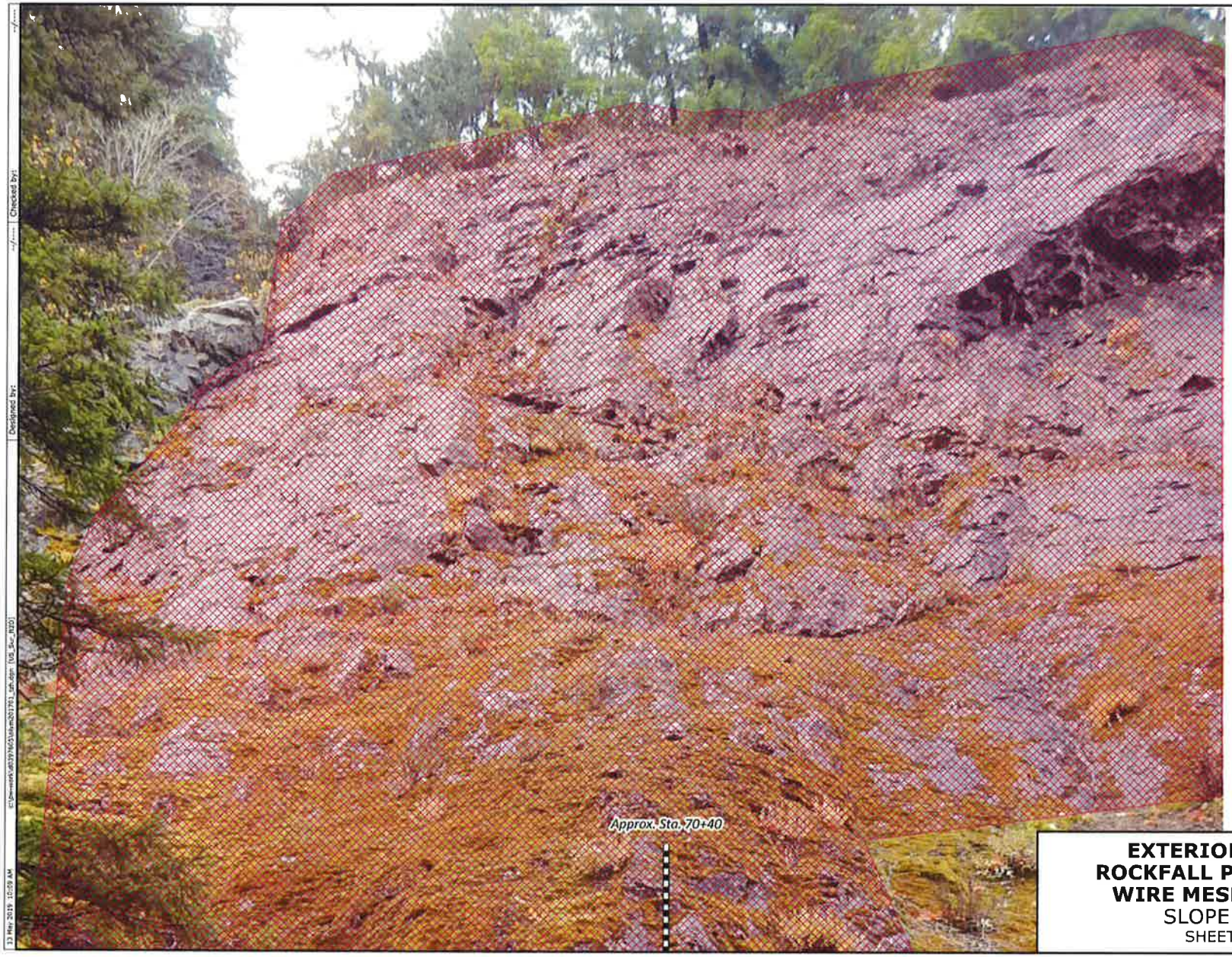
Minimum length, in feet, shown next to approximate location of reinforcement.

EXTERIOR SCALING AND ROCK REINFORCEMENT LAYOUTS

SLOPE - US40

SHEET 5 of 5

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.34



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US40

SHEET 1 of 5

Designed by:

Checked by:

13 Mar 2019 12:09 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.35

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US40

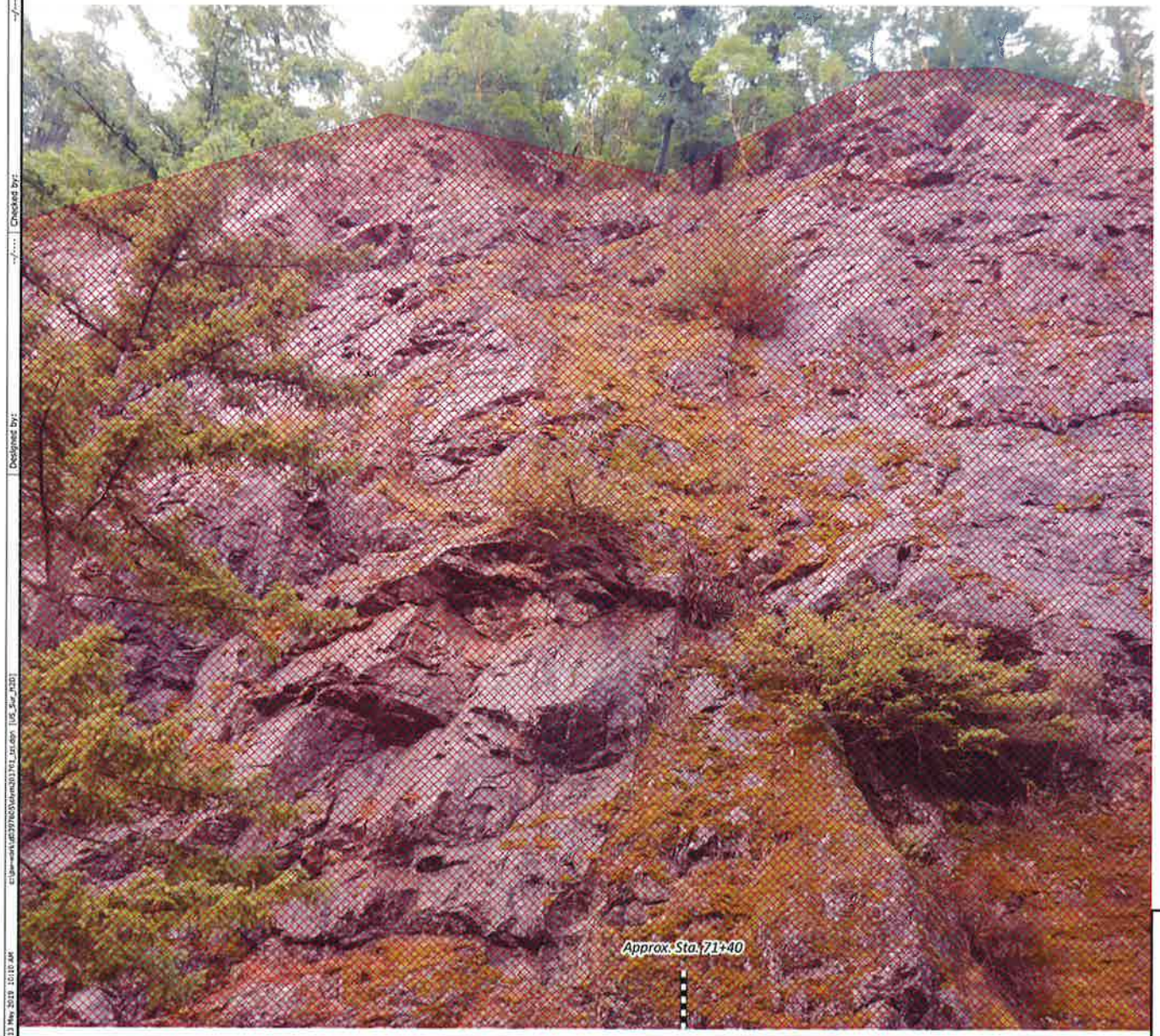
SHEET 2 of 5

Designed by:

Checked by:

13 May 2019 10:10 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1,36



Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US40

SHEET 3 of 5

Designed by:

Checked by:

13 May 2019 10:10 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.37

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US40

SHEET 4 of 5

Designed by:

Checked by:

