APPENDIX G

OREGON LNG SOILS, WETLANDS, AND WATERBODY INFORMATION

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APPENDIX G1

WETLANDS AND WATERBODIES CROSSED BY THE OREGON LNG PIPELINE

Table G1-1

Wetlands Impacted by Terminal and Associated Facilities

Facility Type	Wetland ID	Cowardin Classification [a]	HGM [b]	Offsite Mapping [c]	Permanent Wetland Impact [d] (acres)	Temporary Wetland Impact [e] (acres)	Total Construction Disturbance (acres)
Terminal	W4BCL01	PSS	Depressional	N	2.962	0.129	3.091
	W4BCL02	PSS	Depressional	N	0.076	0.000	0.076
	W4BCL03	PSS	Depressional	N	0.135	0.000	0.135
	W4BCL04	PSS	Depressional	N	0.313	0.000	0.313
	W4BCL05	E2EM	Estuarine Fringe	N	26.748	0.827	27.575
	W4BCL06	E2EM	Estuarine Fringe	N	0.012	0.006	0.018
	W4BCL07	E2EM	Estuarine Fringe	N	0.489	0.121	0.610
	W4BCL08	E2EM	Estuarine Fringe	N	0.293	0.017	0.310
	W4BCL09	E2EM	Depressional	N	0.028	0.000	0.028
	W4BCL11	E2EM	Estuarine Fringe	N	0.015	0.035	0.050
	W4BCL12	E2EM	Estuarine Fringe	N	0.023	0.000	0.023
	W5BCL016	E2EM	Estuarine Fringe	N	0.461	0.307	0.768
	W5BCL020	PEM	Depressional	N	0.178	0.000	0.178
	W5BCL048	PEM	Depressional	N	0.330	0.001	0.331
	W5BCL049A	PSS	Depressional	N	0.694	0.008	0.702
	W5BCL059	PEM	Estuarine Fringe	N	0.010	0.012	0.022
				Terminal Subtotal	32.767	1.463	34.230
Access Road	W5BCL020	PEM	Depressional	N	0.012	0.042	0.054
	W5BCL021	PEM	Depressional	N	0.397	0.199	0.596
	W5BCL023	PEM	Depressional	N	0.507	0.382	0.889
	W5BCL084	PFO	Depressional	N	0.001	0.000	0.001
	W5BCL085	PFO	Depressional	N	0.160	0.000	0.160
	W5BCL086	PSS	Depressional	N	0.028	0.013	0.041
				Access Road Subtotal	1.105	0.636	1.741
Terminal Total					**33.872**	**2.099**	**35.971**
Nonjursidictional Facilities							
Effluent & Potable Water Lines	W5BCL019	PEM	Depressional	N	0.000	0.299	0.299
	W5BCL023	PEM	Depressional	N	0.000	0.033	0.033
Potable Water Line	W99CL0002	PFO/SS	TBD	Y	0.040	0.000	0.040
	W99CL0003	PEM/SS	TBD	Y	0.000	0.029	0.029
	W99CL0004	PSS	TBD	Y	0.000	0.014	0.014
	W99CL0005	PEM	TBD	Y	0.000	0.187	0.187
	W99CL0007	PFO	TBD	Y	0.002	0.000	0.002
				Effluent and Potable Water Line Subtotal	**0.042**	**0.23**	**0.272**
HDD Drill Area	W99CL0005	PEM	TBD	Y	0.000	0.013	0.013
	W99CL0006	PFO	TBD	Y	0.104	0.000	0.104
	W99CL0007	PFO	TBD	Y	0.892	0.000	0.892
	W99CL0008	PEM	TBD	Y	0.000	0.026	0.026
HDD Pullback	W5BCL019	PEM	Depressional	N	0.000	0.049	0.049
	W5BCL020	PEM	Depressional	N	0.000	0.296	0.296
	W5BCL021	PEM	Depressional	N	0.000	0.037	0.037
	W5BCL023	PEM	Depressional	N	0.000	0.079	0.079
				HDD Drill Area and Pullback Subtotal	0.996	0.500	1.496
Nonjursidictional Facilities Total					**1.038**	**0.730**	**1.768**

[a] Cowardin Classification System: PEM = palustrine emergent; PSS = palustrine scrub-shrub; PFO = palustrine forested, E2EM=estuarine emergent.

[b] Wetland classes based on Hydrogeomorphic Assessment Guidebook for Tidal Wetlands of the Oregon Coast, TBD = to be determined due to lack of site access.

[c] Y = Oregon LNG surveyed wetland, N = no site access – proxy data used.

[e] Permanent impacts on wetlands requiring long term restoration including the functional conversion of forested wetlands to scrub-shrub wetlands, or conversation of scru shrub wetlands to emergent wetlands.

[f] Temporary impacts on wetlands that are expected to recover to preconstruction conditions.

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
Lower Columbia HUC 4 Subbasin - Clatsop County, Oregon												
0.1	W5BCL050	PSS	Depressional	CLATSOP, OR	08N10W15D001600	N	141	0.1	0.2	0.2	417.6	417.6
0.1	W5BCL058	PEM	Depressional	CLATSOP, OR	08N10W15D001600	N	327	0.0	0.7	0.7	969.9	969.9
0.2	W5BCL021	PEM	Depressional	CLATSOP, OR	08N10W22AC01000	N	310	0.0	1.5	1.5	917.2	917.2
0.2	W5BCL052	PEM	Depressional-Fringe	CLATSOP, OR	08N10W15D001600	N	504	0.0	1.1	1.1	1492	1492
0.8	W99CL0021	E2USN	Estuarine	CLATSOP, OR	08N10W23BD00600	Y	1774	0.0	5.1	5.1	5256	5256
0.8	W99CL0021A	PEM	TBD	CLATSOP, OR	08N10W23BD00600	Y	960	0.0	3.4	3.4	2843.8	2843.8
1.3	W5BCL015A	AW	TBD	CLATSOP, OR	08N10W230000200	N	718	0.0	1.2	1.2	2126.3	2126.3
1.3	W5BCL015K	PSS	Depressional	CLATSOP, OR	08N10W230000200	N	21	0.0	0.0	0.0	61.2	61.2
1.4	W5BCL015L	PSS	Depressional	CLATSOP, OR	08N10W230000200	N	258	0.2	0.3	0.4	764.9	764.9
1.4	W5BCL015N	PSS	Depressional	CLATSOP, OR	08N10W230000200	N	103	0.1	0.1	0.2	304.8	304.8
1.5	W5BCL015Q	PSS	Depressional	CLATSOP, OR	08N10W230000200	N	110	0.1	0.1	0.2	326.2	326.2
1.5	W5BCL015R	PSS	Depressional	CLATSOP, OR	08N10W260000500	N	44	0.0	0.1	0.2	130.5	130.5
1.6	W5BCL015O	AW	TBD	CLATSOP, OR	08N10W260000500	N	933	0.0	3.0	3.0	2765.2	2765.2
1.7	W5BCL060	AW	Depressional	CLATSOP, OR	08N10W260000500	N	486	0.0	1.6	1.6	1439.8	1439.8
1.8	W5BCL061	PSS	Depressional	CLATSOP, OR	08N10W260000500	N	255	0.2	0.4	0.6	756.8	756.8
1.8	W99CL200	PSS	TBD	CLATSOP, OR	08N10W260000401	Y	115	0.2	0.3	0.4	340.5	340.5
2.0	W5BCL062	AW	Depressional	CLATSOP, OR	08N10W260000500	N	0	0.0	0.0	0.0	0	0
2.0	W99CL201	PFO	TBD	CLATSOP, OR	08N10W260000800	Y	937	2.2	0.0	2.2	2776.1	2776.1
2.3	W99CL202	PSS	TBD	CLATSOP, OR	08N10W250000500	Y	235	0.2	0.6	0.7	697.2	697.2
2.4	W38CL083	PEM	TBD	CLATSOP, OR	08N10W250000500	Y	0	0.0	0.0	0.0	0	0
2.4	W5BCL066	PEM	Depressional	CLATSOP, OR	08N10W250000400	N	239	0.0	1.1	1.1	709.3	709.3
2.5	W5BCL067	PSS	Depressional	CLATSOP, OR	08N10W250000400	N	513	0.4	0.6	1.0	1519.3	1519.3
2.7	W40CL001	PSS	TBD	CLATSOP, OR	08N10W250000400	Y	1464	1.0	2.6	3.6	4337.9	4337.9
3.3	W40CL010	AW	TBD	CLATSOP, OR	08N10W250001500	Y	327	0.0	1.9	1.9	968.4	968.4
3.4	W40CL011	AW	TBD	CLATSOP, OR	08N10W250001500	Y	175	0.0	0.3	0.3	517.3	517.3
3.4	W99CL026	AW	TBD	CLATSOP, OR	08N10W250001500	Y	161	0.0	0.3	0.3	478	478
3.5	W99CL077B	AW	TBD	CLATSOP, OR	08N10W250001500	Y	143	0.0	0.3	0.3	424.7	424.7
3.6	W99CL030	PEM	TBD	CLATSOP, OR	08N10W360000200	Y	72	0.0	0.1	0.1	211.9	211.9
3.7	W99CL033	PFO	TBD	CLATSOP, OR	08N10W360000300	Y	365	0.5	0.0	0.5	1080.6	1080.6
3.7	W99CL077A	AW	TBD	CLATSOP, OR	08N10W360000200	Y	1249	0.0	3.3	3.3	3702	3702
3.8	W99CL017	AW	TBD	CLATSOP, OR	08N10W360000300	Y	492	0.0	1.1	1.1	1457.6	1457.6
3.8	W99CL076	AW	TBD	CLATSOP, OR	08N10W360000300	Y	154	0.0	0.4	0.4	457.2	457.2
4.2	W5BCL042F	AW	TBD	CLATSOP, OR	08N10W360001800	N	1800	0.0	5.4	5.4	5333.7	5333.7
4.5	W42CL001	PEM	TBD	CLATSOP, OR	08N10W360001800	Y	1423	0.0	5.1	5.1	4216.5	4216.5
4.5	W5BCL042A	AW	TBD	CLATSOP, OR	07N10W010000200	N	0	0.0	0.0	0.0	0	0
4.5	W5BCL073	PFO	TBD	CLATSOP, OR	08N10W360001706	N	0	0.0	0.0	0.0	0	0
4.6	W5BCL042C	AW	TBD	CLATSOP, OR	07N10W000000100 WATER	N	561	0.0	1.8	1.8	1663.3	1663.3
4.6	W5BCL043	PEM	Depressional	CLATSOP, OR	07N10W010000200	N	400	0.0	1.0	1.0	1186.6	1186.6

