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Bridge Administrator

The Interstate Bridge Replacement's estimate of immersed tunnel excavation and dredging is an inflated 8 million cubic yards, a realistic estimate is 2 million cubic yards.

Attached is recent written testimony I submitted to the Washington State Transportation Commission. Also attached is the supporting IBR's estimate documents obtained from a public disclosure request.

I also gave oral testimony on Sept. 14, 2023, that can be viewed on TVW.

<https://twv.org/video/washington-state-transportation-commission-2023091003/?eventID=2023091003>

The graph of station 87+00 is a good example of the wildly inaccurate IBR's estimate.

The IBR has admitted its estimate is wrong but does not plan to retract its "Tunnel Concept Assessment".

Respectfully
Bob Ortblad MSCE, MBA
206 992-1111

Sept. 10, 2023

Washington State Transportation Commission

The Interstate Bridge Replacement Program's "Tunnel Concept Assessment" must be retracted. It is based on extremely incorrect estimates of excavation and dredging,

The report was issued July 15, 2021, and signed by thirteen professional engineers and four consultants and then used to disqualify an immersed tunnel. However, the report was not stamped by a professional engineer and official until April 19, 2023.

On Aug. 8, 2023, from a Public Disclosure Request I received "Earthwork Documentation Model Report" and "Earthwork Documentation Tunnel Plan Profile Section" then questioned the IBR's estimates. (See attachments)

On Sept. 8, 2023, the IBR admitted its estimates were incorrect. Stating: "error that may arise with third party software" and "Quantity errors like this are not uncommon" and "This error does result in a change in the quantity of excavation of material". (See following email)

My analysis shows estimates of excavation and dredging are extremely inaccurate and inflated.

Respectfully
Bob Ortblad MSCE, MBA
206 992-1111

Comments on email:

To coverup its deceptive "Tunnel Concept Assessment" the IBR is claiming incompetence.

IBR admits report is incorrect but plans to ignore it and continue to disqualify an immersed tunnel solution.

Email should be sign by Greg Johnson, Program Administrator.

To: Bob Ortblad Sept. 8, 2023
From: IBR Communications Team

Good afternoon,

Thank you for reaching out to the Interstate Bridge Replacement (IBR) program and for sharing your questions about the Cross Section areas. We are responding back to address your specific questions but want to be clear that this does not change that the tunnel still does not best address the needs of the I-5 bridge and the corridor.

Our team of engineers uses a variety of software tools, such as InRoads that you referenced. We have investigated your inquiry and were able to confirm an issue with the model. Duplication occurred in the model where some excavation quantities were counted more than once. We are working on making the correction in the report and uploading an updated version.

However, upon reviewing what you provided, it appears your representative diagram and excavation calculations at 87+00 do not account the construction need for laying back slopes during excavation (and the resulting surface property impacts), or the alternative to have temporary structural walls which come with an extremely high cost. As you know, one of these options must be accounted for to prevent the sides of the trench from caving in during construction of an ITT.

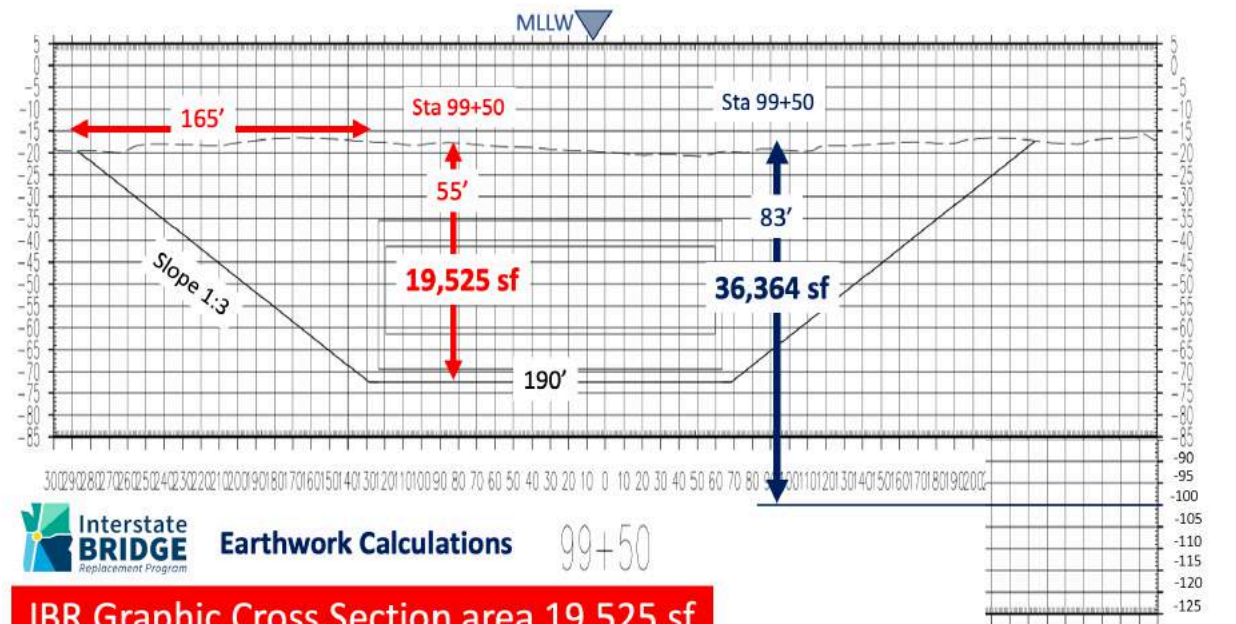
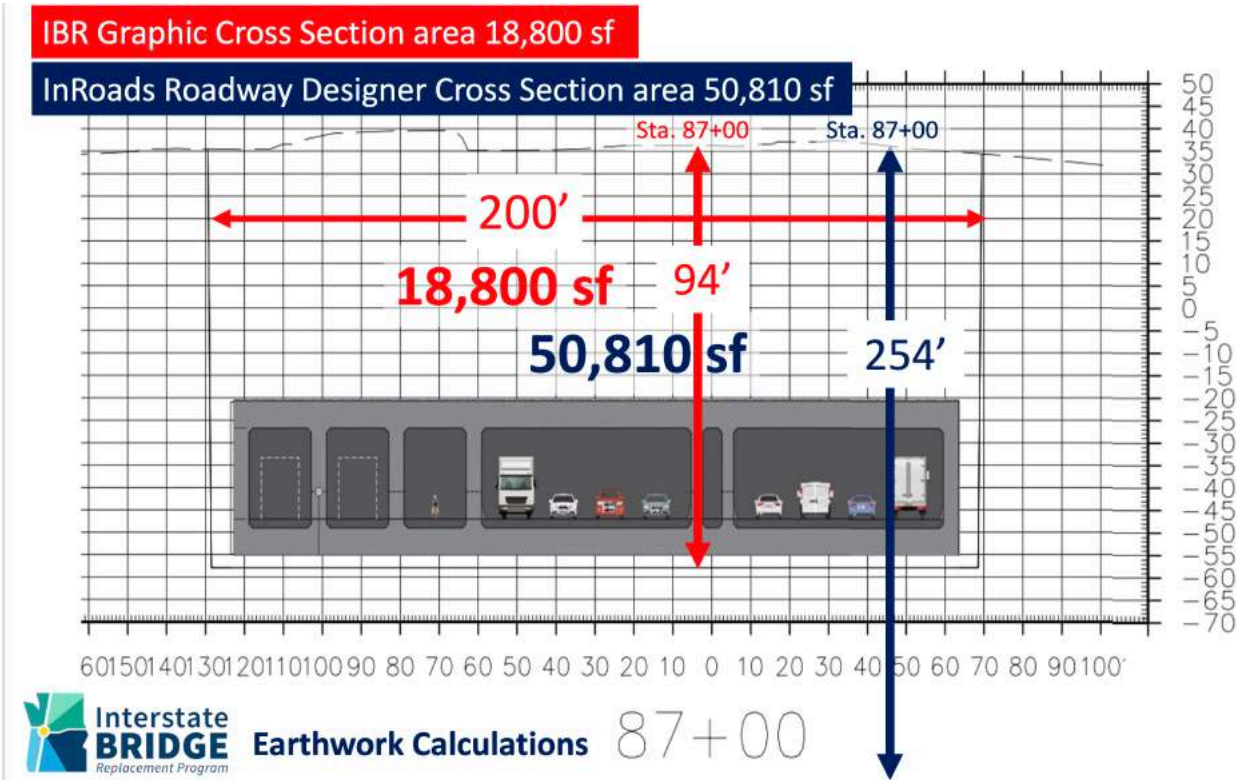
We conduct continuous quality checks and assurances to catch any errors that may arise with third party software and appreciate you flagging this. Quantity errors like this are not uncommon during the development of conceptual work. In a situation where plans are being constructed, the increasing level of detail completed as work advances would address potential calculation errors before moving to future steps.

As we have extensively detailed and documented, a tunnel still results in out-of-direction travel, cannot tie into existing connections, potentially causes safety concerns for active transportation, has significant environmental impacts, and has a higher estimated cost. While this error does result in a change in the quantity of excavation of material, it does not change the decision, reached with agency partners, not to pursue a tunnel as a solution for the I-5 corridor as the multiple factors considered remain true.

We appreciate your understanding.