13 Mar 2019 10:11 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.38

Legend

Draped Rockfall Protection, Wire Mesh

EXTERIOR DRAPED ROCKFALL PROTECTION, WIRE MESH LAYOUTS

SLOPE - US40

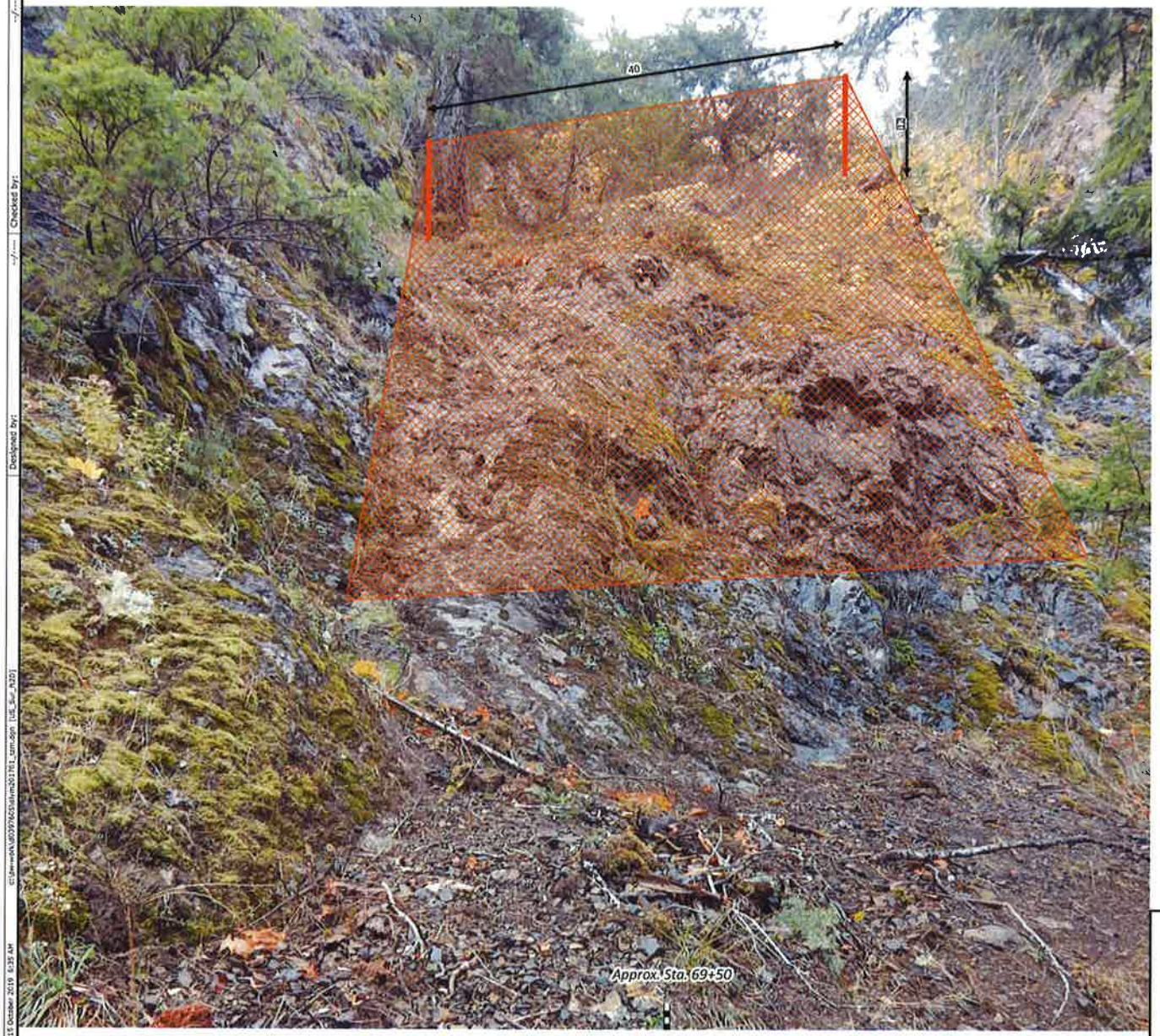
SHEET 5 of 5

Designed by:

Checked by:

13 Mar 2019 10:11 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	1.39



Legend

- Safety Scaling
- Midslope Rockfall Attenuator Location
- Midslope Rockfall Attenuator Post Location
- Dimension (feet)

NOTE:

1. *Final location of the Midslope Rockfall Attenuator will be decided by the CO.*

EXTERIOR MIDSLOPE ROCKFALL ATTENUATOR AND SAFETY SCALING AREAS

SLOPE - US41

SHEET 1 of 2

Designed by:

Checked by:

15 October 2019 8:35 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.40

Legend

- Safety Scaling
- Midslope Rockfall Attenuator Location
- Midslope Rockfall Attenuator Post Location

NOTE:

1. Final location of the Midslope Rockfall Attenuator will be decided by the CO.

EXTERIOR MIDSLOPE ROCKFALL ATTENUATOR AND SAFETY SCALING AREAS

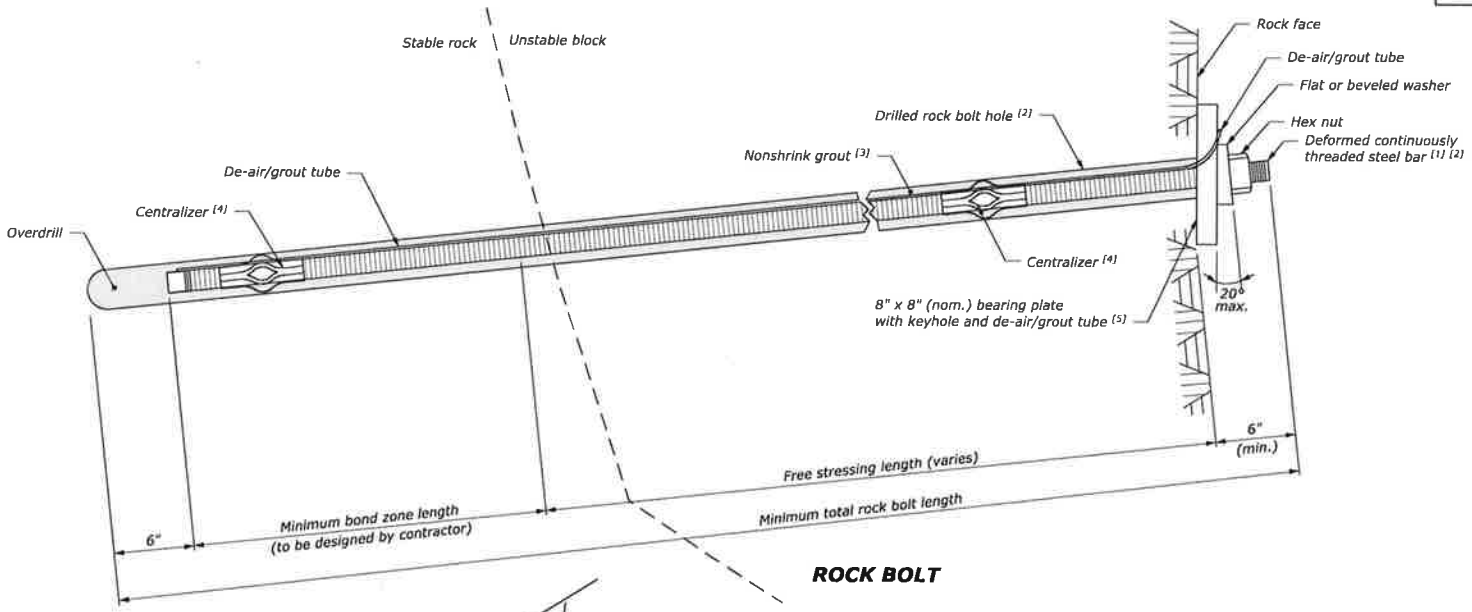
SLOPE - US41

SHEET 2 of 2

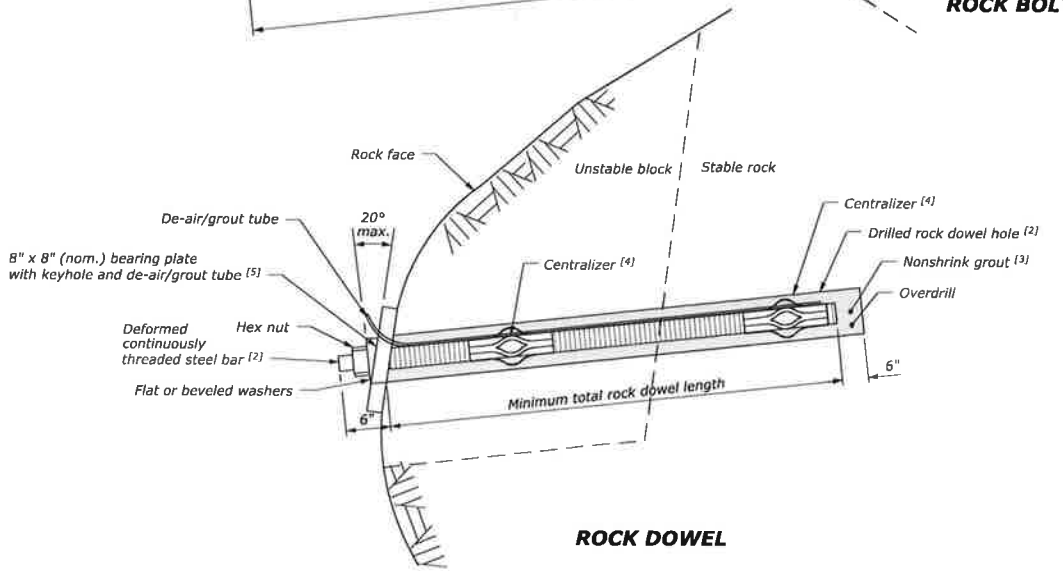
Designed by: --/---- | Checked by: --/----

17 May 2019 10:08 AM c:\pw-work\d0297640\dwm261701_cm.dgn (US_Sur_R25)

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.41



ROCK BOLT



ROCK DOWEL

NO SCALE

NOTE:

1. Install rock dowels and rock bolts at the locations and orientations shown in the plans or as directed by the CO.

FOOTNOTE:

[1] Rock bolt design load is 25 Kips and 50 Kips. Rock dowel design load is 25 Kips.