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
4.7	W42CL002	AW	TBD	CLATSOP, OR	07N10W010000500	Y	656	0.0	1.7	1.7	1943.7	1943.7
4.8	W5BCL044	PEM	Depressional	CLATSOP, OR	07N10W010001003	N	7	0.0	0.0	0.0	20.1	20.1
4.9	W5BCL042D	AW	TBD	CLATSOP, OR	07N10W010001003	N	147	0.0	0.4	0.4	435	435
5.0	W40CL016	AW	TBD	CLATSOP, OR	07N10W010001003	Y	689	0.0	1.6	1.6	2041.4	2041.4
5.0	W40CL018	PFO	TBD	CLATSOP, OR	07N10W010001003	Y	0	0.1	0.0	0.1	0	0
5.1	W39CL004	AW	TBD	CLATSOP, OR	07N10W010001003	Y	100	0.0	1.0	1.0	296.2	296.2
5.5	W40CL023	AW	TBD	CLATSOP, OR	07N09W060001500	Y	241	0.0	4.0	4.0	714.4	714.4
5.5	W99CL074	AW	TBD	CLATSOP, OR	07N09W060001500	Y	289	0.0	1.1	1.1	855.5	855.5
5.6	W99CL073	AW	TBD	CLATSOP, OR	07N09W060001500	Y	301	0.0	1.4	1.4	890.8	890.8
6.2	W5BCL047	PEM	Depressional	CLATSOP, OR	07N10W120000500	N	67	0.0	0.1	0.1	199	199
6.3	W38CL007B	PEM	TBD	CLATSOP, OR	07N10W120003000	Y	312	0.0	0.9	0.9	924.9	924.9
7.9	W1BCL001	PFO	Slope	CLATSOP, OR	07N10W130000801	N	222	0.4	0.0	0.4	657	657
8.0	W1BCL002	PEM	Riverine	CLATSOP, OR	07N10W240000100	N	146	0.0	0.2	0.2	431.3	431.3
8.0	W1BCL003	PEM	Slope	CLATSOP, OR	07N10W240000100	N	0	0.0	0.0	0.0	0	0
8.1	W1BCL005	PEM	Slope	CLATSOP, OR	07N10W240000100	N	0	0.0	0.0	0.0	0	0
8.8	W1BCL008	PEM	Riverine	CLATSOP, OR	07N10W240000100	N	111	0.0	0.2	0.2	327.6	327.6
10.2	W1BCL011	PEM	Slope	CLATSOP, OR	07N10W360000100	N	135	0.0	0.2	0.2	400.9	400.9
10.2	W1BCL023	PEM	Flats	CLATSOP, OR	07N10W360000100	N	150	0.0	0.2	0.2	443.5	443.5
10.3	W1BCL022	PSS	Flats	CLATSOP, OR	07N10W360000100	N	60	0.0	0.1	0.1	178.4	178.4
10.9	W39CL006	PEM	TBD	CLATSOP, OR	07N09W310000400	Y	10	0.0	0.0	0.0	29.5	29.5
10.9	W99CL004	PEM	TBD	CLATSOP, OR	07N09W310000400	Y	143	0.0	0.7	0.7	424.1	424.1
10.9	W99CL007	PEM	TBD	CLATSOP, OR	07N09W310000500	Y	279	0.0	0.9	0.9	825.4	825.4
12.3	W1BCL032	PEM	Flats	CLATSOP, OR	06N09W000000600	N	123	0.0	0.2	0.2	365.5	365.5
12.3	W1BCL033	PEM	Flats	CLATSOP, OR	07N09W000000300	N	141	0.0	0.2	0.2	416.8	416.8
12.4	W1BCL030	PEM	Flats	CLATSOP, OR	06N09W000000600	N	59	0.0	0.1	0.1	173.6	173.6
12.4	W1BCL031	PEM	Flats	CLATSOP, OR	06N09W000000600	N	0	0.0	0.0	0.0	0	0
12.5	W1BCL025	PEM	Riverine	CLATSOP, OR	06N09W000000600	N	40	0.0	0.0	0.0	119	119
12.5	W1BCL028	PEM	Slope	CLATSOP, OR	06N09W000000600	N	0	0.0	0.0	0.0	0	0
12.5	W1BCL029	PEM	Flats	CLATSOP, OR	06N09W000000600	N	0	0.0	0.1	0.1	0	0
13.1	W1BCL035	PSS	Slope	CLATSOP, OR	06N09W000000600	N	102	0.1	0.1	0.1	303.5	303.5
13.1	W1BCL037	PEM	Slope	CLATSOP, OR	06N09W000000600	N	0	0.0	0.0	0.0	0	0
13.2	W1BCL036	PSS	Slope	CLATSOP, OR	06N09W000000600	N	244	0.2	0.3	0.4	724.1	724.1
15.1	W5BCL080	PEM	Depressional	CLATSOP, OR	06N09W000000600	N	17	0.0	0.0	0.0	51.5	51.5
15.8	W5BCL005	PEM	Depressional	CLATSOP, OR	06N09W360000100	N	2	0.0	0.0	0.0	4.7	4.7
15.9	W5BCL006	PEM	Depressional	CLATSOP, OR	06N09W360000100	N	0	0.0	0.0	0.0	0	0
15.9	W5BCL007	PEM	Depressional	CLATSOP, OR	06N09W000000000	N	162	0.0	0.3	0.3	479.6	479.6
15.9	W5BCL008	PEM	Depressional	CLATSOP, OR	06N09W000000000	N	47	0.0	0.1	0.1	138	138
15.9	W5BCL009	PEM	Depressional	CLATSOP, OR	06N09W360000100	N	0	0.0	0.0	0.0	0	0
16.0	W5BCL010	PEM	Depressional	CLATSOP, OR	06N09W360000100	N	6	0.0	0.0	0.0	16.6	16.6
16.0	W5BCL011	PEM	Depressional	CLATSOP, OR	06N09W000000000	N	66	0.0	0.1	0.1	194.6	194.6

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
16.6	W5BCL012B	PEM	TBD	CLATSOP, OR	06N09W360000100	N	0	0.0	0.0	0.0	0	0
17.8	W5BCL070	PEM	Riverine	CLATSOP, OR	06N09W360000100	N	63	0.0	0.1	0.1	186.1	186.1
17.8	W5BCL071	PEM	Depressional	CLATSOP, OR	06N09W360000100	N	0	0.0	0.0	0.0	0	0
18.3	W5BCL069	PSS	Depressional	CLATSOP, OR	06N08W000001800	N	0	0.0	0.0	0.0	0	0
18.4	W5BCL068	PEM	Riverine	CLATSOP, OR	06N08W000001800	N	0	0.0	0.0	0.0	0	0
18.6	W1BCL012	PFO	Riverine	CLATSOP, OR	06N08W000001800	N	71	0.1	0.0	0.1	211.8	211.8
18.6	W1BCL014	PFO	Flats	CLATSOP, OR	06N08W000001800	N	193	0.3	0.0	0.3	573.3	573.3
18.9	W1BCL015	PFO	Slope	CLATSOP, OR	06N08W000003400	N	19	0.0	0.0	0.0	55.4	55.4
19.0	W1BCL016	PFO	Slope	CLATSOP, OR	06N08W000003400	N	0	0.0	0.0	0.0	0	0
19.0	W1BCL018	PFO	Slope	CLATSOP, OR	06N08W000003700	N	0	0.0	0.0	0.0	0	0
19.0	W1BCL019	PEM	Slope	CLATSOP, OR	06N08W000003700	Y	0	0.0	0.0	0.0	0	0
19.3	W1BCL020	PEM	Riverine	CLATSOP, OR	06N08W000003400	N	97	0.0	0.1	0.1	288.6	288.6
19.3	W1BCL021	PFO	Slope	CLATSOP, OR	06N08W000003300	N	0	0.0	0.0	0.0	0	0
19.4	W7BCL004	PEM	Slope	CLATSOP, OR	06N08W000003400	N	9	0.0	0.0	0.0	27.2	27.2
19.6	W2BCL008	PFO	Riverine	CLATSOP, OR	06N08W000003400	N	245	0.4	0.0	0.4	727.4	727.4
19.7	W2BCL009	PEM	Slope	CLATSOP, OR	06N08W000003300	N	174	0.0	0.3	0.3	516.6	516.6
19.8	W2BCL007	PEM	Slope	CLATSOP, OR	06N08W160002000	N	0	0.0	0.0	0.0	0	0
22.1	W5BCL028	PEM	Riverine	CLATSOP, OR	06N08W160002000	N	67	0.0	0.1	0.1	199.5	199.5
22.4	W7BCL006	PFO	Slope	CLATSOP, OR	06N08W160002000	N	40	0.1	0.0	0.1	117.6	117.6
22.5	W6BCL003	PFO	Riverine	CLATSOP, OR	06N08W160002000	N	63	0.1	0.0	0.1	185.7	185.7
22.6	W6BCL002	PEM	Riverine	CLATSOP, OR	06N08W160002000	N	41	0.0	0.1	0.1	122	122
Nehalem HUC 4 Subasin - Clatsop County, OR												
24.4	W5BCL001	PEM	Slope	CLATSOP, OR	06N08W260004100	N	25	0.0	0.0	0.0	75	75
24.8	W2BCL001	PSS	Depressional	CLATSOP, OR	06N08W260004100	N	60	0.0	0.1	0.1	176.7	176.7
24.9	W2BCL002	PEM	Slope	CLATSOP, OR	06N08W260004100	N	46	0.0	0.1	0.1	137.6	137.6
25.3	W2BCL003A	PEM	Riverine	CLATSOP, OR	06N08W260004100	N	10	0.0	0.0	0.0	28.2	28.2
25.3	W2BCL004A	PEM	Riverine	CLATSOP, OR	06N08W260004100	N	0	0.0	0.0	0.0	0	0
25.9	W2BCL006	PEM	Riverine	CLATSOP, OR	06N08W260004100	N	24	0.0	0.0	0.0	71.7	71.7
26.8	W5BCL003	PEM	Slope	CLATSOP, OR	05N08W010000100	N	0	0.0	0.0	0.0	0	0
27.3	W5BCL002	PEM	Slope	CLATSOP, OR	05N08W010000100	N	0	0.0	0.0	0.0	0	0
27.3	W5BCL078	PEM	Depressional	CLATSOP, OR	05N08W010000100	N	10	0.0	0.0	0.0	31	31
30.1	W6BCL001	PEM	Depressional	CLATSOP, OR	05N07W000000500	N	30	0.0	0.1	0.1	89.9	89.9
30.5	W1BCL039	PEM	Flats	CLATSOP, OR	05N07W000000500	N	41	0.0	0.0	0.0	120.4	120.4
30.7	W2BCL019	PEM	Depressional	CLATSOP, OR	05N07W000000500	N	0	0.0	0.0	0.0	0	0
31.3	W2BCL018	PEM	Slope	CLATSOP, OR	05N07W000000500	N	38	0.0	0.1	0.1	111.9	111.9
31.4	W2BCL017	PEM	Riverine	CLATSOP, OR	05N07W000000500	N	38	0.0	0.0	0.0	112.2	112.2
32.5	W3BCL001	PEM	Slope	CLATSOP, OR	05N07W000002500	N	42	0.0	0.1	0.1	124.5	124.5
33.8	W99CL102	PSS	TBD	CLATSOP, OR	05N07W330000300	Y	132	0.1	0.1	0.2	392.4	392.4
33.9	W39CL013	AW	TBD	CLATSOP, OR	05N07W330000300	Y	0	0.0	0.2	0.2	0	0
33.9	W39CL014	AW	TBD	CLATSOP, OR	05N07W330000300	Y	139	0.0	0.6	0.6	412.3	412.3