Sincerely,
Interstate Bridge Replacement program
Communications Team

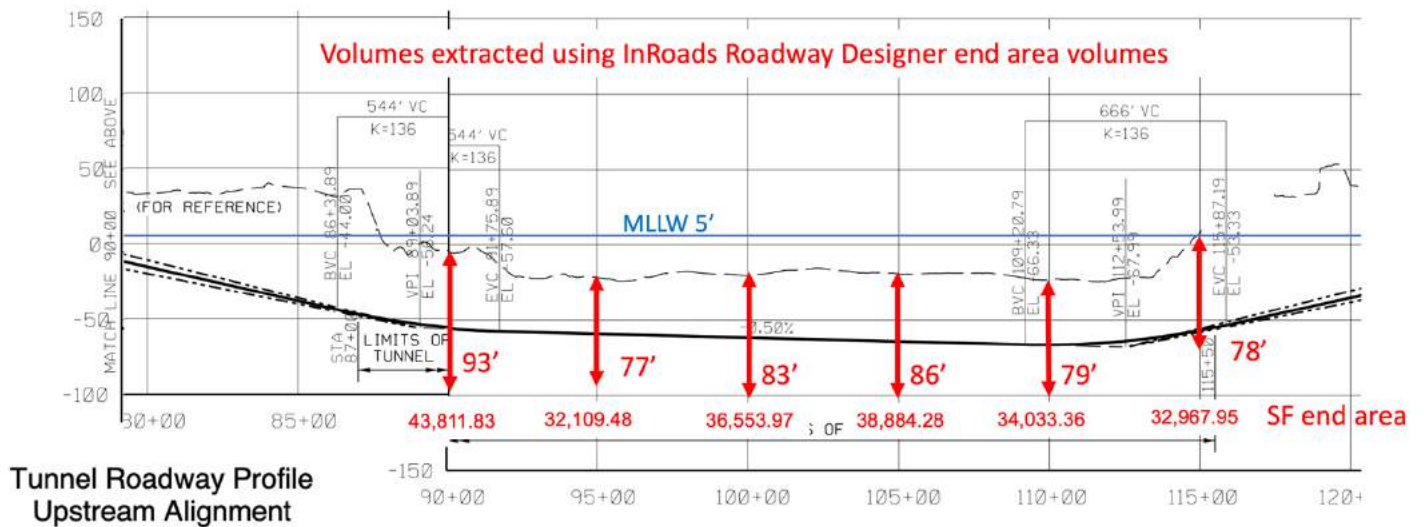
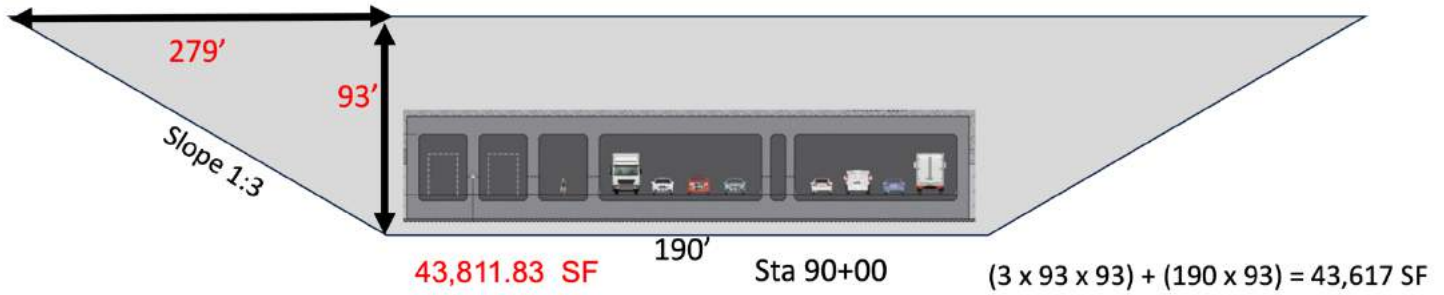
Every Cross Section SF must equal InRoads SF, IBR's are wildly different.



IBR Graphic Cross Section area 19,525 sf

InRoads Roadway Designer Cross Section area 36,364 sf

The end areas SF used by the InRoads Roadway Designer require depths 30' to 40' deeper than IBR's Tunnel Roadway Profile.



Ridiculous and misleading quantities that require 200' excavations & dredge depths of 80'. Realistic quantities are 1/4 as large and costly.

Table 1. Preliminary Tunnel Excavation Quantities

Location	Upstream Alignment	Realistic
Hayden Island (on land)	1,800,000 yd ³	200,000 cy
Columbia River (in water)	3,800,000 yd ³	1,400,000 cy
Vancouver (on land)	2,300,000 yd ³	500,000 cy
Total	7,900,000 yd³	2,100,000 cy

Misleading

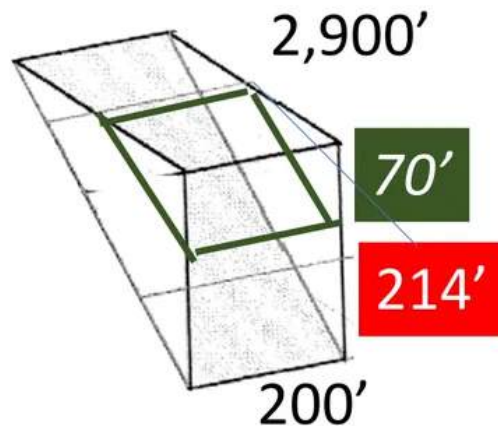
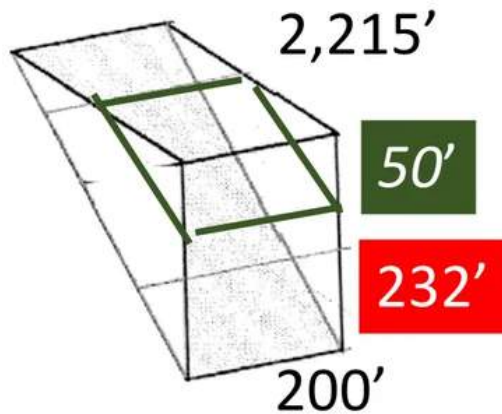


100%

27%

Hayden Island

Vancouver



Columbia River



Please send the assumptions and calculations made to support the Dredging and Excavation Quantities in section 3.1 of the Interstate Bridge Replacement’s “Tunnel Concept Assessment”, April 19, 2023.

Tunnel Concept Assessment

Revision 1

April 19, 2023



CONCEPTUAL – NOT FOR CONSTRUCTION

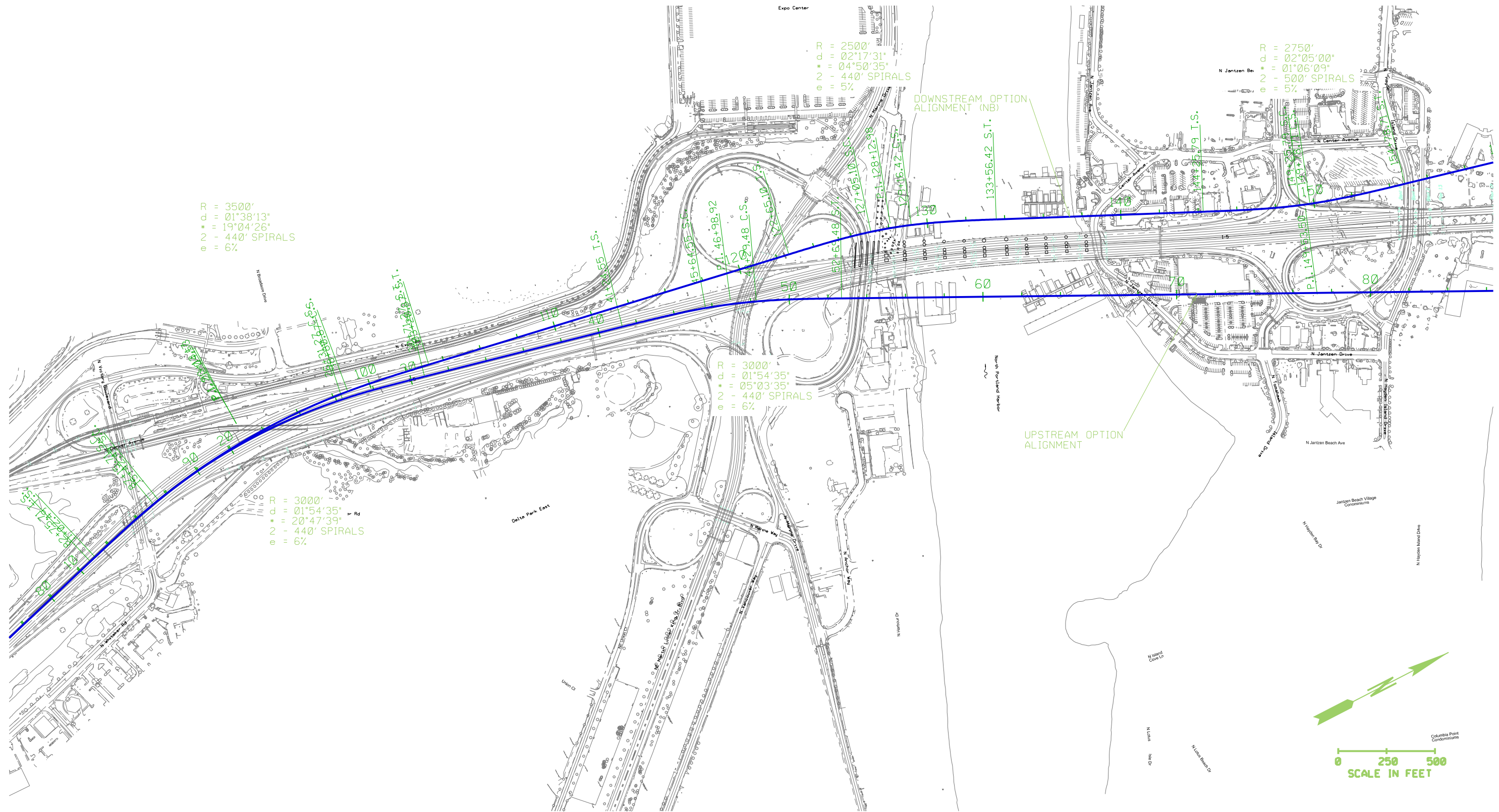
3.1 Dredging and Excavation

Prior to placement of the ITT segments, a trapezoidal channel would be dredged, with the base of the trapezoid wider than the base of the immersed tunnel segment and side slopes laid back to prevent sloughing or raveling. Table 1 shows the anticipated preliminary excavation quantities on Hayden Island, in the Columbia River, and in Vancouver for the full cross-section shown in Figure 1.