[2] Drill hole diameter, bar size, and minimum bond zone length to be determined by rock bolt contractor.

[3] Fully encapsulated rock bolt and dowel bar in nonshrink grout.

[4] Place lowest centralizer within 12-inches of the distal end of the bar. Place additional centralizers on 10-foot centers.

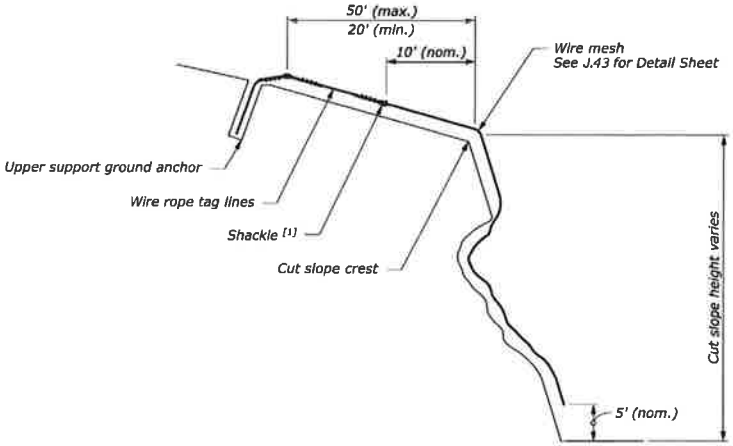
[5] Thickness of bearing plate to be designed by the contractor for project design loads.

ROCK BOLT AND ROCK DOWEL DETAILS

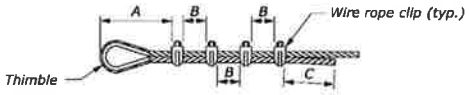
Designed by: Checked by:

13 May 2019 10:22 AM

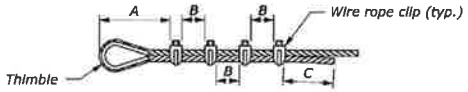
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.42



WIRE MESH TYPICAL SECTION



GROUND ANCHOR WIRE ROPE LOOP DETAIL (TYP.) [2]



SEAMING WIRE ROPE LOOP DETAIL [2]

FOOTNOTE:

[1] *Use a shackle with 1-inch (min.) nominal size and 8-ton (min.) working load limit.*

[2] *Comply with manufacturer's specifications (as based on rope size/diameter) for thimble selection, number of clips, clip size, distance A, B, C and required torque.*

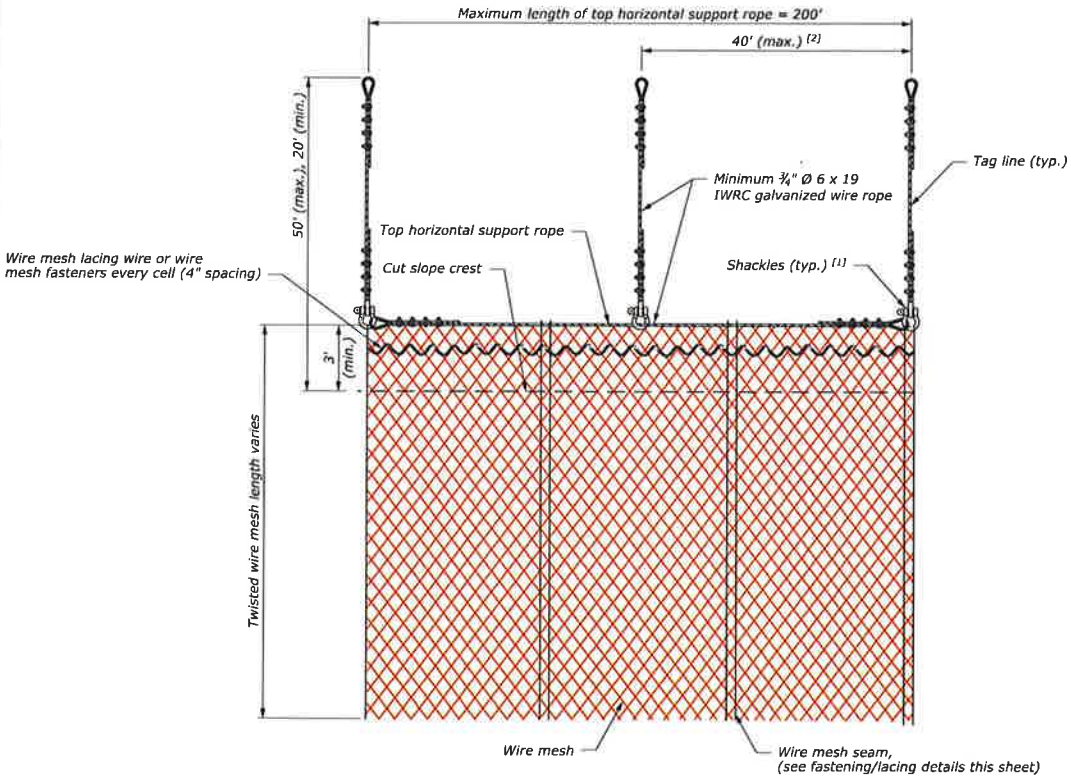
DRAPED ROCKFALL PROTECTION, WIRE MESH DETAILS

(1 of 3)

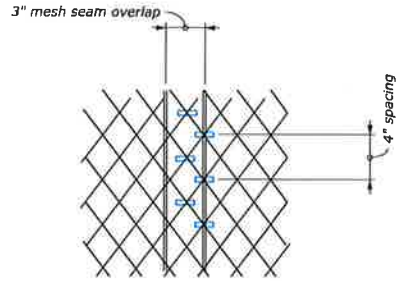
Designed by: | Checked by:

E:\pw-work\pb3976035\or-a1903177_1.dgn [US_Sur_R20] 17 May 2019 10:10 AM

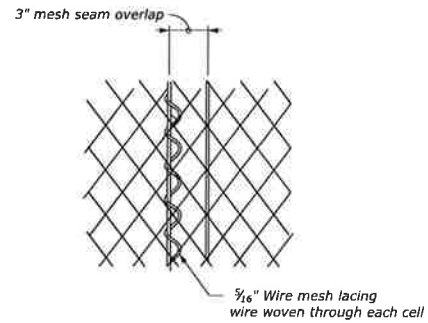
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.43



WIRE MESH DETAIL



FASTENER ALTERNATIVE



LACING ALTERNATIVE

WIRE MESH FASTENING/LACING DETAILS

FOOTNOTE:

[1] *Use a shackle with 1-inch (min.) nominal size and 8-ton (min.) working load limit.*

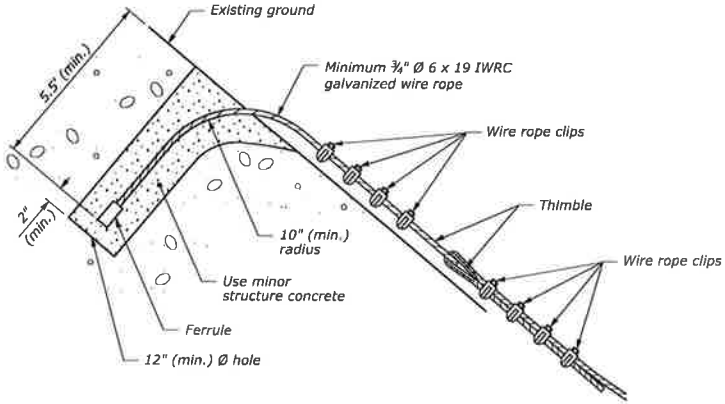
[2] *Shorten anchor spacing to facilitate changes in slope geometry as approved by the CO. Arrange anchors in such a manner as to allow wire mesh to conform to the slope.*