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
34.0	W39CL015	AW	TBD	CLATSOP, OR	05N07W330000300	Y	406	0.0	1.1	1.1	1201.7	1201.7
34.1	W99CL002	AW	TBD	CLATSOP, OR	05N07W330000300	Y	387	0.0	0.8	0.8	1146.3	1146.3
34.4	W5BCL026	PEM	Riverine	CLATSOP, OR	05N07W330000700	N	0	0.0	0.0	0.0	0	0
36.3	W3BCL101	PSS/PFO	TBD	CLATSOP, OR	04N07W000000400	N	458	1.0	0.0	1.0	1358.1	1358.1
36.5	W3BCL100	PSS/PFO	TBD	CLATSOP, OR	04N07W000000300	N	92	0.1	0.0	0.1	271.5	271.5
36.7	W3BCL101b	PSS/PFO	TBD	CLATSOP, OR	04N07W000000400	N	2169	5.3	0.0	5.3	6426.7	6426.7
37.1	W3BCL003	PFO	Slope	CLATSOP, OR	04N07W000000102	N	29	0.1	0.0	0.1	84.7	84.7
37.2	W3BCL002	PFO	Slope	CLATSOP, OR	04N07W000000102	N	38	0.1	0.0	0.1	113.9	113.9
37.6	W8BCL004	PEM	Slope	CLATSOP, OR	04N07W000000100	N	803	0.0	1.4	1.4	2379.1	2379.1
38.3	W8BCL003	PSS	Depressional	CLATSOP, OR	04N07W000000100	N	42	0.0	0.0	0.1	125.3	125.3
38.4	W8BCL002	PSS	Depressional	CLATSOP, OR	04N07W000000100	N	43	0.0	0.0	0.0	128.8	128.8
38.5	W8BCL001	PSS	Depressional	CLATSOP, OR	04N07W000000100	N	50	0.0	0.0	0.1	146.8	146.8
39.1	W2BCL030B	PEM	Riverine	CLATSOP, OR	04N07W130000304	N	16	0.0	0.0	0.0	46.3	46.3
39.3	W2BCL028	PEM	Riverine	CLATSOP, OR	04N07W130000304	N	124	0.0	0.2	0.2	368.3	368.3
39.5	W2BCL026	PEM	Slope	CLATSOP, OR	04N07W130000304	N	128	0.0	0.2	0.2	379.3	379.3
39.6	W1BCL050A	PFO	Slope	CLATSOP, OR	04N07W000002500	N	462	0.8	0.0	0.8	1368.5	1368.5
40.6	W8BCL030	PEM	TBD	CLATSOP, OR	ROW	N	153	0.0	0.2	0.2	452.8	452.8
40.9	W8BCL007C	PSS	TBD	CLATSOP, OR	04N06W000001000	N	101	0.1	0.1	0.2	298.7	298.7
41.4	W8BCL011A	PFO	TBD	CLATSOP, OR	04N06W000000607	N	0	0.0	0.0	0.0	0	0
41.5	W8BCL011B	PFO	TBD	CLATSOP, OR	04N06W000000607	N	108	0.2	0.0	0.2	319.2	319.2
41.6	W8BCL012	PFO	Depressional	CLATSOP, OR	04N06W000000607	N	87	0.2	0.0	0.2	257.4	257.4
41.7	W8BCL013	PFO	Depressional	CLATSOP, OR	04N06W000000607	N	80	0.1	0.0	0.1	236.8	236.8
41.9	W8BCL014	PSS	Depressional	CLATSOP, OR	04N06W000000603	N	152	0.1	0.2	0.3	449.1	449.1
42.0	W8BCL015	PSS	Depressional	CLATSOP, OR	04N06W000000603	N	86	0.1	0.1	0.1	254.7	254.7
42.2	W8BCL017	PSS	Depressional	CLATSOP, OR	04N06W000000603	N	133	0.1	0.0	0.1	393.3	393.3
42.3	W8BCL018	PFO	Riverine	CLATSOP, OR	04N06W000000603	N	292	0.5	0.0	0.5	865.2	865.2
42.6	W1BCL040	PEM	Riverine	CLATSOP, OR	04N06W000000603	N	0	0.0	0.0	0.0	0	0
43.0	W1BCL042	PEM	Slope	CLATSOP, OR	04N06W000000603	N	0	0.0	0.0	0.0	0	0
43.7	W1BCL045	PEM	Riverine	CLATSOP, OR	04N06W000000600	N	0	0.0	0.0	0.0	0	0
43.9	W1BCL046	PEM	Riverine	CLATSOP, OR	04N06W000000600	N	63	0.0	0.1	0.1	187.2	187.2
44.0	W1BCL047	PEM	Riverine	CLATSOP, OR	ROW	N	0	0.0	0.0	0.0	0	0
Nehalem HUC 4 Subasin - Tillamook County, OR												
44.2	W1BTI001	PFO	Riverine	TILLAMOOK, OR	03N06W000099980	N	69	0.1	0.0	0.1	203.3	203.3
44.3	W1BTI002	PEM	Riverine	TILLAMOOK, OR	03N06W000099980	N	0	0.0	0.0	0.0	0	0
44.8	W5BTI003	PEM	Riverine	TILLAMOOK, OR	03N06W000004600	N	0	0.0	0.0	0.0	0	0
45.5	W1BTI004	PEM	Slope	TILLAMOOK, OR	03N06W000000800	N	58	0.0	0.1	0.1	172.9	172.9
47.4	W5BTI001	PEM	Depressional	TILLAMOOK, OR	03N06W000000100	N	49	0.0	0.1	0.1	146.5	146.5
47.6	W6BCO004	PFO	Riverine	COLUMBIA, OR	04N05W000004000	N	31	0.1	0.0	0.1	92	92
48.3	W1BCO001	PEM	Depressional	COLUMBIA, OR	04N05W000003900	N	0	0.0	0.0	0.0	0	0
48.3	W1BCO002	PSS	Depressional	COLUMBIA, OR	04N05W000003900	N	0	0.0	0.0	0.0	0.018	0

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
49.4	W4BCO001	PEM	Depressional	COLUMBIA, OR	04N05W000003600	N	18	0.0	0.0	0.0	53.1	53.1
50.6	W3BCO111	PFO	Slope	COLUMBIA, OR	04N05W000003600	N	115	0.1	0.0	0.1	341	341
50.7	W3BCO113	PEM	Slope	COLUMBIA, OR	04N05W000003400	N	0	0.0	0.0	0.0	0	0
50.8	W3BCO112	PFO	Slope	COLUMBIA, OR	04N05W000003400	N	89	0.1	0.0	0.1	264.2	264.2
53.6	W3BCO002	PSS	Riverine	COLUMBIA, OR	04N05W000001800	N	1	0.0	0.0	0.0	2.8	2.8
55.1	W4BCO002	PEM	Depressional	COLUMBIA, OR	04N05W000002100	N	0	0.0	0.0	0.0	0	0
55.4	W3BCO109	PEM	Riverine	COLUMBIA, OR	04N05W000000200	N	0	0.0	0.0	0.0	0	0
55.5	W3BCO110	PEM	Depressional	COLUMBIA, OR	04N05W000000200	N	0	0.0	0.0	0.0	0	0
55.8	W3BCO107	PEM	Depressional	COLUMBIA, OR	04N05W000000200	N	553	0.0	1.0	1.0	1639.8	1639.8
57.7	W3BCO100	PFO	TBD	COLUMBIA, OR	05N05W000007800	N	0	0.0	0.0	0.0	0	0
63.5	W3BCO102	PFO	Slope	COLUMBIA, OR	05N04W230000600	N	149	0.2	0.0	0.2	440.7	440.7
63.6	W3BCO103	PEM	Riverine	COLUMBIA, OR	05N04W230000600	N	0	0.0	0.1	0.1	0	0
63.6	W3BCO103c	PEM	Riverine	COLUMBIA, OR	05N04W230000600	N	174	0.0	0.5	0.5	515.5	515.5
66.3	W3BCO101	PEM	Slope	COLUMBIA, OR	05N03W190000100	N	110	0.0	0.2	0.2	326.1	326.1
69.1	W6BCO005	PFO	Riverine	COLUMBIA, OR	05N03W220000200	N	112	0.3	0.0	0.3	330.6	330.6
Lower Columbia Clastskanie HUC 4 Subasin - Columbia County, OR												
70.2	W3BCO003	PEM	Riverine	COLUMBIA, OR	05N03W140000100	N	0	0.0	0.0	0.0	0	0
71.0	W1BCO020	PEM	Depressional	COLUMBIA, OR	05N03W140000100	N	0	0.0	0.0	0.0	0	0
71.1	W1BCO021	PEM	Slope	COLUMBIA, OR	05N03W130000100	N	0	0.0	0.0	0.0	0	0
71.2	W1BCO022	PEM	Depressional	COLUMBIA, OR	05N03W130000100	N	0	0.0	0.0	0.0	0	0
Lower Willamette HUC 4 Subbasin - Columbia County, OR												
72.9	W3BCO007	PFO	Depressional	COLUMBIA, OR	05N02W180000100	N	77	0.3	0.0	0.3	227.7	227.7
73.5	W1BCO023	PFO	Riverine	COLUMBIA, OR	05N02W170000200	N	72	0.1	0.0	0.1	213.6	213.6
73.6	W1BCO024	PSS	Depressional	COLUMBIA, OR	05N02W170000200	N	106	0.1	0.1	0.2	312.8	312.8
74.6	W6BCO002	PFO	Riverine	COLUMBIA, OR	05N02W160000200	N	365	0.7	0.0	0.7	1081	1081
74.9	W6BCO001	PFO	Riverine	COLUMBIA, OR	05N02W160000200	N	21	0.0	0.0	0.0	63.6	63.6
Lower Columbia Clastskanie HUC 4 Subasin - Columbia County, OR												
76.4	W3BCO013	PEM/PFO	Riverine	COLUMBIA, OR	05N02W150000100	N	92	0.1	0.0	0.1	273.7	273.7
78.4	W3BCO121	PSS	Riverine	COLUMBIA, OR	05N02W130000100	N	13	0.0	0.0	0.0	37.1	37.1
78.7	W3BCO120	PSS	Slope	COLUMBIA, OR	05N02W130000100	N	137	0.1	0.1	0.2	405.3	405.3
78.9	W3BCO119	PSS	Slope	COLUMBIA, OR	05N02W130000100	N	94	0.2	0.0	0.2	277.8	277.8
79.0	W3BCO118	PSS	Slope	COLUMBIA, OR	05N01W180000500	N	199	0.0	0.3	0.3	588.3	588.3
79.1	W3BCO116	PSS	Slope	COLUMBIA, OR	05N01W180000500	N	0	0.0	0.0	0.0	0.011	0
79.1	W3BCO117	PFO	Slope	COLUMBIA, OR	05N01W180000500	N	198	0.3	0.0	0.3	588.1	588.1
79.2	W3BCO115	PSS	Slope	COLUMBIA, OR	05N01W180000500	N	212	0.1	0.1	0.2	627.9	627.9
79.8	W3BCO114A	PSS	Riverine	COLUMBIA, OR	05N01W180000300	N	0	0.0	0.0	0.0	0	0
79.8	W3BCO114B	PSS	Riverine	COLUMBIA, OR	05N01W180000300	N	60	0.0	0.1	0.1	177.9	177.9
80.2	W5BCO012	PEM	Slope	COLUMBIA, OR	05N01W170000300	N	0	0.0	0.3	0.3	0	0
80.2	W99CO001	PEM	TBD	COLUMBIA, OR	05N01W170000204	Y	126	0.0	0.2	0.2	373.3	373.3
81.4	W5BCO013	PFO	Riverine	COLUMBIA, OR	05N01W160000100	N	306	0.8	0.0	0.8	907.6	907.6