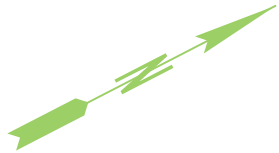
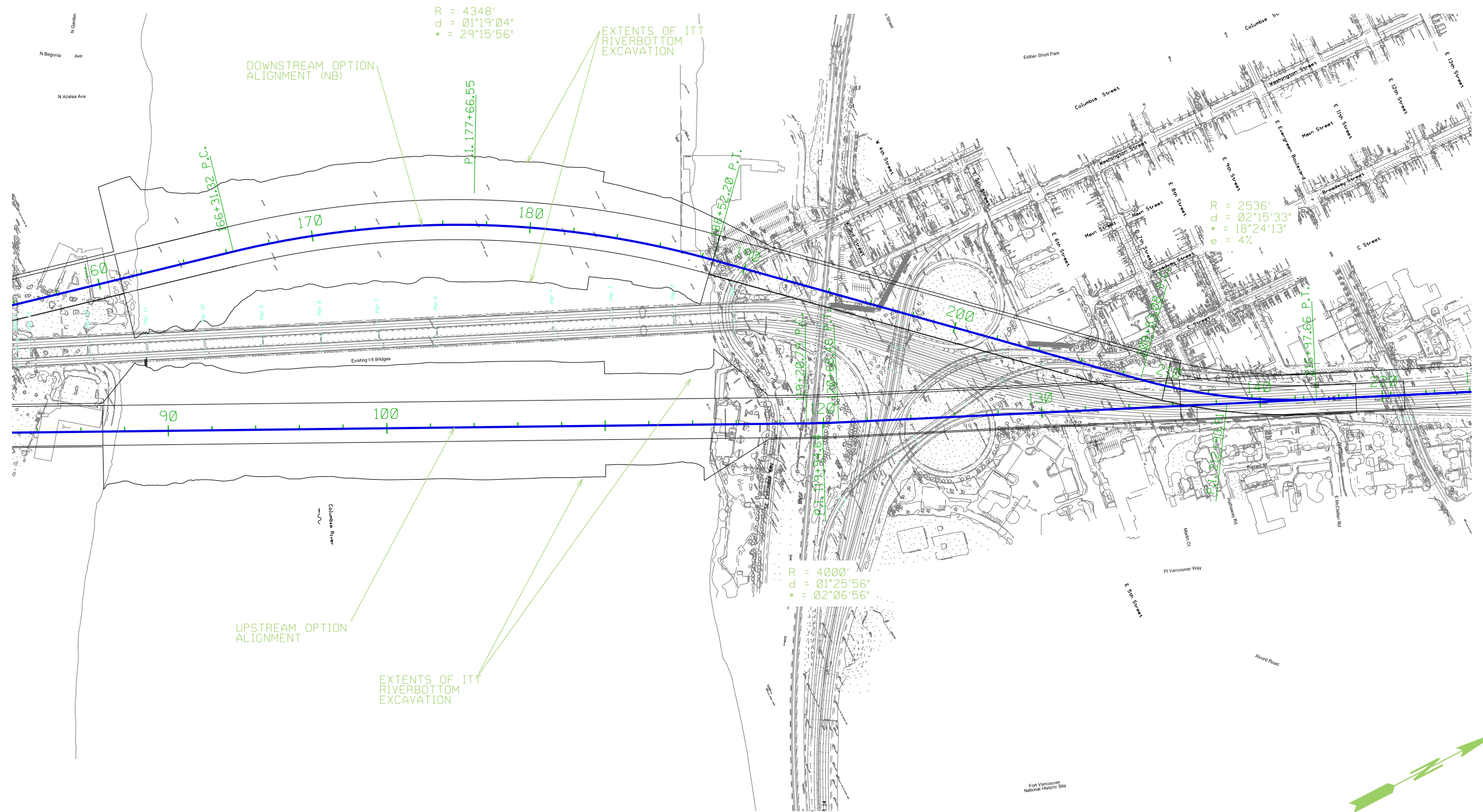
Some of the dredged materials would typically be used as backfill over the rip rap protection layer. However, much of the excavated material would be replaced by engineered fill designed to protect the tunnel from scour and potential impacts, as well as to provide tunnel support both during construction and a potential seismic event. Figure 7 shows a cross-section of the conceptual dredge prism for the ITT across the Columbia River.

Table 1. Preliminary Tunnel Excavation Quantities

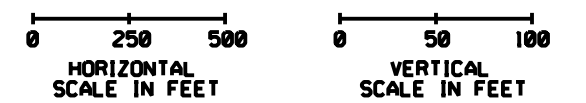
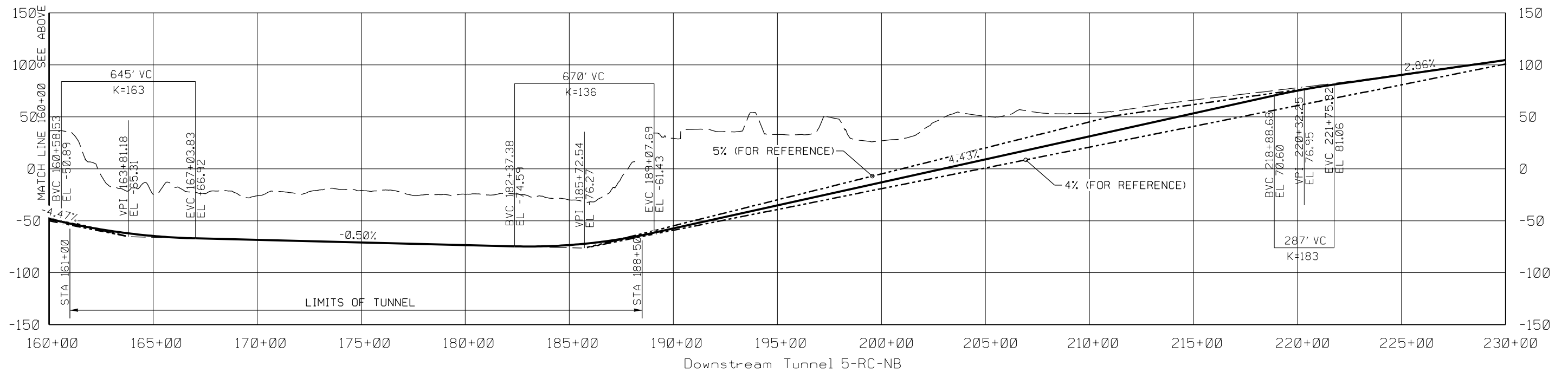
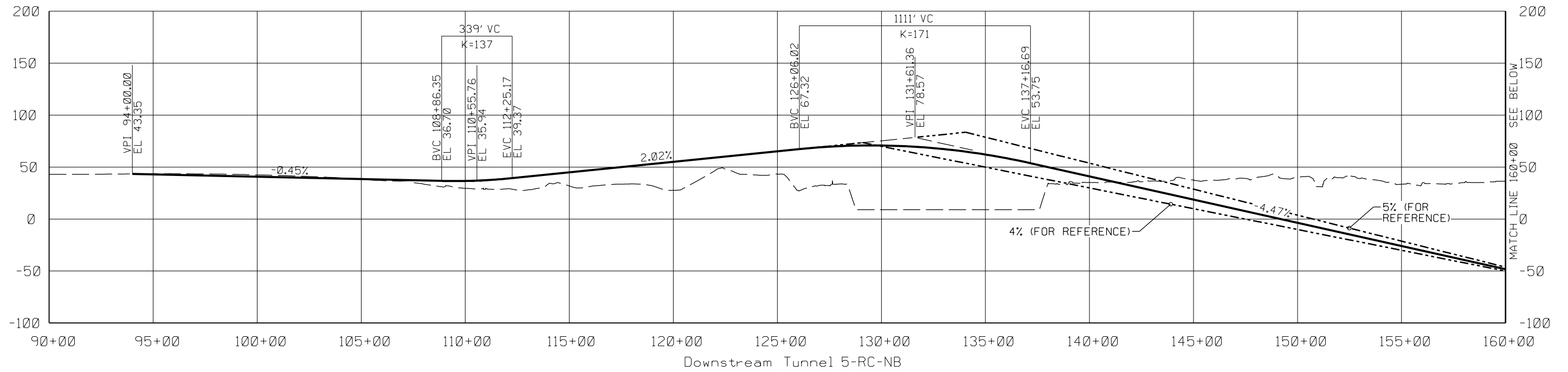
Location	Upstream Alignment	Downstream Alignment
Hayden Island (on land)	1,800,000 yd ³	2,200,000 yd ³
Columbia River (in water)	3,800,000 yd ³	4,000,000 yd ³
Vancouver (on land)	2,300,000 yd ³	2,700,000 yd ³
Total	7,900,000 yd³	8,900,000 yd³