NO SCALE

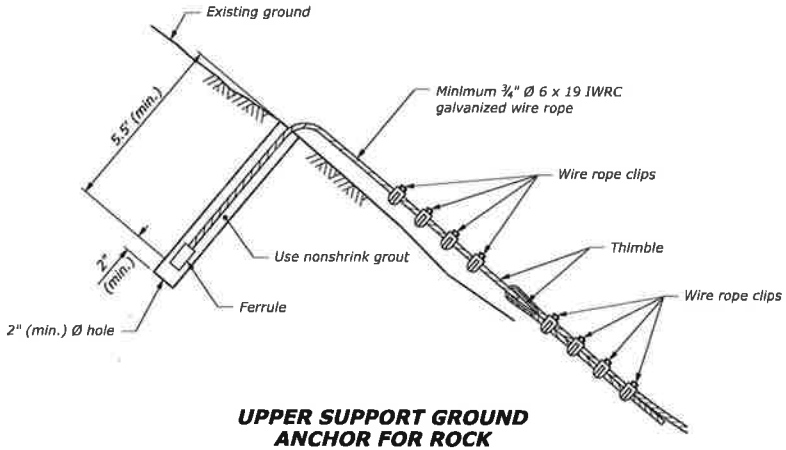
DRAPED ROCKFALL PROTECTION, WIRE MESH DETAILS

(2 of 3)

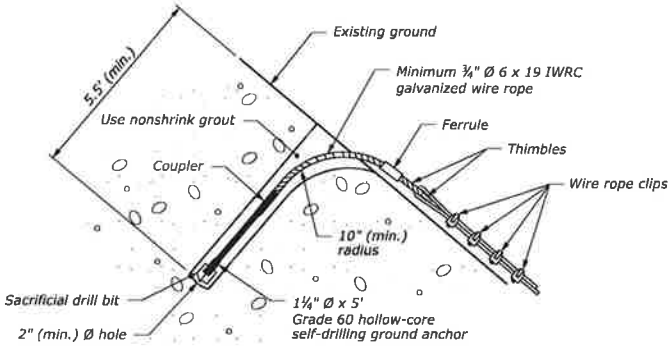
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.44



UPPER SUPPORT GROUND ANCHOR FOR SOIL (TYPE I)



UPPER SUPPORT GROUND ANCHOR FOR ROCK



UPPER SUPPORT GROUND ANCHOR FOR SOIL (TYPE II)

NO SCALE

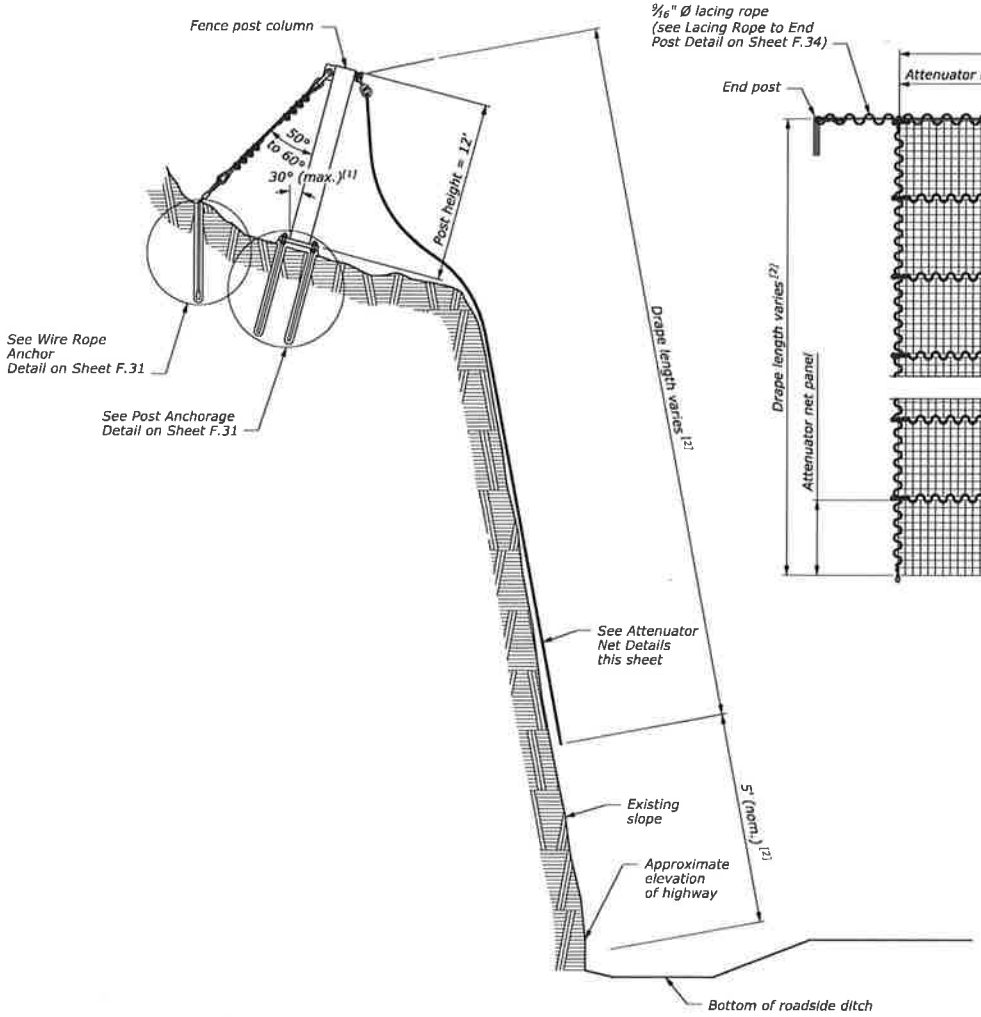
DRAPED ROCKFALL PROTECTION, WIRE MESH DETAILS

(3 of 3)

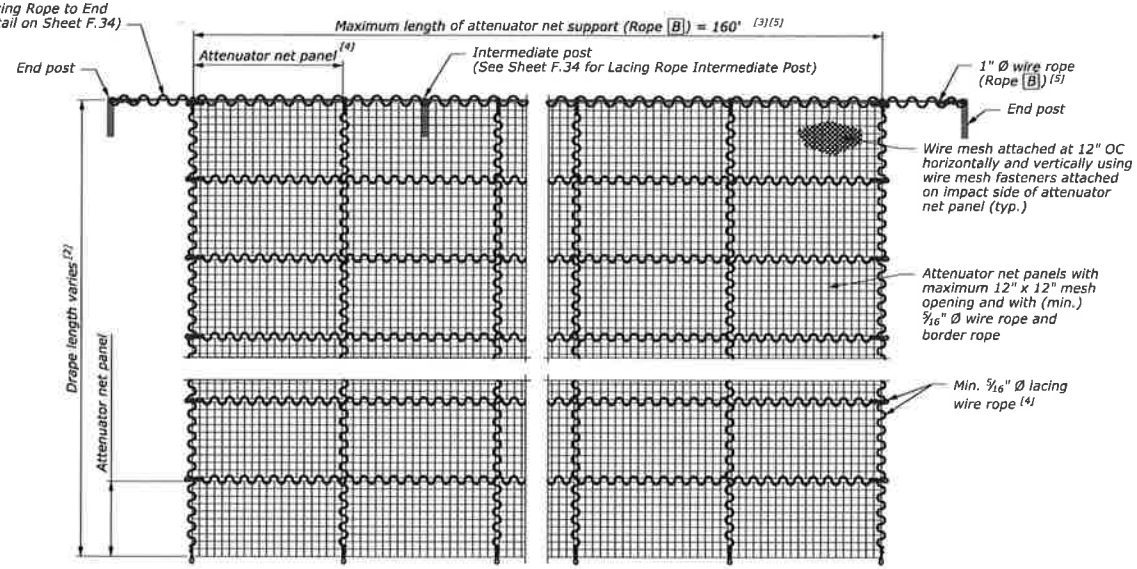
Designed by: | Checked by:

13 May 2019 10:23 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.45



ATTENUATOR TYPICAL CROSS SECTION



ATTENUATOR NET DETAILS

FOOTNOTE:

[1] Prepare foundation for fence post column to accommodate the orientation shown.

[2] Area to be draped by the plans & CO.

[3] Maximum attenuator net support rope length = 160' (I.E. post spacing's at 40'). Attenuator net support rope shall be terminated at a connection or end post.

[4] Attenuator net panels to be seam laced with (min.) 5/16" Ø wire ropes through each square of net. End of lacing wire rope is to be looped on itself and terminated with min. (2) 5/16" wire rope clips or in accordance with manufacturer's specifications.