Table G1-2

Wetlands Crossed by the Oregon LNG Pipeline

MP	Wetland ID	Cowardian Classification [a]	HGM [b]	County/State	Tax Lot	Offsite Mapping [c]	Length of pipeline (feet) [d]	Permanent Wetland Impact (acres) [e]	Temporary Wetland Impact (acres) [f]	Total Construction Disturbance (acres)	Excavated Volume [g] (cubic yards)	Fill Volume (cubic yards)
81.5	W99CO030	PFOA	TBD	COLUMBIA, OR	05N01W170000200	Y	174	0.6	0.0	0.6	515.9	515.9
81.6	W99CO030	PFO/SSA	TBD	COLUMBIA, OR	05N01W160000100	Y	132	0.7	0.0	0.7	391.4	391.4
81.6	W99CO031	PEM	TBD	COLUMBIA, OR	05N01W160000100	Y	475	0.0	1.9	1.9	1407.4	1407.4
81.7	W3BCO009	PSS	Riverine	COLUMBIA, OR	05N01W160000201	N	173	0.1	0.1	0.2	511.4	511.4
81.7	W99CO005	PFOA	TBD	COLUMBIA, OR	05N01W160000100	Y	98	0.5	0.0	0.5	291.7	291.7
81.7	W99CO006	PFO	TBD	COLUMBIA, OR	05N01W160000100	Y	85	1.2	0.0	1.2	251	251
81.7	W99CO007	PFOC	TBD	COLUMBIA, OR	05N01W160000100	Y	0	0.1	0.0	0.1	0	0
81.7	W99CO032	PEM	TBD	COLUMBIA, OR	05N01W160000201	Y	77	0.0	0.3	0.3	228.6	228.6
82.0	W3BCO008	PEM	Riverine	COLUMBIA, OR	05N01W1600 WATER	N	0	0.0	0.0	0.0	0	0
Lower Columbia Clastskanie HUC 4 Subasin - Cowlitz County, WA												
82.7	W99CW001	PEM	TBD	COWLITZ, WA	WB1502002	Y	353	0.0	1.6	1.6	1047.1	1047.1
83.0	W99CW002	PEM	TBD	COWLITZ, WA	WB1502001	Y	3024	0.0	6.9	6.9	8959.3	8959.3
84.7	W99CW020	PEM	TBD	COWLITZ, WA	507810106	Y	0	0.0	0.1	0.1	0	0
85.8	W99CW022	PEM	TBD	COWLITZ, WA	50729	Y	765	0.0	2.1	2.1	2267.3	2267.3
Lewis HUC 4 Subasin - Cowlitz County, WA												
86.6	W99CW011	PEM	TBD	COWLITZ, WA		Y	125	0.0	0.2	0.2	370.6	370.6

[a] Cowardin Classification System: PEM = palustrine emergent; PSS = palustrine scrub-shrub; PFO = palustrine forested,E2USN= estuarine unconsoldiated bottom; AW= agricultural wetland (not a Cowardin class).

[b] Wetland classes based on Hydrogeomorphic Assessment Guidebook for Tidal Wetlands of the Oregon Coast, TBD = to be determined due to lack of site access.

[c] Y = Oregon LNG surveyed wetland, N = no site access – proxy data used.

[e] Permanent impacts on wetlands requiring long term restoration including the functional conversion of forested wetlands to scrub-shrub wetlands, or conversation of scrub-shrub wetlands to emergent wetlands.

[f] Temporary impacts on wetlands that are expected to recover to preconstruction conditions.

[g] Volumes based on a 10-foot width, 8-foot average depth, and the length of the pipeline through each wetland. Volumes include the temporary excavation of material from the trench and the replacement of the excavated material to backfill the trench but excludes temporary spoils piles in wetlands from trench excavation or temporary soil disturbances in temporary workspaces from equipment operation or other construction activities.

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
Lower Columbia HUC 4 Subbasin										
1.0	S99CL001	110	Adair Slough	CLATSOP, OR	HDD	Major	Perennial	Category 3	0.00	Nov. 1- Feb. 28
1.5	S5BCL074	20	Vera Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 3	0.49	Nov. 1- Feb. 28
2.6	S40CL001	50	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Intermediate	Perennial	Category 5	0.47	Nov. 1- Feb. 28
3.1	S40CL002	1250	Lewis and Clark River	CLATSOP, OR	HDD	Major	Perennial	Category 5	0.00	Nov. 1- Feb. 28
3.5	S99CL019	60	Tributary of Jeffers Slough	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 3	0.23	Nov. 1- Feb. 28
4.1	S5BCL059	1.5	Tributary of Barrett Slough	CLATSOP, OR	Flume	Minor	Perennial	Category 3	0.10	Nov. 1- Feb. 28
4.2	S5BCL062	2	Tributary of Barrett Slough	CLATSOP, OR	Open cut	Minor	Perennial	Category 3	0.12	Nov. 1- Feb. 28
4.3	S5BCL063	4.5	Tributary of Barrett Slough	CLATSOP, OR	Open cut	Minor	Intermittent	Category 3	0.06	Nov. 1- Feb. 28
4.5	S5BCL064	12	Barrett Slough	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 3	0.00	Nov. 1- Feb. 28
4.6	S5BCL066	3	Tributary of Barrett Slough	CLATSOP, OR	Open cut	Minor	Perennial	Category 3	0.11	Nov. 1- Feb. 28
4.8	S5BCL068	8	Tributary of Green Slough	CLATSOP, OR	Open cut	Minor	Intermittent	Category 3	0.30	Nov. 1- Feb. 28
4.8	S5BCL069	7	Tributary of Green Slough	CLATSOP, OR	Open cut	Minor	Intermittent	Category 3	0.40	Nov. 1- Feb. 28
4.9	S5BCL070	2	Unnamed	CLATSOP, OR	Open cut	Minor	Intermittent	NA	0.20	Nov. 1- Feb. 28
5.0	S5BCL071	5	Unnamed	CLATSOP, OR	HDD	Minor	Intermittent	NA	0.54	Nov. 1- Feb. 28
5.2	S5BCL072	7	Tributary of Lewis and Clark River	CLATSOP, OR	HDD	Minor	Intermittent	Category 5	0.09	Nov. 1- Feb. 28
5.2	S99CL111	340	Lewis and Clark River	CLATSOP, OR	HDD	Major	Perennial	Category 5	0.00	Nov. 1- Feb. 28
5.4	S99CL034	20	Tributary of Lewis and Clark River	CLATSOP, OR	HDD	Intermediate	Perennial	Category 5	0.08	Nov. 1- Feb. 28
5.5	S99CL024	13	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Intermediate	Perennial	Category 5	0.10	Nov. 1- Feb. 28
5.7	S99CL064	340	Lewis and Clark River	CLATSOP, OR	HDD	Major	Intermittent	Category 5	0.00	Nov. 1- Feb. 28
5.8	S38CL003	8	Tributary of Lewis and Clark River	CLATSOP, OR	HDD	Minor	Perennial	Category 5	0.41	Nov. 1- Feb. 28
7.9	S1BCL001	10	Heckard Creek	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 5	0.02	July 1- Sept. 15
8.1	S1BCL050	10	Unnamed	CLATSOP, OR	Open cut	Intermediate	Intermittent	NA	0.13	July 1- Sept. 15
8.6	S1BCL002	4	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	1.17	July 1- Sept. 15
8.8	S1BCL018	25	Tributary of Lewis and Clark River	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 5	1.29	July 1- Sept. 15
9.1	S1BCL003	3	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	0.86	July 1- Sept. 15
9.3	S1BCL004	4	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.82	July 1- Sept. 15
9.7	S1BCL006	3	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.96	July 1- Sept. 15
9.7	S1BCL005	8	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.97	July 1- Sept. 15
9.9	S1BCL007	3	Tributary of Lewis and Clark River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.97	July 1- Sept. 15
10.0	S1BCL008	10	Tributary of Lewis and Clark River	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 5	0.98	July 1- Sept. 15
11.0	S99CL018	35	Lewis and Clark River	CLATSOP, OR	HDD	Intermediate	Perennial	Category 5	0.00	July 15- Sept. 15
12.8	S1BCL016	8	Tributary of Speelyai Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 5	1.03	July 1- Sept. 15
13.8	S5BCL040	0.8	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.02	July 15- Sept. 15
13.8	S5BCL041	2	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.03	July 15- Sept. 15
13.9	S5BCL042	5	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	2.05	July 15- Sept. 30