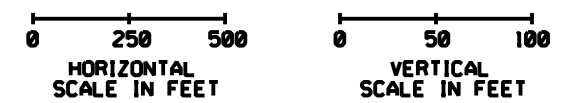
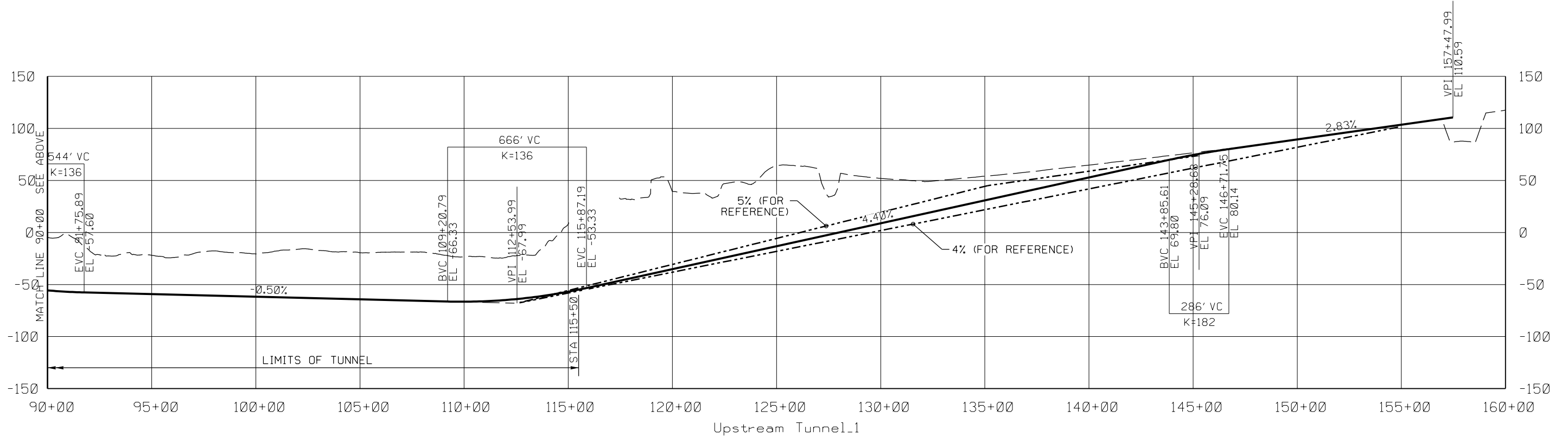
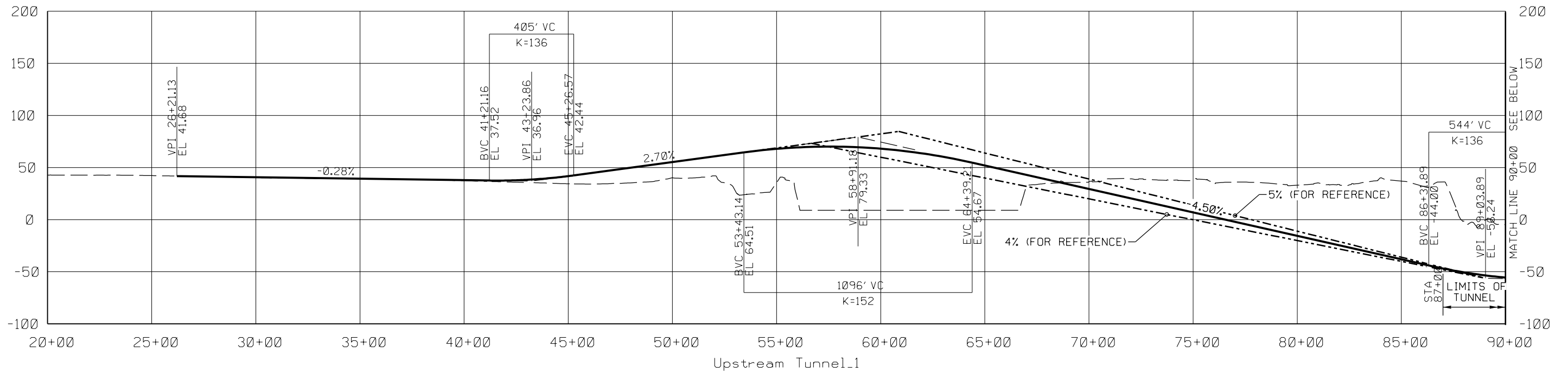
Tunnel Roadway Alignments
 Upstream and Downstream
 1 of 2



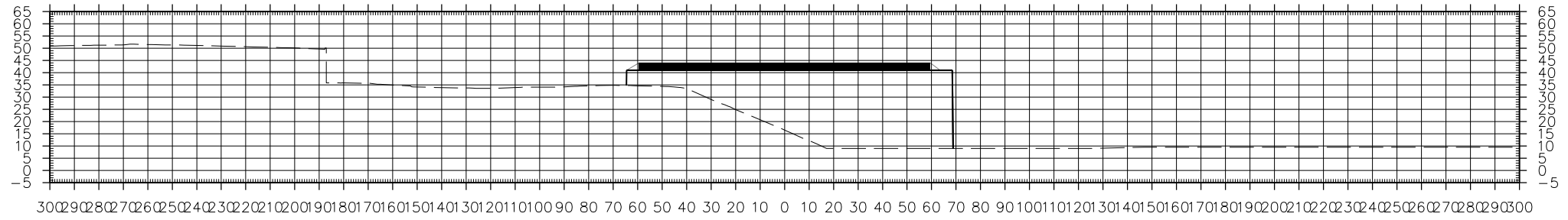
Tunnel Roadway Alignments
Upstream and Downstream
2 of 2



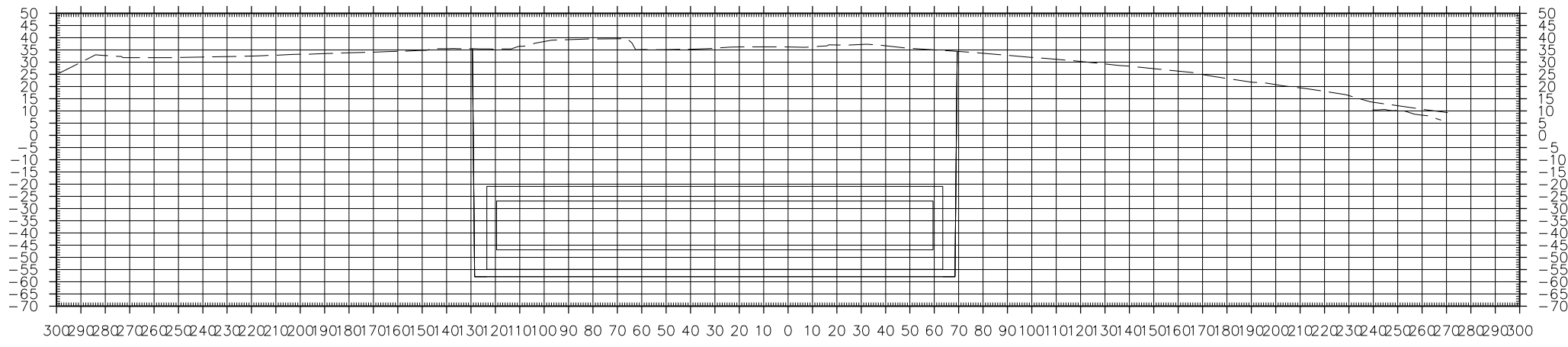
Tunnel Roadway Profile
Downstream Alignment



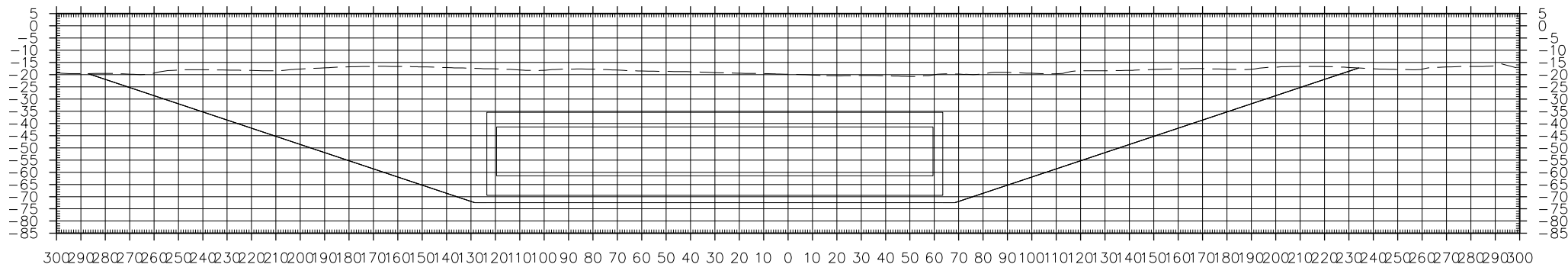
Tunnel Roadway Profile
Upstream Alignment



66+76



87+00



99+50

Tunnel Representative Cross Sections -
Upstream Alignment

ITT Earthwork Calculations

Upstream Earthwork

	Net Volume	Cut/Fill
Oregon	1,826,095	Cut
Riverbottom	3,766,733	Cut
Washington	2,305,642	Cut
Total	7,898,470	Cut
Rounded Total	7,900,000	Cut

Downstream Earthwork

	Net Volume	Cut/Fill
Oregon	2,251,605	Cut
Riverbottom	3,961,503	Cut
Washington	2,655,074	Cut
Total	8,868,182	Cut
Rounded Total	8,870,000	Cut

From InRoads Model

U:\Port\Projects\Clients\1585-WSP\274-1585-058 IBR Program\02WBS\Task 8 Design Engineering\ITT\CAD\InRoads

**Volumes extracted using InRoads Roadway Designer end area volumes (reports on subsequent tabs).

**See also the accompanying plan, profile, and representative sections (attached)

Some minor discrepancies occur between the InRoads section cut viewer and the exported report, which are caused by EG surface overlap (i.e. between Oregon EG and River surface) or at model template transitions. The numbers originally reported in the white paper were based on the section cut viewer, so revisions to the report were only made to align the two. The result of these changes were negligible to totals. Manual overrides are highlighted in blue where these discrepancies were noted. The downstream earthwork numbers do not report exactly the same upon re-run (7/28) but the difference is also negligible (<0.04% of total).