[5] Additional details for Rope B are provided on Sheet F.30.

NO SCALE

MIDSLOPE ROCKFALL ATTENUATOR DETAILS

(1 of 6)

Designed by: | Checked by:

15 October 2019 9:39 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.46

END AND CONNECTION FENCE POST COLUMNS [1] [2]

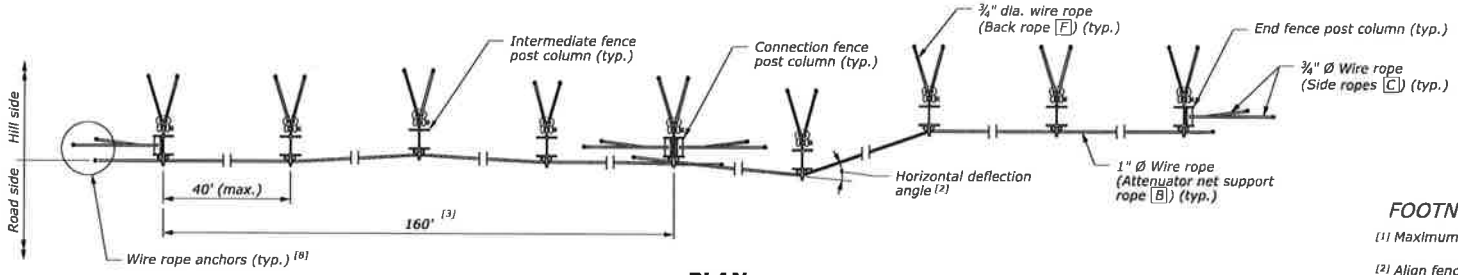
END & CONNECTION POSTS		POST ANCHORAGE			ATTENUATOR NET SUPPORT ROPE CONNECTION					SIDE ROPES CONNECTION			
HEIGHT	SIZE	PLATE A	WELD Af	WELD Aw	ROPE B [3]	PLATE B [4]	HOLE B (DIA.)	WELD B	SWIVEL B [5]	ROPE C	PLATE C	HOLE C (DIA.)	WELD C
12'	W 8 x 40	¾ x 16 x 1'-4"	7/16	¼	1"	1 x 4 x 6"	1¼"	½	1	¾"	½ x 4 x 7"	1¾"	5/16

INTERMEDIATE FENCE POST COLUMNS

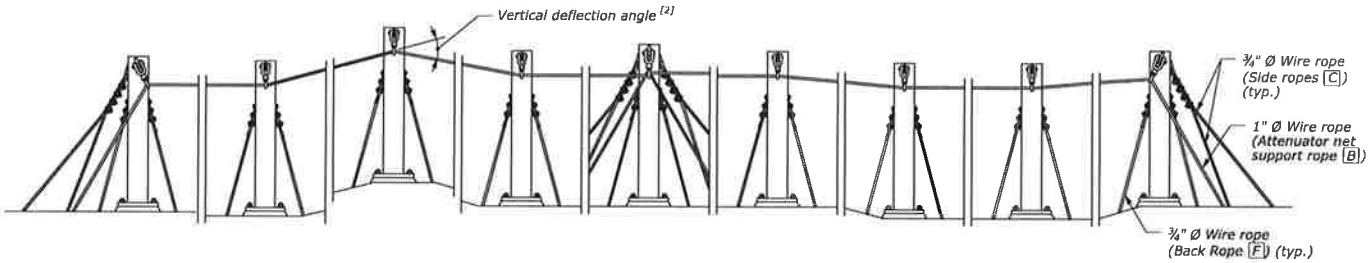
INTERMEDIATE POSTS [1] [2]		POST ANCHORAGE			ATTENUATOR NET SUPPORT ROPE CONNECTION				
HEIGHT	SIZE	PLATE D	WELD Df	WELD Dw	ROPE B [3]	PLATE B [4]	HOLE B (DIA.)	WELD B	SWIVEL B [5]
12'	W 8 x 35	¾ x 16 x 1'-4"	5/16	¼	1"	1 x 4 x 6"	1¼"	½	1

ULTIMATE WIRE ROPE ANCHOR CAPACITY [6] [7]

CAPACITY (KIPS)		
ROPE B	ROPE C (PER ROPE)	ROPE F (PER ROPE)
103	58	58



PLAN



ELEVATION

ATTENUATOR NET NOT SHOWN FOR CLARITY

NO SCALE

FOOTNOTE:

[1] Maximum spacing between fence post columns = 40'.

[2] Align fence post columns with horizontal and vertical deflection angles of less than 30°. If the deflection in any direction exceeds 30°,anchor the attenuator net support Rope B at the deflection point with an end fence post column.

[3] Maximum attenuator net support rope length (Rope B)= 160' (I.E. 4 post spacings at 40'). Attenuator net support rope shall be terminated at a connection or end post column.

[4] Clip the lower corner of Plate B by 1¾-inch.

[5] Use jaw end type swivels.

[6] For rope B, double wire rope anchors with individual tag lines may be used as an alternative to a single wire rope anchor in order to achieve the required capacity. The angle between a tag line and the axis of the corresponding anchor shall be less than 30°. Anchors and tag lines shall have a minimum of 75% of the required capacity for a single anchor.

[7] Capacity shall be obtained by proof testing. See special contract requirements.

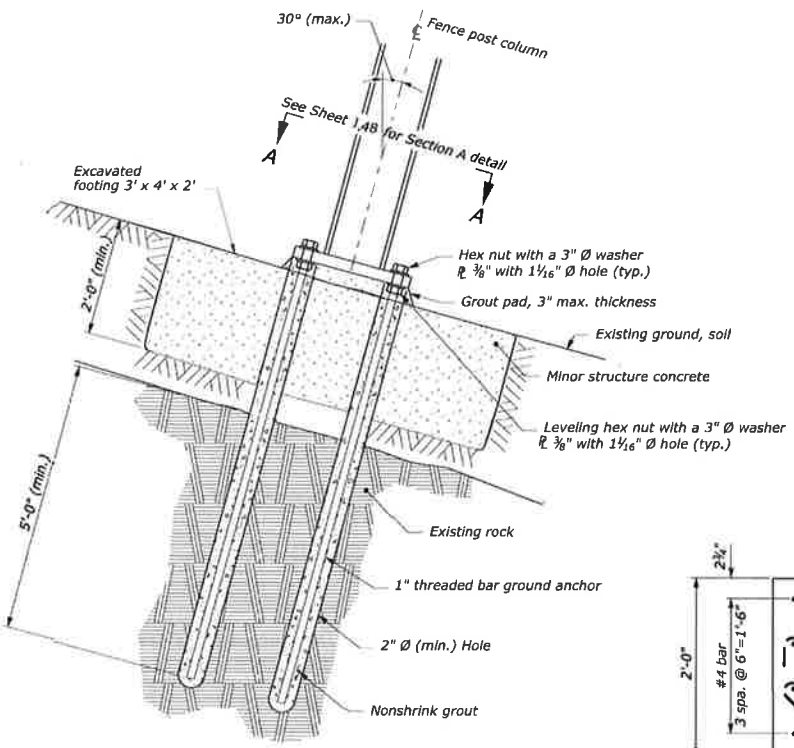
[8] Minimum spacing between anchors is equal to half the embedment length of Rope B anchor.

MIDSLOPE ROCKFALL ATTENUATOR DETAILS

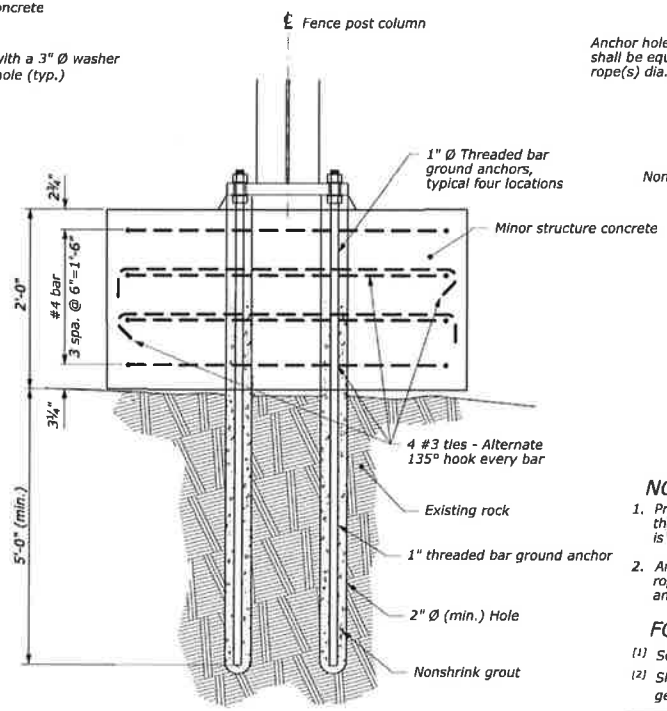
(2 of 6)