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
13.9	S5BCL043	20	Tributary of Youngs River	CLATSOP, OR	Open cut	Intermediate	Intermittent	Category 5	2.08	July 15- Sept. 30
14.1	S5BCL045	8	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	2.15	July 15- Sept. 30
14.2	S5BCL044	5	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.16	July 15- Sept. 30
14.8	S5BCL038	2	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	2.28	July 15- Sept. 30
15.3	S5BCL035	3	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	2.09	July 15- Sept. 30
15.6	S5BCL030	4	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	2.11	July 15- Sept. 30
15.6	S5BCL034	4	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.08	July 15- Sept. 30
15.8	S5BCL031	5	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.25	July 15- Sept. 30
16.1	S99CL016	7	Bayney Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.49	July 15- Sept. 30
16.6	S5BCL032	3	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	2.98	July 15- Sept. 30
17.3	S5BCL077	6	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	3.61	July 15- Sept. 30
17.8	S5BCL078	6	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	4.05	July 15- Sept. 30
17.8	S5BCL079	5	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	4.09	July 15- Sept. 30
17.9	S5BCL080	4	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	4.20	July 15- Sept. 30
18.4	S5BCL076	4	Tributary of Rock Creek	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	4.64	July 15- Sept. 30
18.5	S1BCL009	10	Rock Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 3B	4.78	July 15- Sept. 30
18.8	S1BCL010	5	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Perennial	Category 5	5.08	July 15- Sept. 30
19.0	S1BCL011	6	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	5.25	July 15- Sept. 30
19.1	S1BCO012	3	Unnamed	CLATSOP, OR	Open cut	Minor	Perennial	NA	2.93	July 15- Sept. 30
19.3	S1BCL014	8	Osgood Creek	CLATSOP, OR	Flume	Minor	Intermittent	Category 5	5.55	July 15- Sept. 30
19.6	S2BCL013A	7	Tributary of Osgood Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 5	5.79	July 15- Sept. 30
20.1	S2BCL013B	35	Fox Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 5	6.10	July 15- Sept. 30
21.4	S38CL013	3	South Fork Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	7.16	July 15- Sept. 30
21.6	S42CL003	3	Unnamed	CLATSOP, OR	Open cut	Minor	Perennial	NA	2.83	July 15- Sept. 30
21.8	S5BCL058	15	Tributary of Youngs River	CLATSOP, OR	Flume	Intermediate	Perennial	Category 5	7.58	July 15- Sept. 30
22.1	S5BCL049	2.5	Tributary of Youngs River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	7.85	July 15- Sept. 30
22.2	S5BCL048	5	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	7.92	July 15- Sept. 30
22.5	S6BCL016	2	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.20	July 15- Sept. 30
22.6	S6BCL014	4	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.29	July 15- Sept. 30
22.6	S6BCL013	1	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.28	July 15- Sept. 30
22.6	S6BCL015	2	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.23	July 15- Sept. 30
22.8	S6BCL017	3.5	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.51	July 15- Sept. 30
22.8	S6BCL010	2	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.49	July 15- Sept. 30
22.8	S6BCL011	2	Tributary of Youngs River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.45	July 15- Sept. 30
22.9	S6BCL018	4	Tributary of Fall Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.62	July 15- Sept. 30
23.0	S6BCL019	20	Tributary of Fall Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 5	8.66	July 15- Sept. 30

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
23.1	S6BCL020	3	Tributary of Fall Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	8.77	July 15- Sept. 30
23.4	S38CL014	10	Fall Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 5	9.11	July 15- Sept. 30
Nehalem HUC 4 Subasin										
24.3	S5BCL016	3.5	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	2.36	July 1- Aug. 31
24.4	S5BCL018	6	Tributary of Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 5	2.32	July 1- Aug. 31
24.4	S5BCL017	3.5	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	2.34	July 1- Aug. 31
24.8	S2BCL002	25	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Intermediate	Intermittent	Category 4C	2.08	July 1- Aug. 31
24.8	S2BCL001	7	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	2.09	July 1- Aug. 31
25.1	S2BCL003	8	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	1.97	July 1- Aug. 31
25.2	S2BCL004	3	Tributary of Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Perennial	Category 4C	1.96	July 1- Aug. 31
25.2	S2BCL005	10	Tributary of Fishhawk Creek	CLATSOP, OR	Flume	Intermediate	Intermittent	Category 4C	1.96	July 1- Aug. 31
25.3	S2BCL007	3	Tributary of Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	1.95	July 1- Aug. 31
25.4	S2BCL008A	15	Tributary of Fishhawk Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 4C	1.95	July 1- Aug. 31
25.7	S2BCL009	10	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 4C	4.29	July 1- Aug. 31
25.7	S2BCL010	4	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	4.27	July 1- Aug. 31
25.9	S2BCL012	10	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Intermediate	Intermittent	Category 4C	4.19	July 1- Aug. 31
26.3	S5BCL019	1.2	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.87	July 1- Aug. 31
26.5	S5BCL029	1.5	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.68	July 1- Aug. 31
26.6	S5BCL027	1	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.63	July 1- Aug. 31
26.6	S5BCL028	2	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	3.63	July 1- Aug. 31
26.8	S5BCL025	1.4	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.41	July 1- Aug. 31
26.8	S5BCL023	1.3	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.40	July 1- Aug. 31
27.0	S5BCL022	3	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	3.27	July 1- Aug. 31
27.2	S5BCL021	6	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	3.05	July 1- Aug. 31
27.3	S5BCL020	1.8	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	2.97	July 1- Aug. 31
27.4	S5BCL015	4	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	2.89	July 1- Aug. 31
27.6	S5BCL014	2.4	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	2.68	July 1- Aug. 31
27.8	S5BCL012	2	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	2.55	July 1- Aug. 31
27.8	S5BCL013	2	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	2.56	July 1- Aug. 31
27.9	S5BCL011	3	Tributary of Little Fishhawk Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4C	2.46	July 1- Aug. 31
28.1	S5BCL010	3.5	Tributary of Little Fishhawk Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4C	2.35	July 1- Aug. 31
28.4	S5BCL007	6	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	1.24	July 1- Sept. 15
28.5	S5BCL005	4	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	1.19	July 1- Sept. 15
28.5	S5BCL004	7	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	1.13	July 1- Sept. 15
29	S5BCL001	3	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.79	July 1- Sept. 15
29	S5BCL002	2	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.81	July 1- Sept. 15

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
29.4	S6BCL007	1	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.81	July 1- Sept. 15
29.4	S6BCL008	1.5	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.80	July 1- Sept. 15
29.5	S6BCL005	6	Tributary of East Humbug Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4A	0.78	July 1- Sept. 15
29.5	S6BCL006	7	Tributary of East Humbug Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4A	0.79	July 1- Sept. 15
29.9	S6BCL004	5	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.59	July 1- Sept. 15
30.9	S2BCL021	2	Tributary of East Humbug Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4	0.72	July 1- Sept. 15
31.4	S2BCL008B	15	Alder Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 4	0.00	July 1- Sept. 15
31.6	S6BCL001	3.5	Tributary of Alder Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4	0.21	July 1- Sept. 15
32	S3BCL002	6	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.68	July 1- Aug. 31
32	S3BCL001	6	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.69	July 1- Aug. 31
32.1	S3BCL004	6	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.66	July 1- Aug. 31
32.1	S3BCL003	4	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.67	July 1- Aug. 31
32.3	S3BCL005	8	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.67	July 1- Aug. 31
32.3	S3BCL006	10	Tributary of Nehalem River	CLATSOP, OR	Open cut	Intermediate	Intermittent	Category 5	0.67	July 1- Aug. 31
32.4	S3BCL007	8	Tributary of Nehalem River	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.68	July 1- Aug. 31
33.5	S99CL108	120	Nehalem River	CLATSOP, OR	HDD	Major	Perennial	Category 5	0.00	July 1- Aug. 31
34.4	S5BCL046	2	Tributary of Nehalem River	CLATSOP, OR	Flume	Minor	Perennial	Category 5	1.06	July 1- Aug. 31
36.2	S3BCL101	10	Unnamed	CLATSOP, OR	Flume	Intermediate	Perennial	NA	0.26	July 1- Aug. 31
36.3	S3BCL102	5	Unnamed	CLATSOP, OR	Flume	Minor	Perennial	NA	0.27	July 1- Aug. 31
37.5	S8BCL004	5	Tributary of NF Quartz Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 5	0.47	July 1- Aug. 15
37.7	S8BCL003	2.3	Tributary of NF Quartz Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 5	0.54	July 1- Aug. 15
38.5	S8BCL001	2	Tributary of SF Quartz Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 3	1.28	July 1- Aug. 15
39.6	S1BCL029	2.6	Tributary of Military Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.28	July 1- Aug. 15
39.8	S1BCL027	1.5	Tributary of Military Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.17	July 1- Aug. 15
39.8	S1BCL028	2.6	Tributary of Military Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.18	July 1- Aug. 15
41	S8BCL005	20	Rock Creek	CLATSOP, OR	HDD	Intermediate	Perennial	Category 4A	0.00	July 1- Aug. 31
42.3	S8BCL009	11	Tributary of South Fork Rock Creek	CLATSOP, OR	Flume	Intermediate	Perennial	Category 4A	0.00	July 1- Aug. 31
42.7	S1BCL020	6	Tributary of South Fork Rock Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4A	0.03	July 1- Aug. 31
43.1	S1BCL021	15	South Fork Rock Creek	CLATSOP, OR	HDD	Intermediate	Perennial	Category 4A	0.00	July 1- Aug. 31
43.4	S1BCL022	12	Bear Creek	CLATSOP, OR	HDD	Intermediate	Perennial	Category 4A	0.00	July 1- Aug. 31
43.5	S1BCL023	1.3	Tributary of Bear Creek	CLATSOP, OR	HDD	Minor	Intermittent	Category 4A	0.04	July 1- Aug. 31
43.7	S1BCL024	1.6	Tributary of Bear Creek	CLATSOP, OR	Flume	Minor	Perennial	Category 4A	0.09	July 1- Aug. 31
43.9	S1BCL025	4	Tributary of Bear Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.12	July 1- Aug. 31
44	S1BCL026	3	Tributary of Bear Creek	CLATSOP, OR	Open cut	Minor	Intermittent	Category 4A	0.11	July 1- Aug. 31
44.2	S1BTI001	6	Bear Creek	Tillamook, OR	Flume	Minor	Perennial	Category 4A	0.18	July 1- Aug. 31
44.3	S1BTI002	1.8	Tributary of Bear Creek	Tillamook, OR	Open cut	Minor	Intermittent	Category 4A	0.27	July 1- Aug. 31