End Area Volume Report (Oregon)

Report Created: 7/31/2023
 Time: 1:57pm

Cross Section Set Name: Upstream Tunnel_1
 Alignment Name: Upstream Tunnel_1
 Input Grid Factor: 1

Note: All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	Station Quantities								Added Quantities								Mass Ordinate
	Cut				Fill				Cut				Fill				
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor	Volume	Adjusted			
66+75.00	1	0	0	0	1	2984.86	0	0	1	0	0	1	0	0	0		
67+00.00	1	0	0	0	1	1790.41	2210.77	2101.77	1	0	0	1	0	0	-2101.77 -2210.77		
67+50.00	1	0	0	0	1	496.58	2117.59	2117.59	1	0	0	1	0	0	-4219.36 -4328.36		
68+00.00	1	42.9	39.72	39.72	1	55.53	511.21	511.21	1	0	0	1	0	0	-4690.85 -4799.85		
68+50.00	1	350.9	364.63	364.63	1	0	51.42	51.42	1	0	0	1	0	0	-4377.64 -4486.64		
69+00.00	1	682.78	957.11	957.11	1	0	0	0	1	0	0	1	0	0	-3420.53 -3529.53		
69+50.00	1	1005.26	1563	1563	1	0	0	0	1	0	0	1	0	0	-1857.53 -1966.53		
70+00.00	1	1345.95	2177.05	2177.05	1	0	0	0	1	0	0	1	0	0	210.52		
70+50.00	1	1700.85	2821.11	2821.11	1	0	0	0	1	0	0	1	0	0	3140.64 3031.63		
71+00.00	1	2239.53	3648.5	3648.5	1	0	0	0	1	0	0	1	0	0	6789.14 6680.13		
71+50.00	1	2565.3	4448.92	4448.92	1	0	0	0	1	0	0	1	0	0	11238.06 11129.05		
72+00.00	1	2832.1	4997.59	4997.59	1	0	0	0	1	0	0	1	0	0	16235.65 16126.64		
72+50.00	1	9405.62	15799.28	11331.22	1	0	0	0	1	0	0	1	0	0	27566.87 31925.92		
73+00.00	1	15289.45	27333.87	22865.81	1	0	0	0	1	0	0	1	0	0	50432.68 59259.79		
73+50.00	1	16193.92	29151.27	29151.27	1	0	0	0	1	0	0	1	0	0	79583.96 88411.06		
74+00.00	1	17216.26	30935.36	30935.36	1	0	0	0	1	0	0	1	0	0	110519.3 119346.42		
74+50.00	1	18548.68	33115.69	33115.69	1	0	0	0	1	0	0	1	0	0	143635 152462.11		
75+00.00	1	20487.36	36144.48	36144.48	1	0	0	0	1	0	0	1	0	0	179779.5 188606.59		
75+50.00	1	21551.35	38924.73	38924.73	1	0	0	0	1	0	0	1	0	0	218704.2 227531.32		
76+00.00	1	21594.15	39949.53	39949.53	1	0	0	0	1	0	0	1	0	0	258653.7 267480.85		
76+50.00	1	22963.54	41257.12	41257.12	1	0	0	0	1	0	0	1	0	0	299910.9 308737.97		
77+00.00	1	24128.56	43603.8	43603.8	1	0	0	0	1	0	0	1	0	0	343514.7 352341.77		
77+50.00	1	25210.55	45684.36	45684.36	1	0	0	0	1	0	0	1	0	0	389199 398026.13		
78+00.00	1	26271.98	47669.01	47669.01	1	0	0	0	1	0	0	1	0	0	436868 445695.14		
78+50.00	1	27163.68	49477.46	49477.46	1	0	0	0	1	0	0	1	0	0	486345.5 495172.60		
79+00.00	1	27990.06	51068.28	51068.28	1	0	0	0	1	0	0	1	0	0	537413.8 546240.88		
79+50.00	1	28888.81	52665.62	52665.62	1	0	0	0	1	0	0	1	0	0	590079.4 598906.50		
80+00.00	1	30023.32	54548.27	54548.27	1	0	0	0	1	0	0	1	0	0	644627.7 653454.77		
80+50.00	1	31388.58	56862.87	56862.87	1	0	0	0	1	0	0	1	0	0	701490.5 710317.64		
81+00.00	1	32744.29	59382.29	59382.29	1	0	0	0	1	0	0	1	0	0	760872.8 769699.93		
81+50.00	1	33991.15	61792.07	61792.07	1	0	0	0	1	0	0	1	0	0	822664.9 831492.00		
82+00.00	1	34955.11	63839.13	63839.13	1	0	0	0	1	0	0	1	0	0	886504 895331.13		
82+50.00	1	36343.17	66016.92	66016.92	1	0	0	0	1	0	0	1	0	0	952521 961348.05		
83+00.00	1	38373.28	69181.9	69181.9	1	0	0	0	1	0	0	1	0	0	1021703 1030529.95		
83+50.00	1	40567.27	73093.1	73093.1	1	0	0	0	1	0	0	1	0	0	1094796 1103623.05		
84+00.00	1	43273.64	77630.47	77630.47	1	0	0	0	1	0	0	1	0	0	1172426 1181253.52		
84+50.00	1	43935.56	80749.26	80749.26	1	0	0	0	1	0	0	1	0	0	1253176 1262002.78		
85+00.00	1	44731.46	82099.1	82099.1	1	0	0	0	1	0	0	1	0	0	1335275 1344101.88		
85+50.00	1	45483.91	83532.76	83532.76	1	0	0	0	1	0	0	1	0	0	1418808 1427634.64		
86+00.00	1	46188.1	84881.49	84881.49	1	0	0	0	1	0	0	1	0	0	1503689 1512516.13		
86+50.00	1	47521.78	86768.41	86768.41	1	0	0	0	1	0	0	1	0	0	1590457 1599284.54		
87+00.00	1	50810.14	91048.07	91048.07	1	0	0	0	1	0	0	1	0	0	1681506 1690332.61		
87+50.00	1	47906.81	91404.58	91404.58	1	0	0	0	1	0	0	1	0	0	1772910 1781737.19		
88+00.00	1	0	44358.16	44358.16	1	0	0	0	1	0	0	1	0	0	1826095.35		

Grand Total: 1830986.3 1822050 4890.99 4781.99 0 0 0 0

End Area Volume Report (Riverbottom)