Designed by: Checked by: 13 May 2019 11:24 AM E:\Dev-work\dt397\605\0=a390\171_c8.dgn [US_Sur_PCD]

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.47

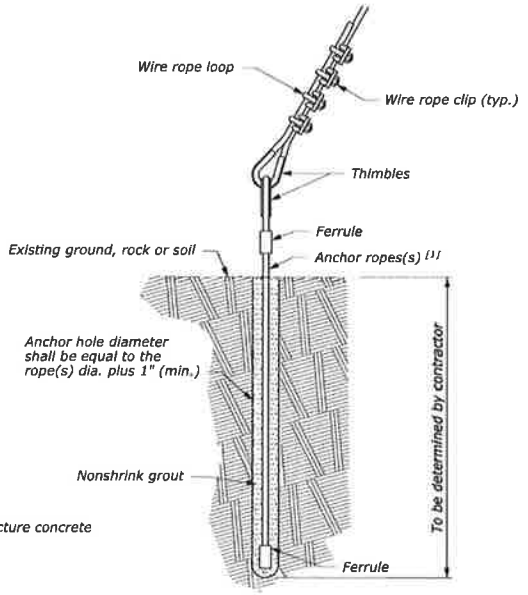


POST ANCHORAGE IN ROCK



ELEVATION
FOUNDATION DETAIL[2]

NO SCALE



WIRE ROPE ANCHOR [2]

NOTE:

1. Prepare foundation for fence post column to accommodate the orientation shown. Grout pad not required if bearing surface is flat.
2. Anchor rope(s) size should be adequate to develop the ultimate rope anchor capacities listed on Sheet J.46 in both rock and soil anchoring conditions.

FOOTNOTE:

[1] See Sheet J.46 for ultimate capacity requirements.

[2] Shorten the anchor spacing to facilitate changes in slope geometry as approved by the CO.

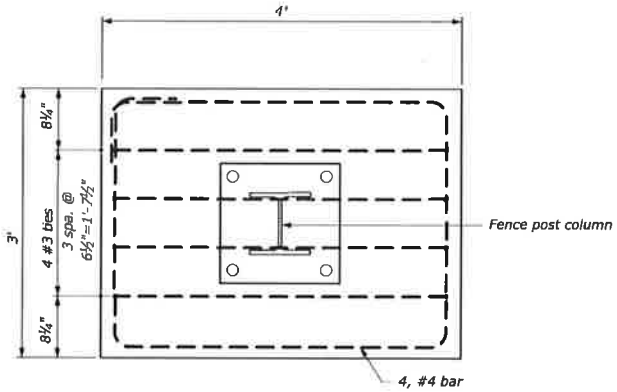
MIDSLOPE ROCKFALL ATTENUATOR DETAILS

(3 of 6)

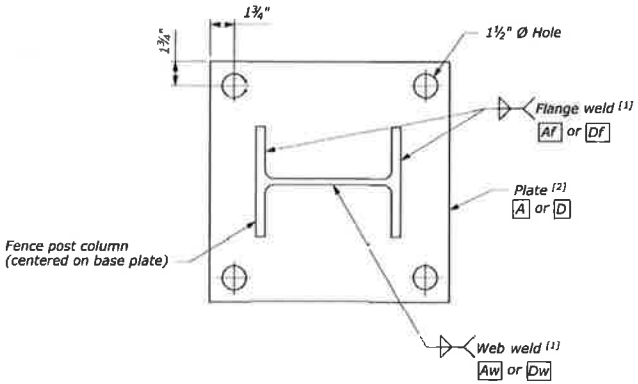
Designed by: Checked by:

13 Mar 2018 10:25 AM

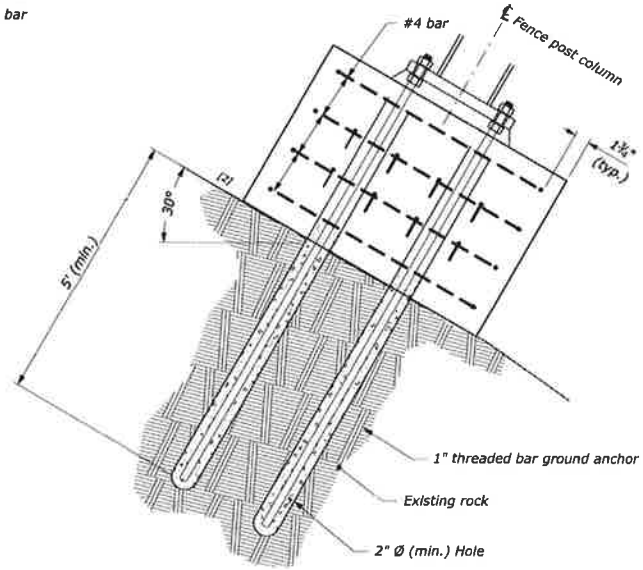
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.48



FOUNDATION DETAIL PLAN



BASE PLATE - NEW
SECTION A-A



FOUNDATION DETAIL SECTION

FOOTNOTE:

[1] For plate and weld sizes, refer to the tables on Sheet J.46.

[2] For ground slopes greater than 30 degrees, remove soil and rock to place the foundation at less than 30 degrees.

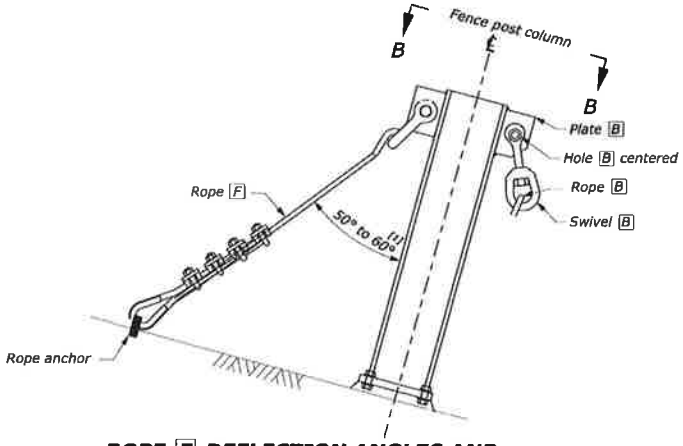
NO SCALE

MIDSLOPE ROCKFALL ATTENUATOR BASE PLATE DETAILS

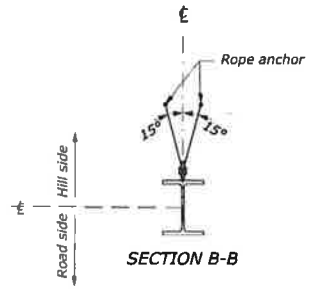
(4 of 6)

13 May 2015 10:25 AM | e:\pw-work\d0397605\pw-a1900171_jf.dgn [US_Sur_RDB] | Designed by: -/— | Checked by: -/—

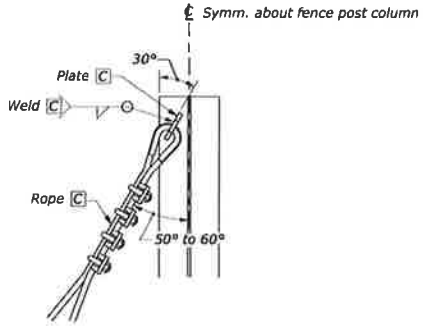
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.49



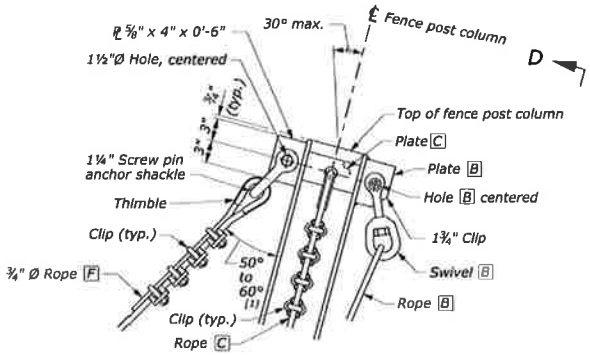
ROPE F DEFLECTION ANGLES AND ROPE ANCHOR PLACEMENT FOR END AND INTERMEDIATE POSTS