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
44.8	S5BTI001	8	Tributary of Wolf Creek	Tillamook, OR	Flume	Minor	Perennial	Category 4A	2.70	July 1- Aug. 31
45.1	S1BTI003	4	Tributary of Wolf Creek	Tillamook, OR	Open cut	Minor	Intermittent	Category 4A	2.41	July 1- Aug. 31
47.6	S6BCO002	30	North Fork Wolf Creek	COLUMBIA, OR	Flume	Intermediate	Perennial		0.00	July 1- Aug. 31
48.3	S1BCO000	3	Tributary of North Fork Wolf Creek	COLUMBIA, OR	Flume	Minor	Perennial	Category 3	0.64	July 1- Aug. 31
50.5	S3BCO012	30	Clear Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	Category 3	0.03	July 1- Aug. 31
53.6	S3BCO002	1	Fall Creek	COLUMBIA, OR	Flume	Minor	Perennial	NA	2.28	July 1- Aug. 31
55.7	S3BCO107	10	Cedar Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	NA	0.01	July 1- Aug. 31
55.8	S3BCO106	4	Tributary of Cedar Creek	COLUMBIA, OR	Flume	Minor	Perennial	NA	0.21	July 1- Aug. 31
57.7	S3BCO101B	10	Braided Channel to Rock Creek	COLUMBIA, OR	HDD	Intermediate	Perennial	Category 3	0.00	July 1- Aug. 31
57.7	S3BCO100	10	Tributary of Rock Creek	COLUMBIA, OR	HDD	Intermediate	Perennial	Category 3	0.01	July 1- Aug. 31
57.7	S3BCO101	30	Rock Creek	COLUMBIA, OR	HDD	Intermediate	Perennial	Category 3	0.00	July 1- Aug. 31
63.8	S3BCO014	30	Nehalem River	COLUMBIA, OR	HDD	Intermediate	Perennial	Category 4A	0.00	July 1- Aug. 31
66.3	S3BCO103	1	Tributary of Oak Ranch Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	NA	0.68	July 1- Aug. 31
67.7	S6BCO004	3	Unnamed	COLUMBIA, OR	Open cut	Minor	Intermittent	NA	0.38	July 1- Aug. 31
68	S6BCO003	3	Unnamed	COLUMBIA, OR	Flume	Minor	Perennial	NA	0.49	July 1- Aug. 31
Lower Columbia Clastskanie HUC 4 Subasin										
70.2	S3BCO003	1	Tributary of Clatskanie River	COLUMBIA, OR	Flume	Minor	Perennial	Category 3	0.59	July 1- Aug. 31
70.7	S99CO020	18.5	Clatskanie River	COLUMBIA, OR	Flume	Intermediate	Perennial	Cat 2, Cat 3, Cat 3B, Cat 4A	0.00	July 1- Aug. 31
71	S99CO021	1	Unnamed	COLUMBIA, OR	Flume	Minor	Perennial	NA	0.19	July 1- Aug. 31
71.8	S5BCO001	2	Little Clatskanie River	COLUMBIA, OR	Flume	Minor	Perennial	Category 3	0.06	July 1- Aug. 31
Lower Willamette HUC 4 Subbasin										
72.7	S3BCO008	2	Tributary of Milton Creek	COLUMBIA, OR	Flume	Minor	Perennial/Inte	Category 3	0.24	July 1- Aug. 31
73	S3BCO010	12	Milton Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	Category 3B	0.02	July 15-Sept 15
73.5	S1BCO004	3	Apilton Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	NA	0.54	July 15-Sept 15
73.6	S1BCO005	1	Tributary of Apilton Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	NA	0.58	July 15-Sept 15
74.5	S5BCO011	5	Unnamed	COLUMBIA, OR	Flume	Minor	Perennial	NA	0.12	July 15-Sept 15
74.6	S5BCO010	30	Unnamed	COLUMBIA, OR	Flume	Intermediate	Perennial	NA	0.12	July 15-Sept 15
74.9	S6BCO001	22	Milton Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	Category 3	0.00	July 15-Sept 15
Lower Columbia Clastskanie HUC 4 Subasin										
76.3	S3BCO110	1	Tributary of Merril Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	NA	0.24	July 15-Sept 15
76.4	S3BCO017	35	Merrill Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	NA	0.00	July 15-Sept 15
78.2	S2BCO009	3	Tributary of Merrill Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	Category 3	0.38	July 15-Sept 15
78.4	S3BCO122	10	Tributary of Merrill Creek	COLUMBIA, OR	Flume	Intermediate	Perennial	Category 3	0.20	July 15-Sept 15
79	S3BCO120	1	Tributary of Merrill Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	Category 3	0.87	July 15-Sept 15
79	S3BCO119	1	Tributary of Merrill Creek	COLUMBIA, OR	Open cut	Minor	Intermittent	Category 3	0.92	July 15-Sept 15
79.9	S3BCO115	1	Tributary of Merrill Creek	COLUMBIA, OR	Flume	Minor	Perennial	Category 3	2.01	July 15-Sept 15

Table G1-3

Waterbodies Crossed by the Oregon LNG Pipeline

Milepost	Stream ID	Stream Width (feet)	Waterbody	County/State	Crossing Method	FERC Waterbody Type	Stream Type	Oregon State Class	Miles to Salmonid Habitat	In-Water Work Window
81.6	S99CO011	280	Deer Island Slough	COLUMBIA, OR	Flume	Major	Perennial	Category 3B	0.46	July 15-Sept 15
82.0	S3BCO123	20	Dyna Nobel Channel	COLUMBIA, OR	HDD	Intermediate	Perennial	Category 3	0.45	July 15-Sept 15
82.3	S99CO014	3300	Columbia River	COLUMBIA, OR	HDD	Major	Perennial	Cat 2, Cat 3, Cat 3B, Cat 4A	0.00	Novr 1- Feb 28
83.3	S99CW020	10	Burris Creek	COWLITZ, WA	Flume	Intermediate	Perennial	NA	0.00	Aug 1-Aug 31
85.8	S99CW021	2	Unnamed	COWLITZ, WA	Flume	Minor	Perennial	NA	0.36	Aug 1-Aug 31
86	S99CW022	2	Unnamed	COWLITZ, WA	Flume	Minor	Perennial	NA	0.31	Aug 1-Aug 31
86.5	S99CW023	3	Unnamed	COWLITZ, WA	Open cut	Minor	Intermittent	NA	0.48	Aug 1-Aug 31
86.7	S99CW025	3	Unnamed	COWLITZ, WA	Open cut	Minor	Intermittent	NA	0.40	Aug 1-Aug 31
86.8	S99CW026	3	Unnamed	COWLITZ, WA	Flume	Minor	Perennial	NA	0.39	Aug 1-Aug 31

Category 1: All standards are met. (This category is not used.)
Category 2: Attaining - Some of the pollutant standards are met.
Category 3: Insufficient data to determine whether a standard is met.
3B: Potential concern - Some data indicate nonattainment of a criterion, but data are insufficient to assign another category.
Category 4: Water is water quality limited but a Total Maximum Daily Load (TMDL) is not needed. This category encompasses:
4A: TMDL approved - TMDLs needed to attain applicable water quality standards have been approved.
4B: Other pollution control requirements are expected to address all pollutants and will attain water quality standards.
4C: Impairment is not caused by a pollutant (e.g., flow or lack of flow is not considered a pollutant).
Category 5: Water is water quality limited and a TMDL is needed, Section 303(d) list.
Cat = category
TMDL = total maximum daily load; NA = not applicable.
Precision loss may occur because of rounding.

Crossing Method

Flume: Water will be diverted around the construction area using a flume or flumes to allow a dry Open cut. If no fish are present, the crossing method may be modified with a dam and pump arrangement to convey
HDD: horizontal directional drill
Open cut: Conventional Open cut. Applicable to intermittent and ephemeral streams that are not fish-bearing, fish-bearing intermittent or ephemeral streams if dry at the time of construction, and some perennial streams

APPENDIX G2

LANDSLIDE HAZARD AREAS CROSSED BY THE OREGON LNG PIPELINE

Appendix G2

Landslide Hazard Areas Crossed by the Oregon LNG Pipeline

Mapped Landslide Hazard [a]			
From MP	**To MP**	**Type of Landslide Hazard**	**References**
6.5	7.8	Landslide Topography; Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Schlicker et al., 1972; Burns et al., 2011; Hofmeister, 2002; CH2M HILL, 2009
8.0	8.6	Landslide Topography	Schlicker et al., 1972; Burns et al., 2011
8.7	10.2	Landslide Topography; Potential Gullying/Erosion/Debris Flow	Schlicker et al., 1972; Burns et al., 2011
11.2	15.6	Inactive Landslide; Landslide Topography; Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Schlicker et al., 1972; Burns et al., 2011; Hofmeister, 2002; CH2M HILL, 2009
16.5	17.8	Mass Movement Topography, Landslide Topography	Schlicker et al., 1972; Burns et al., 2011; CH2M HILL, 2009
17.4	17.6	Potential Rapidly Moving Landslide Hazard	Burns et al., 2011; Hofmeister, 2002.
17.8 [b]	21.5	Mass Movement Topography, Landslide Topography; Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
21.6	22.1	Potential Rapidly Moving Landslide	Hofmeister, 2002
22.1	23.8	Mass Movement Topography; Potential Gullying/Erosion/Debris Flow	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
23.8[b]	25.3	Mass Movement Topography; Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Beaulieu, 1973; Burns et al., 2011; Hofmeister, 2002; CH2M HILL, 2009
25.0	25.1	2007–2008 Landslides—2,000 to 3,500 feet from alignment	CH2M HILL, 2009
25.3 [b]	26.2 [b]	Mass Movement Topography	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
26.2	27.2	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2009
26.9		2007–2008 Landslide—1,200 feet from alignment	CH2M HILL, 2009
27.3	30.3	Mass Movement Topography; Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Beaulieu, 1973; Hofmeister, 2002; CH2M HILL, 2009
30.7	31.9 [b]	Mass Movement Topography; Potential Rapidly Moving Landslide	Beaulieu, 1973; Hofmeister, 2002; CH2M HILL, 2009
31.9	32.3	Mass Movement Topography	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
33.0	33.3	Mass Movement Topography	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
34.2	37.2 [b]	Mass Movement Topography	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
35.7		Recent Landslide—2,500 feet from alignment	Burns et al., 2011
36.1		Recent Landslides—1,300 to 1,500 feet from alignment	Burns et al., 2011
37.2		Recent Landslide—1,900 feet from alignment	Burns et al., 2011; CH2M HILL, 2009
37.5	38.1	Potential Rapidly Moving Landslide; Potential Gullying/Erosion/Debris Flow	Hofmeister, 2002, CH2M HILL, 2009
37.7	38.8	Mass Movement Topography	Beaulieu, 1973; Burns et al., 2011; CH2M HILL, 2009
38.7	39.0	Potential Rapidly Moving Landslide	Hofmeister, 2002
38.8		Recent Landslide—1,300 feet from alignment	Burns et al., 2011
39.0	39.8	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2009
40.2		Recent Landslide—400 feet from alignment	Burns et al., 2011
40.2	41.0	Potential Rapidly Moving Landslide	Hofmeister, 2002