Report Created: 7/31/2023
 Time: 1:57pm

Cross Section Set Name: Upstream Tunnel_1
Alignment Name: Upstream Tunnel_1
Input Grid Factor: 1 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	Station Quantities								Added Quantities								Mass Ordinate
	----- Cut -----				----- Fill -----				----- Cut -----				----- Fill -----				
Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor	Volume	Adjusted	Factor	Volume	Adjusted	
87+00.00	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	
87+50.00	1	8685.43	8042.07	8042.07	1	0	0	0	1	0	0	0	1	0	0	0	
88+00.00	1	39580.99	44691.14	44691.14	1	97.88	90.63	90.63	1	0	0	0	1	0	0	0	
88+50.00	1	40817.79	74443.32	74443.32	1	0	90.63	90.63	1	0	0	0	1	0	0	0	
89+00.00	1	44147.43	78671.49	78671.49	1	0	0	0	1	0	0	0	1	0	0	0	
89+50.00	1	44065.89	81679	81679	1	0	0	0	1	0	0	0	1	0	0	0	
90+00.00	1	44482	81988.79	81988.79	1	0	0	0	1	0	0	0	1	0	0	0	
90+50.00	1	43811.83	81753.54	81753.54	1	0	0	0	1	0	0	0	1	0	0	0	
91+00.00	1	45058.35	82287.2	82287.2	1	0	0	0	1	0	0	0	1	0	0	0	
91+50.00	1	40104.31	78854.32	78854.32	1	0	0	0	1	0	0	0	1	0	0	0	
92+00.00	1	34982.59	69524.91	69524.91	1	0	0	0	1	0	0	0	1	0	0	0	
92+50.00	1	32822.96	62782.92	62782.92	1	0	0	0	1	0	0	0	1	0	0	0	
93+00.00	1	31649.49	59696.72	59696.72	1	0	0	0	1	0	0	0	1	0	0	0	
93+50.00	1	30785.97	57810.61	57810.61	1	0	0	0	1	0	0	0	1	0	0	0	
94+00.00	1	31834.32	57981.75	57981.75	1	0	0	0	1	0	0	0	1	0	0	0	
94+50.00	1	32873.93	59915.04	59915.04	1	0	0	0	1	0	0	0	1	0	0	0	
95+00.00	1	32109.48	60169.82	60169.82	1	0	0	0	1	0	0	0	1	0	0	0	
95+50.00	1	31580.93	58972.6	58972.6	1	0	0	0	1	0	0	0	1	0	0	0	
96+00.00	1	31621.26	58520.54	58520.54	1	0	0	0	1	0	0	0	1	0	0	0	
96+50.00	1	32879.47	59722.9	59722.9	1	0	0	0	1	0	0	0	1	0	0	0	
97+00.00	1	33756.92	61700.36	61700.36	1	0	0	0	1	0	0	0	1	0	0	0	
97+50.00	1	34716.94	63401.72	63401.72	1	0	0	0	1	0	0	0	1	0	0	0	
98+00.00	1	35379.5	64904.12	64904.12	1	0	0	0	1	0	0	0	1	0	0	0	
98+50.00	1	35589.39	65711.93	65711.93	1	0	0	0	1	0	0	0	1	0	0	0	
99+00.00	1	35977.3	66265.45	66265.45	1	0	0	0	1	0	0	0	1	0	0	0	
99+50.00	1	36364.11	66982.79	66982.79	1	0	0	0	1	0	0	0	1	0	0	0	
100+00.00	1	36553.97	67516.75	67516.75	1	0	0	0	1	0	0	0	1	0	0	0	
100+50.00	1	37016.4	68120.72	68120.72	1	0	0	0	1	0	0	0	1	0	0	0	
101+00.00	1	37701.23	69182.99	69182.99	1	0	0	0	1	0	0	0	1	0	0	0	
101+50.00	1	38235.74	70312.01	70312.01	1	0	0	0	1	0	0	0	1	0	0	0	
102+00.00	1	38778.34	71309.34	71309.34	1	0	0	0	1	0	0	0	1	0	0	0	
102+50.00	1	38871.27	71897.79	71897.79	1	0	0	0	1	0	0	0	1	0	0	0	
103+00.00	1	38724.53	71847.97	71847.97	1	0	0	0	1	0	0	0	1	0	0	0	
103+50.00	1	38753.82	71739.21	71739.21	1	0	0	0	1	0	0	0	1	0	0	0	
104+00.00	1	38657.83	71677.45	71677.45	1	0	0	0	1	0	0	0	1	0	0	0	
104+50.00	1	38693.57	71621.67	71621.67	1	0	0	0	1	0	0	0	1	0	0	0	
105+00.00	1	38884.28	71831.34	71831.34	1	0	0	0	1	0	0	0	1	0	0	0	
105+50.00	1	38989.19	72105.06	72105.06	1	0	0	0	1	0	0	0	1	0	0	0	
106+00.00	1	39221.86	72417.63	72417.63	1	0	0	0	1	0	0	0	1	0	0	0	
106+50.00	1	39455.72	72849.61	72849.61	1	0	0	0	1	0	0	0	1	0	0	0	
107+00.00	1	39581.59	73182.69	73182.69	1	0	0	0	1	0	0	0	1	0	0	0	
107+50.00	1	39566.18	73284.97	73284.97	1	0	0	0	1	0	0	0	1	0	0	0	
108+00.00	1	39154.6	72889.61	72889.61	1	0	0	0	1	0	0	0	1	0	0	0	
108+50.00	1	38620.31	72013.81	72013.81	1	0	0	0	1	0	0	0	1	0	0	0	
109+00.00	1	37966.46	70913.68	70913.68	1	0	0	0	1	0	0	0	1	0	0	0	
109+50.00	1	37261.15	69655.19	69655.19	1	0	0	0	1	0	0	0	1	0	0	0	
110+00.00	1	34033.36	66013.44	66013.44	1	0	0	0	1	0	0	0	1	0	0	0	
110+50.00	1	33967.25	62963.53	62963.53	1	0	0	0	1	0	0	0	1	0	0	0	
111+00.00	1	33401.32	62378.3	62378.3	1	0	0	0	1	0	0	0	1	0	0	0	
111+50.00	1	32820.55	61316.54	61316.54	1	0	0	0	1	0	0	0	1	0	0	0	
112+00.00	1	32643.14	60614.53	60614.53	1	0	0	0	1	0	0	0	1	0	0	0	
112+50.00	1	32562.27	60375.38	60375.38	1	0	0	0	1	0	0	0	1	0	0	0	
113+00.00	1	32335.92	60090.92	60090.92	1	0	0	0	1	0	0	0	1	0	0	0	
113+50.00	1	32085.89	59649.82	59649.82	1	0	0	0	1	0	0	0	1	0	0	0	
114+00.00	1	38306.73	65178.35	65178.35	1	0	0	0	1	0	0	0	1	0	0	0	
114+50.00	1	42642.69	74953.17	74953.17	1	0	0	0	1	0	0	0	1	0	0	0	
115+00.00	1	32967.95	70009.85	70009.85	1	0	0	0	1	0	0	0	1	0	0	0	
115+50.00	1	0	30525.88	30525.88	1	0	0	0	1	0	0	0	1	0	0	0	

Grand Total: 3766914.3 3766914 181.26 181.26 0 0 0 0

End Area Volume Report (Washington)

Report Created: 7/31/2023
Time: 1:58pm

Cross Section Set Name: Upstream Tunnel_1
Alignment Name: Upstream Tunnel_1
Input Grid Factor: 1 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	----- Station Quantities -----									----- Added Quantities -----									Mass Ordinate
	----- Cut -----			----- Fill -----			----- Cut -----			----- Fill -----									
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor		Volume	Adjusted				
116+00.00	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0		
116+50.00	1	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0		
117+00.00	1	42.05	38.93	38.93	1	0	0	0	1	0	0	0	1	0	0	38.93	38.93		
117+50.00	1	46520.81	43113.76	43113.76	1	0	0	0	1	0	0	0	1	0	0	43152.69	43152.69		
118+00.00	1	45362.3	85076.96	85076.96	1	0	0	0	1	0	0	0	1	0	0	128229.7	128229.7		
118+50.00	1	44641.49	83336.85	83336.85	1	0	0	0	1	0	0	0	1	0	0	211566.5	211566.5		
119+00.00	1	49825.37	87469.32	87469.32	1	0	0	0	1	0	0	0	1	0	0	299035.8	299035.8		
119+50.00	1	53614.53	95777.68	95777.68	1	0	0	0	1	0	0	0	1	0	0	394813.5	394813.5		
120+00.00	1	45814.35	92063.78	92063.78	1	0	0	0	1	0	0	0	1	0	0	486877.3	486877.3		
120+50.00	1	42594.69	81860.22	81860.22	1	0	0	0	1	0	0	0	1	0	0	568737.5	568737.5		
121+00.00	1	40929.98	77337.66	77337.66	1	0	0	0	1	0	0	0	1	0	0	646075.2	646075.2		
121+50.00	1	39563.42	74530.93	74530.93	1	0	0	0	1	0	0	0	1	0	0	720606.1	720606.1		
122+00.00	1	35515.9	69517.88	69517.88	1	0	0	0	1	0	0	0	1	0	0	790124	790124		
122+50.00	1	41427.6	71243.97	71243.97	1	0	0	0	1	0	0	0	1	0	0	861368	861367.9		
123+00.00	1	42356.63	77577.99	77577.99	1	0	0	0	1	0	0	0	1	0	0	938945.9	938945.9		
123+50.00	1	41404.91	77556.98	77556.98	1	0	0	0	1	0	0	0	1	0	0	1016503	1016503		
124+00.00	1	41218.22	76502.9	76502.9	1	0	0	0	1	0	0	0	1	0	0	1093006	1093006		
124+50.00	1	43335.74	78290.7	78290.7	1	0	0	0	1	0	0	0	1	0	0	1171297	1171297		
125+00.00	1	43774.61	80657.74	80657.74	1	0	0	0	1	0	0	0	1	0	0	1251954	1251954		
125+50.00	1	42899.25	80253.57	80253.57	1	0	0	0	1	0	0	0	1	0	0	1332208	1332208		
126+00.00	1	40941.94	77630.72	77630.72	1	0	0	0	1	0	0	0	1	0	0	1409839	1409839		
126+50.00	1	37967.97	73064.73	73064.73	1	0	0	0	1	0	0	0	1	0	0	1482903	1482903		
127+00.00	1	31692.41	64500.35	64500.35	1	0	0	0	1	0	0	0	1	0	0	1547404	1547404		
127+50.00	1	23851.75	51429.78	51429.78	1	0	0	0	1	0	0	0	1	0	0	1598833	1598833		
128+00.00	1	26996.22	47081.46	47081.46	1	0	0	0	1	0	0	0	1	0	0	1645915	1645915		
128+50.00	1	28266.1	51168.82	51168.82	1	0	0	0	1	0	0	0	1	0	0	1697084	1697084		
129+00.00	1	26565.13	50769.66	50769.66	1	0	0	0	1	0	0	0	1	0	0	1747853	1747853		
129+50.00	1	24976.06	47723.33	47723.33	1	0	0	0	1	0	0	0	1	0	0	1795577	1795577		
130+00.00	1	23527.49	44910.7	44910.7	1	0	0	0	1	0	0	0	1	0	0	1840487	1840487		
130+50.00	1	22241.2	42378.42	42378.42	1	0	0	0	1	0	0	0	1	0	0	1882866	1882866		
131+00.00	1	21058.4	40092.22	40092.22	1	0	0	0	1	0	0	0	1	0	0	1922958	1922958		
131+50.00	1	20064.32	38076.59	38076.59	1	0	0	0	1	0	0	0	1	0	0	1961035	1961035		
132+00.00	1	19199.06	36354.99	36354.99	1	0	0	0	1	0	0	0	1	0	0	1997390	1997390		
132+50.00	1	18379.47	34794.94	34794.94	1	0	0	0	1	0	0	0	1	0	0	2032185	2032185		
133+00.00	1	17748.04	33451.4	33451.4	1	0	0	0	1	0	0	0	1	0	0	2065636	2065636		
133+50.00	1	17193.36	32353.15	32353.15	1	0	0	0	1	0	0	0	1	0	0	2097989	2097989		
134+00.00	1	16646.67	31333.37	31333.37	1	0	0	0	1	0	0	0	1	0	0	2129322	2129322		
134+50.00	1	16025.17	30251.7	30251.7	1	0	0	0	1	0	0	0	1	0	0	2159574	2159574		
135+00.00	1	15372.62	29072.02	29072.02	1	0	0	0	1	0	0	0	1	0	0	2188646	2188646		
135+50.00	1	14589.23	27742.45	27742.45	1	0	0	0	1	0	0	0	1	0	0	2211812	2216389		
136+00.00	1	13814.21	26299.49	26299.49	1	0	0	0	1	0	0	0	1	0	0	2229195	2242688		
136+10.00	1	3166.66	3144.61	3144.61	1	0	0	0	1	0	0	0	1	0	0	2245833	2245833		
136+50.00	1	3032.2	4591.75	4591.75	1	0	0	0	1	0	0	0	1	0	0	2240454	2250424		
137+00.00	1	2875.75	5470.32	5470.32	1	0	0	0	1	0	0	0	1	0	0	2245925	2255895		
137+50.00	1	2718.09	5179.48	5179.48	1	0	0	0	1	0	0	0	1	0	0	2251104	2261074		
138+00.00	1	2571.37	4897.64	4897.64	1	0	0	0	1	0	0	0	1	0	0	2256002	2265972		
138+50.00	1	2422.35	4623.81	4623.81	1	0	0	0	1	0	0	0	1	0	0	2260626	2270596		
139+00.00	1	2268.78	4343.63	4343.63	1	0	0	0	1	0	0	0	1	0	0	2264969	2274939		
139+50.00	1	2108.21	4052.76	4052.76	1	0	0	0	1	0	0	0	1	0	0	2269022	2278992		
140+00.00	1	1947.3	3755.1	3755.1	1	0	0	0	1	0	0	0	1	0	0	2272777	2282747		
140+50.00	1	1788.78	3459.33	3459.33	1	0	0	0	1	0	0	0	1	0	0	2276236	2286207		
141+00.00	1	1628.85	3164.47	3164.47	1	0	0	0	1	0	0	0	1	0	0	2279401	2289371		
141+50.00	1	1482.56	2880.94	2880.94	1	0	0	0	1	0	0	0	1	0	0	2282282	2292252		
142+00.00	1	1344.44	2617.6	2617.6	1	0	0	0	1	0	0	0	1	0	0	2284899	2294870		
142+50.00	1	1210.7	2365.87	2365.87	1	0	0	0	1	0	0	0	1	0	0	2287265	2297235		
143+00.00	1	1076.69	2117.95	2117.95	1	0	0	0	1	0	0	0	1	0	0	2289383	2299353		
143+50.00	1	941.8	1868.97	1868.97	1	0	0	0	1	0	0	0	1	0	0	2291252	2301222		
144+00.00	1	809.96	1622	1622	1	0	0	0	1	0	0	0	1	0	0	2292874	2302844		
144+40.00	1	716.86	1130.98	1130.98	1	0	0	0	1	0	0	0	1	0	0	2294005	2303975		
144+50.00	1	693.66	261.21	261.21	1	0	0	0	1	0	0	0	1	0	0		2304237		
145+00.00	1	592.4	1190.8	1190.8	1	0	0	0	1	0	0	0	1	0	0		2305427		
145+10.00	1	574.48	216.09	216.09	1	0	0	0	1	0	0	0	1	0	0		2305643		