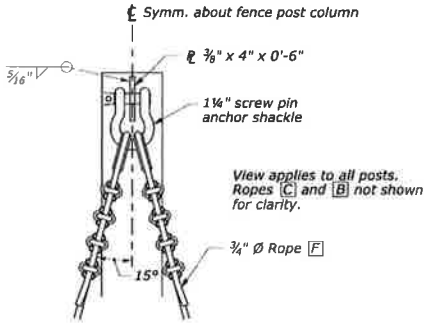
SECTION B-B



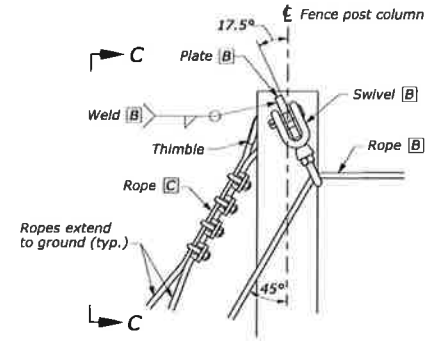
SECTION D-D



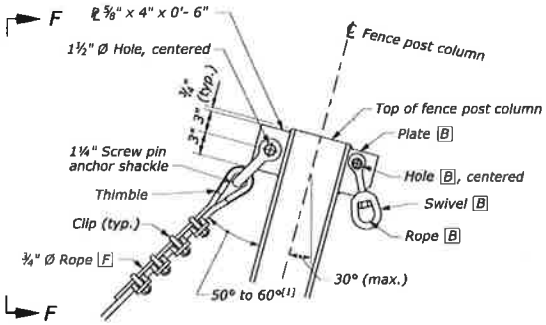
SECTION C-C



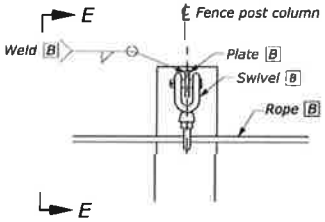
SECTION F-F



END POST



SECTION E-E



INTERMEDIATE POST

NO SCALE

FOOTNOTE:

[1] Angle must be the same for both rope F's.

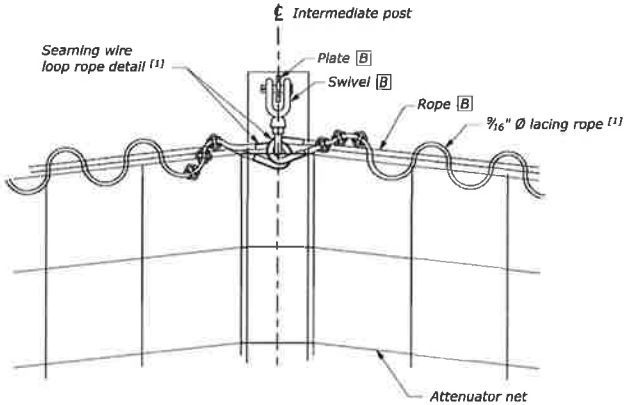
MIDSLOPE ROCKFALL ATTENUATOR POST DETAILS

(5 of 6)

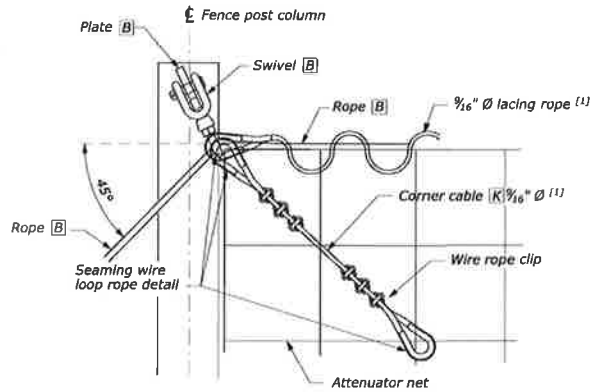
Designed by: | Checked by:

13 May 2019 10:26 AM

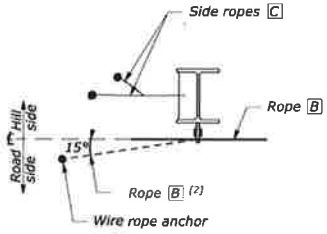
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	J.50



LACING ROPE TO INTERMEDIATE POST

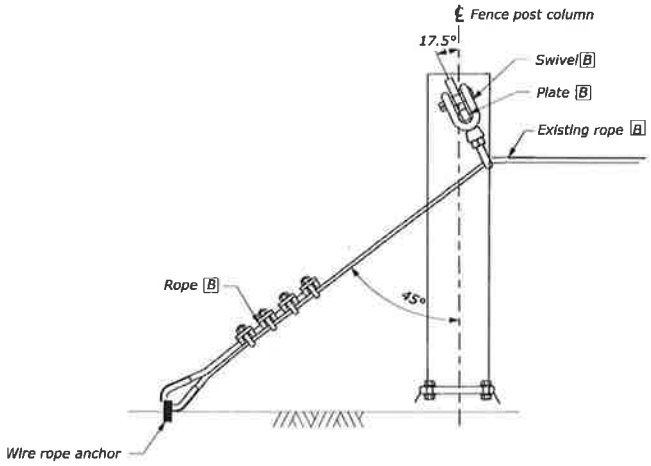


LACING ROPE TO END POST



PLAN VIEW

ATTENUATOR NET SUPPORT ROPE B
HORIZONTAL DEFLECTION ANGLE



ATTENUATOR NET SUPPORT ROPE B
VERTICAL DEFLECTION ANGLE

FOOTNOTE:

[1] *Attach lacing rope to swivel E or B.*

[2] *Up to 15° From the horizontal line of the swivel for rope B.*

NO SCALE

MIDSLOPE ROCKFALL ATTENUATOR POST DETAILS

(6 of 6)

Designed by:
Checked by:
13 May 2019 10:26 AM

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	K.1

NPS PMIS No. 228726
NPS Drwg No. 149/150B22

TEMPORARY TRAFFIC CONTROL, CONSTRUCTION SIGN (INFORMATION ONLY)

MUTCD SIGN	DESCRIPTION	SIGN SIZE INCH x INCH	AREA (SQFT)	NUMBER OF SIGNS	QUANTITY (SQFT)
Ref-1	SPRUCE RAILROAD TRAIL CLOSED XX MILES	66 x 36	16.5	2	33
Ref-1A	SPRUCE RAILROAD TRAIL CLOSED XX MILES	36 x 18	4.5	1	4.5
Ref-2	TRAIL CLOSED	24 x 12	2	2	4
				TOTAL	41.5

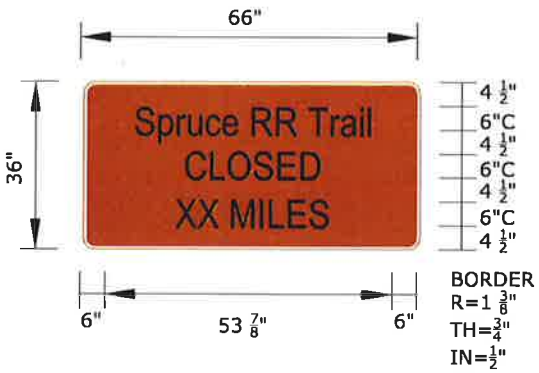
TEMPORARY TRAFFIC CONTROL, ORANGE PLASTIC FENCE (INFORMATION ONLY)

	QUANTITY (LNFT)
TOTAL	500

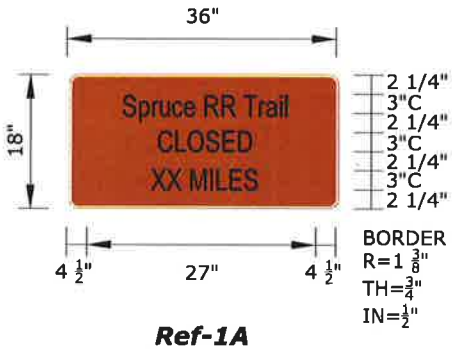
NOTE:
1. As needed for construction sequencing

TEMPORARY TRAFFIC CONTROL, TYPE 3 BARRICADE (INFORMATION ONLY)

	QUANTITY (EACH)
TOTAL	2



Ref-1
Black on orange



Ref-1A
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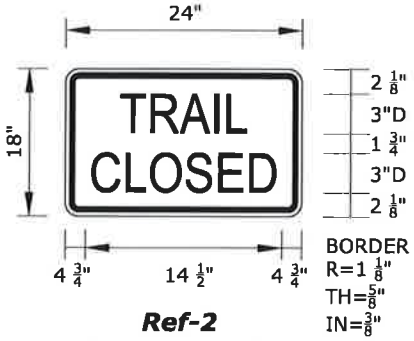
Type 3 Barricade