Landslide Hazard Areas Crossed by the Oregon LNG Pipeline

Mapped Landslide Hazard [a]			
From MP	**To MP**	**Type of Landslide Hazard**	**References**
42.0	42.8	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2009
43.1	43.2	Potential Rapidly Moving Landslide	Hofmeister, 2002
41.5	44.7	Mass Movement Topography; Potential Rapidly Moving Landslide	Beaulieu, 1973; CH2M HILL, 2009; Hofmeister, 2002
45.0		Recent Landslide - 300 feet from alignment	CH2M HILL, 2013
45.2		Recent Landslide – 300 feet from alignment	Burns et al., 2011
45.6	45.6	Potential Gullying/Erosion/Debris Flow, Recent Landslide – 500 feet from alignment	CH2M HILL, 2013, Burns et al., 2011
46.3 [b]		Recent Landslides – 500 feet from alignment	Burns et al., 2011
46.5 [b]		Recent Landslide – 400 feet from alignment	Burns et al., 2011
46.3	46.6	Mass Movement Topography, Potential Rapidly Moving Landslide	Burns et al., 2011; Hofmeister, 2002
46.9	47.3	Mass Movement Topography	Burns et al., 2011
47.5		Recent Landslide – 1,500 feet from alignment	Burns et al., 2011
47.6	49.0	Landslide Topography, Potential Gullying/Erosion/Debris Flow, Potential Rapidly Moving Landslide	CH2M HILL, 2013; Hofmeister, 2002
49.2	49.4	Landslide Topography	CH2M HILL, 2013
49.4 [b]	49.8 [b]	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
50.0	50.1	Potential Rapidly Moving Landslide	Hofmeister, 2002
50.6	50.6	Potential Rapidly Moving Landslide	Hofmeister, 2002
50.8	50.8	Potential Rapidly Moving Landslide	Hofmeister, 2002
51.4	51.9 [b]	Landslide Topography, Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
52.8	52.9	Potential Rapidly Moving Landslide	Hofmeister, 2002
53.4	53.6	Potential Rapidly Moving Landslide, Potential Gullying/Erosion/Debris Flow	Hofmeister, 2002; CH2M HILL, 2013
53.8	54.2	Landslide Topography	CH2M HILL, 2013
54.6	54.7	Landslide Topography	CH2M HILL, 2013
54.9	55.7	Landslide Topography	CH2M HILL, 2013
55.9	55.9	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
55.9	56.4	Landslide Topography	CH2M HILL, 2013
57.4	57.7	Landslide Topography	CH2M HILL, 2013
57.8	58.3	Potential Rapidly Moving Landslide, Landslide Topography	Hofmeister, 2002; CH2M HILL, 2013
59.2	59.3	Landslide Topography	CH2M HILL, 2013
59.9	60.1	Landslide Topography	CH2M HILL, 2013
60.9	61.1	Landslide Topography	CH2M HILL, 2013
62.0	62.0	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
62.3	62.5	Landslide Topography	CH2M HILL, 2013

Landslide Hazard Areas Crossed by the Oregon LNG Pipeline

Mapped Landslide Hazard [a]			
From MP	**To MP**	**Type of Landslide Hazard**	**References**
62.7	62.7	Potential Rapidly Moving Landslide	Hofmeister, 2002
63.4	63.4	Potential Rapidly Moving Landslide	Hofmeister, 2002
63.7		Recent Landslide – 2,400 feet from alignment	Burns et al., 2011
63.8		Recent Landslides – 1,300 to 2,100 feet from alignment	Burns et al., 2011
63.9	63.9	Potential Rapidly Moving Landslide	Hofmeister, 2002
64.5	64.6	Landslide Topography	CH2M HILL, 2013
65.3	65.4	Landslide Topography	CH2M HILL, 2013
65.8	65.9	Landslide Topography	CH2M HILL, 2013
66.2	66.3	Landslide Topography	CH2M HILL, 2013
66.7	66.7	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
67.2	67.3	Landslide Topography	CH2M HILL, 2013
67.6	68.0	Landslide Topography, Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
69.1	69.1	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
69.7	69.9	Landslide Topography	CH2M HILL, 2013
70.2	70.2	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
70.6	71.3	Landslide Topography; Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
71.6	71.7	Landslide Topography	CH2M HILL, 2013
71.8	71.8	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
72.1	72.9	Landslide Topography, Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
73.6	73.6	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
73.7	74.2	Landslide Topography, Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
75.4	75.4	Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
76.1	76.8	Landslide Topography, Potential Gullying/Erosion/Debris Flow	CH2M HILL, 2013
77.9	79.3	Landslide Deposits, Landslide Topography	Burns et al., 2011; CH2M HILL, 2013
85.6	86.0	Mapped Deep-Seated Composite Landslide, Landslide Topography	DNR, 2010; CH2M HILL, 2013
86.3	86.4	Mapped Deep-Seated Composite Landslide	DNR, 2010; CH2M HILL, 2013
86.6	86.8	Mapped Deep-Seated Rotational Landslide	DNR, 2010; CH2M HILL, 2013

Landslide Hazard Areas Crossed by the Oregon LNG Pipeline

Mapped Landslide Hazard [a]			
From MP	**To MP**	**Type of Landslide Hazard**	**References**

[a] The milepost numbers in this table identify landslide hazards shown on published landslide hazard mapping and on the project-specific landslide inventory/geologic hazard mapping prepared for Oregon LNG. Source documentation is provided in the "References" column of this table.

[b] Milepost numbers adjusted for consistency with CH2M HILL, 2013.

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APPENDIX G3

SITE-SPECIFIC WATERBODY CROSSING PLANS

EROSION AND SEDIMENT CONTROL KEYED NOTES

1. PERENNIAL, INTERMITTENT AND EPHEMERAL STREAMS BETWEEN 0 AND 30 FEET WIDE WITH FLOW, WILL BE CROSSED USING WATER DIVERSION TECHNIQUES. STREAM FLOW WILL BE DIVERTED FROM THE ACTIVE CONSTRUCTION AREA USING FLUME PIPE(S). THE PIPELINE WILL BE TRENCHED IN UNDERNEATH THE FLUME PIPE(S).
2. FOR INTERMITTENT AND EPHEMERAL STREAMS THAT ARE DRY AT THE TIME OF CONSTRUCTION, THE PIPELINE WILL BE INSTALLED USING AN OPEN CUT METHOD. THIS CONSTRUCTION METHOD WILL ADHERE TO THE TIME RESTRICTIONS LISTED IN GENERAL NOTE 6. AT THE COMPLETION OF PIPE INSTALLATION AT THIS TYPE OF CROSSING THE WATER BODY WILL BE RETURNED TO PRE-CONSTRUCTION CONTOURS.
3. HORIZONTAL DIRECTIONAL DRILLING TECHNIQUES WILL BE USED TO CROSS WATER BODY. SPOILS FROM THE DRILLING WILL BE STOCKPILED AT LEAST 50 FEET FROM THE WATER BODY.
4. CROSSINGS AT DRY WETLANDS WHERE SOILS ARE STABLE ENOUGH TO SUPPORT EQUIPMENT WITHOUT SINKING (E.G., MINERAL HYDRIC SOILS), WILL EMPLOY UPLAND CONSTRUCTION TECHNIQUES (TRENCHING AND BACKFILLING). A REDUCED CONSTRUCTION EASEMENT OF 75 FEET WILL BE ADHERED TO. TOP SOIL WILL BE SEGREGATED, AND NO STABILIZATION MATTING WILL BE USED. EXCESSIVE RUTTING FROM CONSTRUCTION VEHICLES WILL BE AVOIDED.
5. TIMBER MATS WILL BE USED TO SUPPORT CONSTRUCTION EQUIPMENT AT WETLAND CROSSINGS WHERE SOILS ARE TOO WET TO SUPPORT CONSTRUCTION VEHICLES. A REDUCED CONSTRUCTION EASEMENT OF 75 FEET WILL BE USED. TOPSOIL WILL NOT BE SEGREGATED.
6. TIMBER MATS (ONLY ENOUGH FOR ONE TRACTOR) WILL BE USED TO SUPPORT CONSTRUCTION EQUIPMENT AT WETLAND CROSSINGS WHERE STANDING WATER IS PRESENT IN THE WETLAND. PULL/ PUSH TECHNIQUES WILL BE IMPLEMENTED TO MINIMIZE THE DISTURBANCE. A REDUCED CONSTRUCTION EASEMENT OF 75 FEET WILL BE ADHERED TO. SPOILS WILL BE TEMPORARILY PLACED NEXT TO THE EXCAVATION AND BACKFILLED IMMEDIATELY AFTER PIPE HAS BEEN INSTALLED.
7. HORIZONTAL DIRECTIONAL DRILLING TECHNIQUES WILL BE USED TO CROSS WETLAND. SPOILS FROM THE DRILLING WILL BE STOCKPILED AT LEAST 50 FEET FROM THE WETLAND.
8. LIMIT CLEARING OF VEGETATION TO THE TEMPORARY AND PERMANENT EASEMENTS. PLACE HIGHLY VISIBLE CONSTRUCTION FENCING AROUND THE PERIMETER OF SENSITIVE AREAS (INCLUDING WETLANDS) THAT ARE NOT TO BE DISTURBED DURING CONSTRUCTION.
9. CONSTRUCTION STAGING AREAS WILL BE A MINIMUM OF 50 FEET AWAY FROM THE EDGE OF WATER BODIES AND WETLANDS.
10. INSTALL SILT FENCE ALONG THE DOWN GRADIENT EDGE OF TEMPORARY STAGING AREAS. SEE SILT FENCE DETAIL 1 ON FIGURE 6A-29. SILT FENCE SHALL BE INSTALLED PRIOR TO LAND DISTURBING ACTIVITIES. SILT FENCE INSTALLATION WILL CONFORM WITH STANDARD CONSTRUCTION PRACTICES, INCLUDING BEING PROPERLY KEYED IN, OVERLAPPING SECTIONS, AND WILL LOOP OVER ON ITSELF.
11. INSTALL TEMPORARY SEDIMENT BARRIER ACROSS THE ENTIRE WATER BODY DOWN GRADIENT OF THE PIPELINE CROSSING PRIOR TO REMOVAL OF THE FLUME PIPE(S) TO CAPTURE FIRST FLUSH OF SEDIMENT THROUGH THE DISTURBED CONSTRUCTION AREA. REMOVE TEMPORARY SEDIMENT BARRIER ONCE TURBIDITY WITHIN THE DISTURBED AREA IS NO LONGER OBSERVED.
12. (NOT USED)
13. EXCAVATED SPOILS WILL BE STOCKPILED AT LEAST 50 FEET FROM THE EDGE OF THE WATER BODY. STOCKPILED MATERIAL WILL BE LEFT WITH STABLE SLOPES, AND WILL BE COVERED WITH A THICK LAYER OF MULCH OR PLASTIC SHEETING AT THE END OF EACH WORK DAY, OR DURING PERIODS OF PRECIPITATION. SEE PLASTIC SHEETING DETAIL 2 ON SHEET C-181.
14. INSTALL SILT FENCE OR STRAW WATTLES AROUND THE PERIMETER OF STOCKPILED MATERIALS (SPOILS AND VEGETATION)
15. TEMPORARY TRENCH PLUGS WILL BE INSTALLED AT ALL WATER BODY CROSSINGS, AS NECESSARY, TO PREVENT DIVISION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND KEEP ACCUMULATED TRENCH WATER OUT OF THE WATER BODY. SEE TRENCH PLUG DETAIL 3 ON FIGURE 6A-29.
16. WHERE STREAM FLOW IS DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA, TEMPORARY RIPRAP WILL BE PLACED AT THE OUTLET OF THE PIPE OR FLUME, AS NEEDED, TO PREVENT SCOUR. ALL TEMPORARY RIPRAP MATERIAL WILL BE REMOVED AT THE COMPLETION OF STREAM FLOW DIVERSION. SEE OUTLET PROTECTION DETAIL 4 ON FIGURE 6A-29.
17. STABILIZE DISTURBED RIPARIAN AREAS WITHIN 24 HOURS WITH TEMPORARY SEED MIX (TRITICUM AESTIVUM X ELYTRIGIA ELONGATA – REGREEN (STERILE WHEATGRASS HYBRID) AT 60 KG/HA), ALONG WITH A SOIL BINDER, SOIL TACKIFIER, AND MULCH.
18. SHAPE AND STABILIZE STREAM BANKS WITHIN 24 HOURS IN PREPARATION FOR STREAM BANK RESTORATION.
19. (NOT USED)
20. INSTALL EROSION CONTROL MATTING TO STABILIZE STREAM BANKS OR DISTURBED SLOPES AS SHOWN ON DETAIL 9 ON FIGURE 6A-31.
21. INSTALL TURF REINFORCEMENT MATS TO STABILIZE STREAM BANKS OR DISTURBED SLOPES AS SHOWN ON DETAIL 9 ON FIGURE 6A-31.
22. INSTALL ROOTWAD REVETMENTS TO STABILIZE STREAM BANKS.
23. REPAIR ANY GULLIES FORMED ON ELONGATED SLOPES OF STREAM BANKS USING LIVE BRANCH CUTTINGS AND COMPACTED SOIL.
24. TEMPORARILY STABILIZE EXISTING BARE SOIL AREAS BY SPREADING STRAW MULCH AND CRIMPING INTO THE SURFACE. THE APPLICATION RATE FOR STRAW MULCH IS 2,500 LBS PER ACRE. PERMANENTLY SEED THE DISTURBED UPLAND AREAS WITH THE APPROVED NATIVE SEED MIX.
25. ALONG THE PIPELINE EASEMENT, FORESTED WETLANDS WILL BE REHABILITATED TO MAINTAIN AN HERBACEOUS, SCRUB—SHRUB, AND SMALL TREE STATE.