Grand Total: 2305643.4 2303975 0 0 0 0 0 0 0 0

End Area Volume Report (Oregon)

Report Created: 7/31/2023
Time: 2:29pm

Cross Section Set: Downstream Tunnel 5-RC-NB

Alignment Name: Downstream Tunnel 5-RC-NB

Input Grid Factor: 1 Note: All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	----- Station Quantities -----						----- Added Quantities -----						Mass Ordinate			
	----- Cut -----			----- Fill -----			----- Cut -----			----- Fill -----						
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor		Volume	Adjusted	
138+00.00	1	0	0	0	1	2375.09	0	0	1	0	0	1	0	0	0	0
138+50.00	1	0	0	0	1	1546.21	3630.82	3630.82	1	0	0	1	0	0	0	-3630.82
139+00.00	1	0	0	0	1	1055.66	2409.14	2409.14	1	0	0	1	0	0	0	-6039.96
139+50.00	1	0	0	0	1	731.85	1655.1	1655.1	1	0	0	1	0	0	0	-7695.06
140+00.00	1	0	0	0	1	410.83	1058.04	1058.04	1	0	0	1	0	0	0	-8753.10
140+50.00	1	0	0	0	1	127.86	498.78	498.78	1	0	0	1	0	0	0	-9251.88
141+00.00	1	228.43	211.51	211.51	1	0	118.39	118.39	1	0	0	1	0	0	0	-9158.76
141+50.00	1	632.03	796.73	796.73	1	0	0	0	1	0	0	1	0	0	0	-8362.03
142+00.00	1	947.76	1462.77	1462.77	1	0	0	0	1	0	0	1	0	0	0	-6899.26
142+50.00	1	1273.9	2057.09	2057.09	1	0	0	0	1	0	0	1	0	0	0	-4842.17
143+00.00	1	1621.31	2680.75	2680.75	1	0	0	0	1	0	0	1	0	0	0	-2161.42
143+50.00	1	1916.58	3275.83	3275.83	1	0	0	0	1	0	0	1	0	0	0	1114.4
144+00.00	1	2366.63	3965.93	3965.93	1	0	0	0	1	0	0	1	0	0	0	5080.34
144+50.00	1	2819.44	4801.91	4801.91	1	0	0	0	1	0	0	1	0	0	0	9882.25
145+00.00	1	2969.61	5360.23	5360.23	1	0	0	0	1	0	0	1	0	0	0	15242.47
145+50.00	1	13953.29	15669.35	15669.35	1	0	0	0	1	0	0	1	0	0	0	26530.49
146+00.00	1	15248.7	27038.87	27038.87	1	0	0	0	1	0	0	1	0	0	0	49188.04
146+50.00	1	17015.33	29874.1	29874.1	1	0	0	0	1	0	0	1	0	0	0	79062.14
147+00.00	1	18337.05	32733.69	32733.69	1	0	0	0	1	0	0	1	0	0	0	111795.8
147+50.00	1	19765.65	35280.28	35280.28	1	0	0	0	1	0	0	1	0	0	0	147076.1
148+00.00	1	21378.84	38096.75	38096.75	1	0	0	0	1	0	0	1	0	0	0	185172.9
148+50.00	1	23578.02	41626.73	41626.73	1	0	0	0	1	0	0	1	0	0	0	226799.6
149+00.00	1	24611.74	44620.15	44620.15	1	0	0	0	1	0	0	1	0	0	0	271419.7
149+50.00	1	25027.8	45962.54	45962.54	1	0	0	0	1	0	0	1	0	0	0	317382.3
150+00.00	1	26375.12	47595.31	47595.31	1	0	0	0	1	0	0	1	0	0	0	364977.6
150+50.00	1	27803.11	50165.03	50165.03	1	0	0	0	1	0	0	1	0	0	0	415142.6
151+00.00	1	27520.76	51225.8	51225.8	1	0	0	0	1	0	0	1	0	0	0	466368.4
151+50.00	1	30460.61	53686.46	53686.46	1	0	0	0	1	0	0	1	0	0	0	520054.9
152+00.00	1	32205.4	58024.09	58024.09	1	0	0	0	1	0	0	1	0	0	0	578079
152+50.00	1	33751.91	61071.59	61071.59	1	0	0	0	1	0	0	1	0	0	0	639150.5
153+00.00	1	34341.08	63049.07	63049.07	1	0	0	0	1	0	0	1	0	0	0	702199.6
153+50.00	1	34922.99	64133.4	64133.4	1	0	0	0	1	0	0	1	0	0	0	766333
154+00.00	1	35148.88	64881.37	64881.37	1	0	0	0	1	0	0	1	0	0	0	831214.4
154+50.00	1	35396.02	65319.36	65319.36	1	0	0	0	1	0	0	1	0	0	0	896533.7
155+00.00	1	36290.38	66376.3	66376.3	1	0	0	0	1	0	0	1	0	0	0	962910
155+50.00	1	37268.59	68110.16	68110.16	1	0	0	0	1	0	0	1	0	0	0	1031020
156+00.00	1	38721.48	70361.18	70361.18	1	0	0	0	1	0	0	1	0	0	0	1101381
156+50.00	1	40190.61	73066.75	73066.75	1	0	0	0	1	0	0	1	0	0	0	1174448
157+00.00	1	41352.24	75502.64	75502.64	1	0	0	0	1	0	0	1	0	0	0	1249951
157+50.00	1	42906.53	78017.38	78017.38	1	0	0	0	1	0	0	1	0	0	0	1327968
158+00.00	1	44701.25	81118.32	81118.32	1	0	0	0	1	0	0	1	0	0	0	1409086
158+50.00	1	46010.83	83992.67	83992.67	1	0	0	0	1	0	0	1	0	0	0	1493079
159+00.00	1	47233.83	86337.65	86337.65	1	0	0	0	1	0	0	1	0	0	0	1579417
159+50.00	1	48844.57	88961.48	88961.48	1	0	0	0	1	0	0	1	0	0	0	1668378
160+00.00	1	50629.95	92106.04	92106.04	1	0	0	0	1	0	0	1	0	0	0	1760484
160+50.00	1	51727.62	94775.53	94775.53	1	0	0	0	1	0	0	1	0	0	0	1855260
161+00.00	1	80962.36	122861.09	122861.1	1	0	0	0	1	0	0	1	0	0	0	1978121
161+50.00	1	69310.3	139141.35	139141.4	1	0	0	0	1	0	0	1	0	0	0	2117262
162+00.00	1	23665.94	86089.11	86089.11	1	0	0	0	1	0	0	1	0	0	0	2203351
162+50.00	1	8202.12	29507.46	29507.46	1	0	0	0	1	0	0	1	0	0	0	2232859
163+00.00	1	276.27	7850.36	7850.36	1	0	0	0	1	0	0	1	0	0	0	2240709
163+50.00	1	0	255.8	255.8	1	0	0	0	1	0	0	1	0	0	0	2240965
Grand Total:			2259098	2259098			9370.27	9370.27		0	0		0	0		