Ref-2
Black on white

NO SCALE

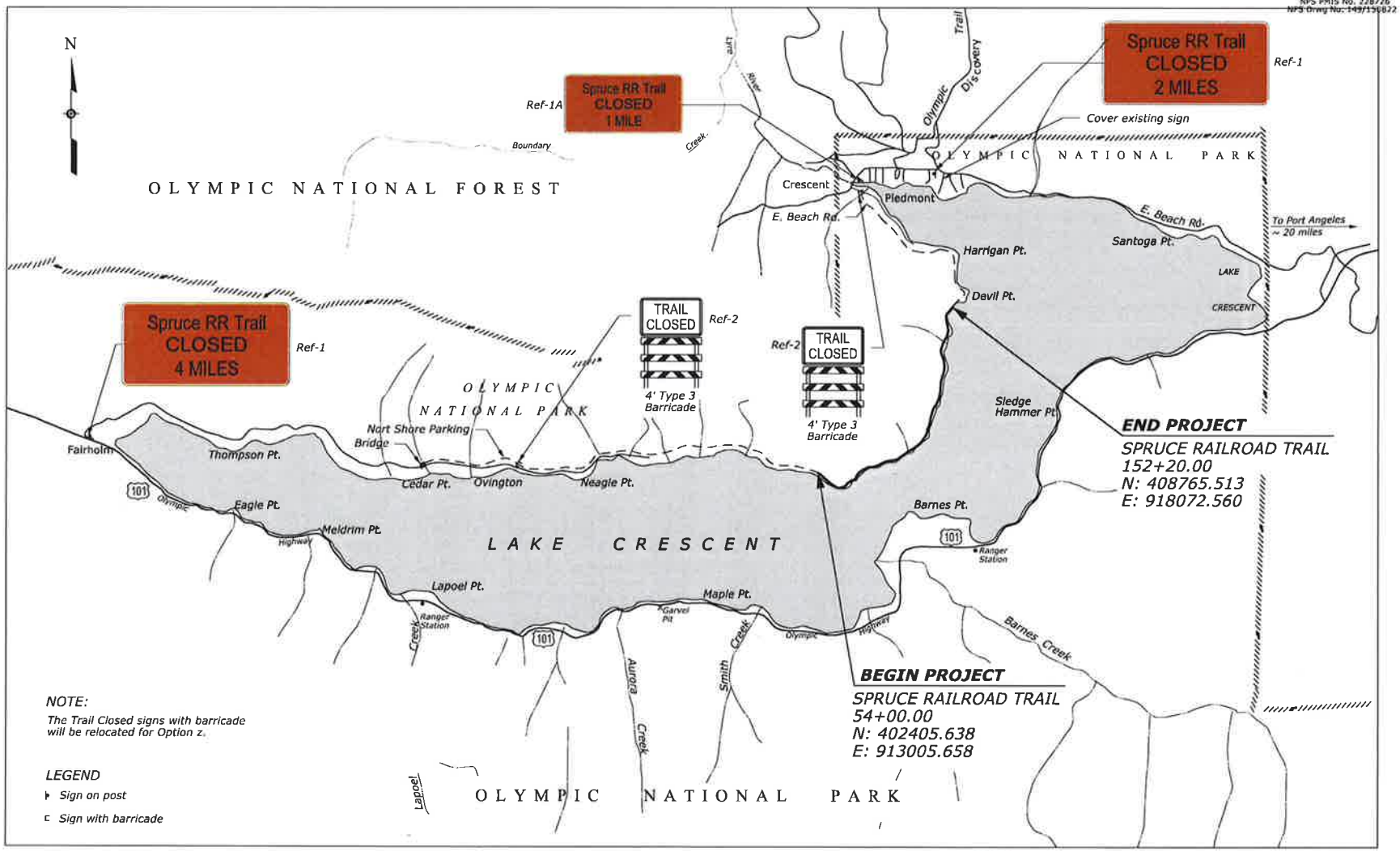
TABULATION OF TEMPORARY TRAFFIC CONTROL QUANTITIES

Designed by: B. McIntosh 04/2017 | Checked by: B. Huschka 08/2019

11 September 2019 7:55 AM

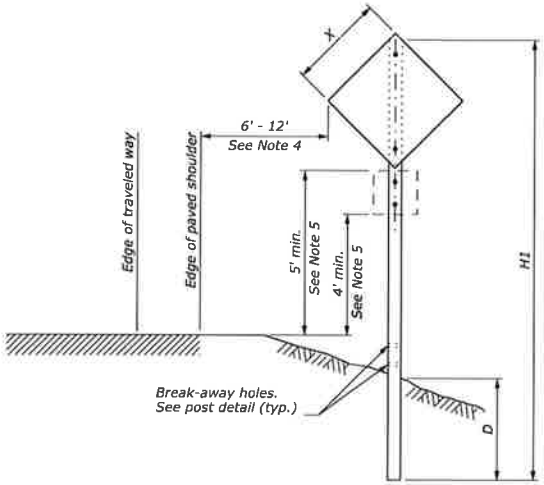
STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	K.2

NPS PMIS No. 228726
NPS Drwg No. 149/150822

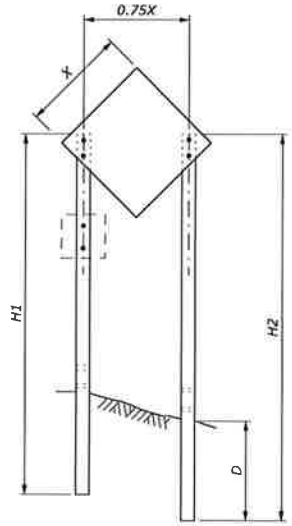


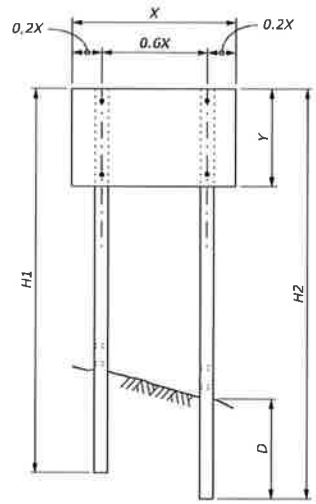
TEMPORARY TRAFFIC CONTROL PLAN

STATE	PROJECT	SHEET NUMBER
WA	NPS OLYM 2017(1)	K.3



SINGLE POST SIGN





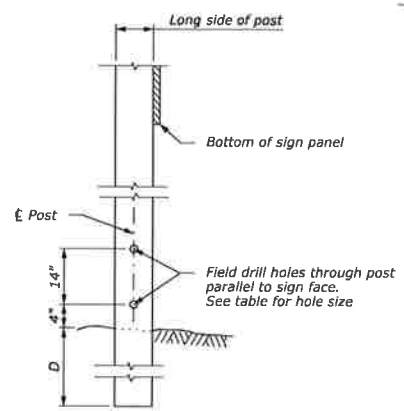
TWO POST SIGN

NOTE:

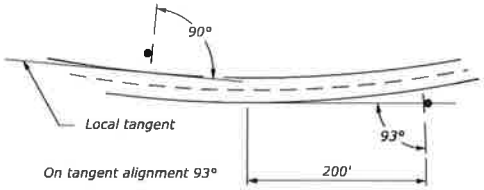
1. Attach sign panels with a minimum of 2 - ¼" dia. bolts per post.
2. H1 and H2 = Overall post length. Select post lengths to fit field conditions.
3. D = Post embedment depth for average soil conditions.
4. In rural areas where lateral distance is limited, a minimum lateral offset of 2' may be used. In urban areas, a minimum lateral offset of 1' behind the face of the curb may be used.
5. In pedestrian locations, or in areas where the view is obstructed, use 7' minimum mounting height for main sign and 6' minimum mounting height for secondary sign.
6. Use 7' minimum spacing between posts for sign posts 6" x 6" or larger.
7. State standards may be used as an alternative if approved by the CO.

WOOD POST SELECTION TABLE

WIDTH "X"	AREA (SQFT)	NUMBER OF POSTS	POST SIZE (INCH)	D (INCH)	HOLE SIZE (INCH)
Diamond ≤ 36" Other Shapes ≤ 48"	< 10	1	4 x 4	36	0
		1	4 x 6	48	1.5
Diamond ≤ 48"	10 - 20	1	6 x 6	48	2
Diamond < 48" Other Shapes ≤ 12'	10 - 20	2	4 x 4	36	0
	20 - 50	2	4 x 6	48	1.5
> 13'	50 - 65	2	6 x 6	48	2
12' - 16'	50 - 65	3	4 x 6	48	1.5
> 17'	65 - 95	4	4 x 6	48	2
> 30'	65 - 95	3	6 x 6	48	2



POST DETAIL



SIGN INSTALLATION ANGLE

NO SCALE

NPS Drwg. No.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL LANDS HIGHWAY

U.S. CUSTOMARY STANDARD

TEMPORARY TRAFFIC CONTROL SIGN INSTALLATION WOOD POSTS

STANDARD APPROVED FOR USE 6/2005

REVISED: DRAFT: 9/2011

STANDARD 635-14