End Area Volume Report (Washington)

Report Created: 7/31/2023
Time: 2:31pm

Cross Sec Downstream Tunnel 5-RC-NB
Alignment Downstream Tunnel 5-RC-NB

Input Grid F 1 **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Baseline Station	----- Station Quantities -----								----- Added Quantities -----								Mass Ordinate
	----- Cut -----				----- Fill -----				----- Cut -----				----- Fill -----				
	Factor	Area	Volume	Adjusted	Factor	Area	Volume	Adjusted	Factor	Volume	Adjusted	Factor	Volume	Adjusted			
188+50.00	1	7073.72	6549.74	6549.74	1	0	0	0	1	0	0	1	0	0	0	6549.74	6549.74
189+00.00	1	17875.65	23101.26	23101.26	1	0	0	0	1	0	0	1	0	0	0	29651	29651.00
189+50.00	1	27026.77	41576.32	41576.32	1	0	0	0	1	0	0	1	0	0	0	71227.32	71227.32
190+00.00	1	39182.71	61305.07	61305.07	1	0	0	0	1	0	0	1	0	0	0	132532.4	132532.39
190+50.00	1	52831.85	85198.67	85198.67	1	0	0	0	1	0	0	1	0	0	0	217731.1	217731.06
191+00.00	1	52375.65	97414.36	97414.36	1	0	0	0	1	0	0	1	0	0	0	315145.4	315145.42
191+50.00	1	51567.42	96243.59	96243.59	1	0	0	0	1	0	0	1	0	0	0	411389	411389.01
192+00.00	1	49990.44	94035.06	94035.06	1	0	0	0	1	0	0	1	0	0	0	505424.1	505424.07
192+50.00	1	48664.04	91346.74	91346.74	1	0	0	0	1	0	0	1	0	0	0	596770.8	596770.81
193+00.00	1	47203.32	88766.07	88766.07	1	0	0	0	1	0	0	1	0	0	0	685536.9	685536.88
193+50.00	1	52972.32	92755.22	92755.22	1	0	0	0	1	0	0	1	0	0	0	778292.1	778292.10
194+00.00	1	51678.03	96898.47	96898.47	1	0	0	0	1	0	0	1	0	0	0	875190.6	875190.57
194+50.00	1	42791.92	87472.18	87472.18	1	0	0	0	1	0	0	1	0	0	0	962662.7	962662.75
195+00.00	1	41383.49	77940.2	77940.2	1	0	0	0	1	0	0	1	0	0	0	1040603	1040602.95
195+50.00	1	40121.73	75467.8	75467.8	1	0	0	0	1	0	0	1	0	0	0	1116071	1116070.75
196+00.00	1	38764.58	73042.87	73042.87	1	0	0	0	1	0	0	1	0	0	0	1189114	1189113.62
196+50.00	1	37520.49	70634.32	70634.32	1	0	0	0	1	0	0	1	0	0	0	1259748	1259747.94
197+00.00	1	39675.22	71477.51	71477.51	1	0	0	0	1	0	0	1	0	0	0	1331225	1331225.45
197+50.00	1	43170.65	76709.14	76709.14	1	0	0	0	1	0	0	1	0	0	0	1407935	1407934.59
198+00.00	1	39996.16	77006.31	77006.31	1	0	0	0	1	0	0	1	0	0	0	1484941	1484940.90
198+50.00	1	30745.53	65501.57	65501.57	1	0	0	0	1	0	0	1	0	0	0	1550442	1550442.47
199+00.00	1	28181.14	54561.74	54561.74	1	0	0	0	1	0	0	1	0	0	0	1605004	1605004.21
199+50.00	1	26533.78	50661.96	50661.96	1	0	0	0	1	0	0	1	0	0	0	1655666	1655666.17
200+00.00	1	25534.77	48211.62	48211.62	1	0	0	0	1	0	0	1	0	0	0	1703878	1703877.79
200+50.00	1	24628.81	46447.77	46447.77	1	0	0	0	1	0	0	1	0	0	0	1750326	1750325.56
201+00.00	1	23906.58	44940.18	44940.18	1	0	0	0	1	0	0	1	0	0	0	1795266	1795265.74
201+50.00	1	23976.7	44336.37	44336.37	1	0	0	0	1	0	0	1	0	0	0	1839602	1839602.11
202+00.00	1	25614.95	45918.19	45918.19	1	0	0	0	1	0	0	1	0	0	0	1885520	1885520.30
202+50.00	1	28325.3	49944.67	49944.67	1	0	0	0	1	0	0	1	0	0	0	1935465	1935464.97
203+00.00	1	29238.8	53300.09	53300.09	1	0	0	0	1	0	0	1	0	0	0	1988765	1988765.06
203+50.00	1	28253.88	53233.97	53233.97	1	0	0	0	1	0	0	1	0	0	0	2041999	2041999.03
204+00.00	1	27154.36	51303.92	51303.92	1	0	0	0	1	0	0	1	0	0	0	2093303	2093302.95
204+50.00	1	26611.64	49783.33	49783.33	1	0	0	0	1	0	0	1	0	0	0	2143086	2143086.28
205+00.00	1	25843.86	48569.91	48569.91	1	0	0	0	1	0	0	1	0	0	0	2191656	2191656.19
205+50.00	1	24628.37	46733.55	46733.55	1	0	0	0	1	0	0	1	0	0	0	2238390	2238389.74
206+00.00	1	23159.95	44248.44	44248.44	1	0	0	0	1	0	0	1	0	0	0	2282638	2282638.18
206+50.00	1	21653.36	41493.8	41493.8	1	0	0	0	1	0	0	1	0	0	0	2324132	2324131.98
207+00.00	1	21048.94	39539.17	39539.17	1	0	0	0	1	0	0	1	0	0	0	2363671	2363671.15
207+50.00	1	19701.24	37731.66	37731.66	1	0	0	0	1	0	0	1	0	0	0	2401403	2401402.81
208+00.00	1	18769.81	35621.34	35621.34	1	0	0	0	1	0	0	1	0	0	0	2437024	2437024.15
208+50.00	1	18148.69	34183.79	34183.79	1	0	0	0	1	0	0	1	0	0	0	2471208	2471207.94
209+00.00	1	17439.04	32951.6	32951.6	1	0	0	0	1	0	0	1	0	0	0	2504160	2504159.54
209+50.00	1	16842.39	31742.06	31742.06	1	0	0	0	1	0	0	1	0	0	0	2535902	2535901.60
210+00.00	1	16212.49	30606.36	30606.36	1	0	0	0	1	0	0	1	0	0	0	2561433	2566507.96
210+50.00	1	3198.8	17973.42	17973.42	1	0	0	0	1	0	0	1	0	0	0	2574332	2584481.38
211+00.00	1	3027.64	5765.22	5765.22	1	0	0	0	1	0	0	1	0	0	0	2580098	2590246.60
211+50.00	1	2884.1	5473.83	5473.83	1	0	0	0	1	0	0	1	0	0	0	2585571	2595720.43
212+00.00	1	2764.28	5229.98	5229.98	1	0	0	0	1	0	0	1	0	0	0	2590801	2600950.41
212+50.00	1	2671.88	5033.47	5033.47	1	0	0	0	1	0	0	1	0	0	0	2595835	2605983.88
213+00.00	1	2583.37	4865.97	4865.97	1	0	0	0	1	0	0	1	0	0	0	2600701	2610849.85
213+50.00	1	2468.7	4677.84	4677.84	1	0	0	0	1	0	0	1	0	0	0	2605379	2615527.69
214+00.00	1	2328.41	4441.76	4441.76	1	0	0	0	1	0	0	1	0	0	0	2609820	2619969.45
214+50.00	1	2181.37	4175.72	4175.72	1	0	0	0	1	0	0	1	0	0	0	2613996	2624145.17
215+00.00	1	2031.77	3901.06	3901.06	1	0	0	0	1	0	0	1	0	0	0	2617897	2628046.23
215+50.00	1	1876.05	3618.35	3618.35	1	0	0	0	1	0	0	1	0	0	0	2621516	2631664.58
216+00.00	1	1733.24	3341.94	3341.94	1	0	0	0	1	0	0	1	0	0	0	2624858	2635006.52
216+50.00	1	1591.23	3078.21	3078.21	1	0	0	0	1	0	0	1	0	0	0	2627936	2638084.73
217+00.00	1	1457.95	2823.31	2823.31	1	0	0	0	1	0	0	1	0	0	0	2630759	2640908.04
217+50.00	1	1321.44	2573.51	2573.51	1	0	0	0	1	0	0	1	0	0	0	2633333	2643481.55
218+00.00	1	1185.94	2321.64	2321.64	1	0	0	0	1	0	0	1	0	0	0	2635654	2645803.19
218+50.00	1	1051.04	2071.27	2071.27	1	0	0	0	1	0	0	1	0	0	0	2637725	2647874.46
219+00.00	1	917.49	1822.71	1822.71	1	0	0	0	1	0	0	1	0	0	0	2639548	2649697.17
219+50.00	1	795.31	1585.93	1585.93	1	0	0	0	1	0	0	1	0	0	0	2641134	2651283.10
220+00.00	1	696.61	1381.4	1381.4	1	0	0	0	1	0	0	1	0	0	0	2642516	2652664.50
220+50.00	1	610.82	1210.58	1210.58	1	0	0	0	1	0	0	1	0	0	0	2643726	2653875.08
221+00.00	1	545.78	1070.93	1070.93	1	0	0	0	1	0	0	1	0	0	0	2644797	2654946.01
221+10.00	1	534.87	200.12	200.12	1	0	0	0	1	0	0	1	0	0	0	2655146.13	2655146.13

Grand Total: **2655146.1** **2655146**