EROSION AND SEDIMENT CONTROL KEYED NOTES (CONTINUED)

26. (NOT USED)
27. INSTALL STRAW WATTLES ON DISTURBED SLOPES ACROSS THE ENTIRE CONSTRUCTION EASEMENT. INSTALL STRAW WATTLES PERPENDICULAR TO THE SLOPE. SEE STRAW WATTLE DETAIL 5 ON FIGURE 6A-29. STRAW WATTL SPACING IS DEPENDANT ON SLOPE AS FOLLOWS:

SLOPE	MINIMUM SPACING
<6:1	50 FEET
6:1 – 4:1	25 FEET
4:1 – 2:1	20 FEET
2:1 – 1:1	10 FEET

28. INSTALL TEMPORARY SEED MIX (TRITICUM AESTIVUM X ELYTRIGIA ELONGATA – REGREEN (STERILE WHEATGRASS HYBRID) AT 60 KG/HA), ALONG WITH A SOIL BINDER, SOIL TACKIFIER, AND MULCH ON DISTURBED SLOPES.
29. INSTALL LIVE STAKE VEGETATION, AND PERMANENT SEED MIX ON DISTURBED SLOPES.
30. RE-SEED UPLAND AREAS DISTURBED BY CONSTRUCTION TRAFFIC (RUTTING) OR USED AS TEMPORARY STAGING AREAS AT THE COMPLETION OF THE PIPE CROSSING WITH A NATIVE SEED MIX.

GENERAL NOTES

1. THE PREDOMINANT SOIL TYPE IN THE AREA IS PRONE TO WATER EROSION. THEREFORE THE IMPLEMENTATION OF EROSION CONTROL PRACTICES MUST BE AN INTEGRAL PART OF ALL ASPECTS OF CONSTRUCTION.
2. THE IMPLEMENTATION OF THESE EROSION CONTROL PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, UPGRADE AND REMOVAL OF THESE BMPS IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED, APPROVED, AND THE SITE IS STABILIZED.
3. THE EROSION AND SEDIMENT CONTROL BMPS SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS, DURING THE ACTIVE CONSTRUCTION PERIOD. THESE EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER RECEIVING WATER BODIES.
4. ALL BMPS WILL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS AND GOOD ENGINEERING PRACTICES. ALL BMPS WILL BE MAINTAINED IN EFFECTIVE OPERATING CONDITIONS.
5. THE EROSION CONTROL MEASURES SHOWN IN THESE PLANS MUST BE CONSTRUCTED IN CONNECTION WITH ALL CLEARING AND GRADING ACTIVITIES AND IN SUCH A MANNER TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DOES NOT ENTER THE RECEIVING WATER BODIES, OR IS TRACKED ONTO PAVED ROADS.
6. CONSTRUCTION ACTIVITIES WILL BE SCHEDULED SO THAT THE PIPELINE TRENCH IS EXCAVATED IMMEDIATELY PRIOR TO PIPE-LAYING ACTIVITIES. THE DURATION OF CONSTRUCTION WILL BE LIMITED TO 3 DAYS ACROSS FISH BEARING STREAMS.
7. VEHICLE FUELING AND EQUIPMENT FUELING AREAS WILL BE LOCATED IN A DESIGNATED AREA 150' AWAY FROM PERENNIAL STREAMS.
8. PRIOR TO ANY LAND DISTURBING ACTIVITIES FOR STREAM, WETLAND, OR OTHER CROSSINGS A CONSTRUCTED ENTRANCE AND EXIT FROM THE PAVED ROAD WILL BE CONSTRUCTED, TO REDUCE TRACKING OF SEDIMENT ONTO PAVED ROADS.
9. ALL WATER BODY CROSSINGS WILL BE RETURNED TO PRECONSTRUCTION CONTOURS, OR TO A STABLE ANGLE OF REPOSE.
10. REMOVE ALL NON-NATIVE MATERIALS FROM THE CROSSING AFTER CONSTRUCTION AND FINAL STABILIZATION ARE COMPLETE.
11. WATER WILL BE USED FOR DUST SUPPRESSION TO MINIMIZE FUGITIVE DUST FROM LEAVING CONSTRUCTION AREAS.

TYPICALS

- A TYPICAL PIPELINE CROSSING - FLAT GROUND
- B TYPICAL STAGING AREAS
- C TYPICAL FLOWING WATER BODY - CROSSING METHOD
- D TYPICAL DRY WATER BODY - CROSSING METHOD
- E TYPICAL HORIZONTAL DIRECTIONAL DRILLING (HDD) SITE PLAN AND PROFILE
- F TYPICAL WETLAND CROSSING
- G TYPICAL PIPELINE CROSSING - STEEP SLOPE
- H TYPICAL CONSTRUCTION ENTRANCE

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
B. OSTAPKOWICZ	A STEPHENSON	N WILLIAMS	R ATTANASIO

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

EROSION AND SEDIMENT CONTROL KEYED AND GENERAL NOTES

LOC: OREGON AND WASHINGTON		from STA:	to STA:
		from MP:	to MP:
PROJ: 199863	DATE: DECEMBER 2013	DWG: FIG 6A-1	REVISION:

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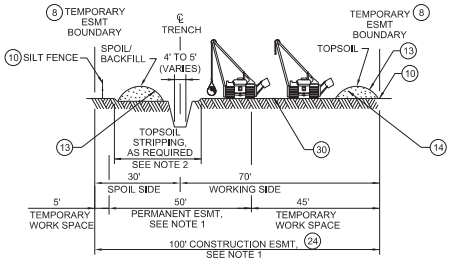
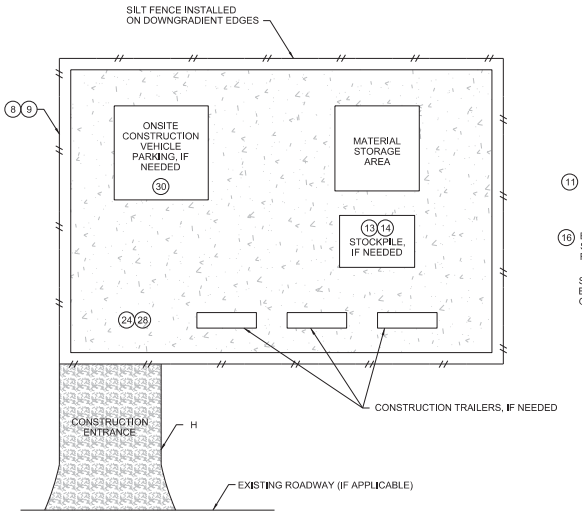


NOTES:

1. CONSTRUCTION EASEMENT WILL TYPICALLY BE 100' WIDE, CONSISTING OF A 50' PERMANENT EASEMENT, AND 50' OF TEMPORARY WORK SPACE. EXTRA TEMPORARY WORK SPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL AND RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.
2. THIS DRAWING REFLECTS "TRENCH AND SPOIL SIDE" TOPSOIL STRIPPING PROCEDURE, AS NEEDED. SALVAGE TOPSOIL OVER TRENCH AND UNDER THE SPOIL PILE AT LOCATIONS IDENTIFIED ON THE CONSTRUCTION ALIGNMENT SHEETS, OR AS DIRECTED BY THE COMPANY'S INSPECTOR. DEPTH OF TOPSOIL STRIPPING IS NOT TO EXCEED 12". MINIMUM WIDTH OF TOPSOIL STRIPPING ON THE WORKING SIDE OF THE TRENCH IS 12".
3. STOCKPILE TOPSOIL AS SHOWN OR IN ANY CONFIGURATION APPROVED BY THE COMPANY'S INSPECTOR, AS NEEDED. KEEP TOPSOIL CLEAN OF ALL CONSTRUCTION DEBRIS. MAINTAIN A MINIMUM 12" OF SEPARATION BETWEEN TOPSOIL AND SUBSOIL PILES.
4. REFUEL STATIONARY EQUIPMENT PER SPCC PLAN.
5. APPLICABLE KEYED NOTES: 8, 10, 13, 14, 24, 30 ON FIGURE 6A-1.

A TYPICAL PIPELINE CROSSING - FLAT GROUND

NTS

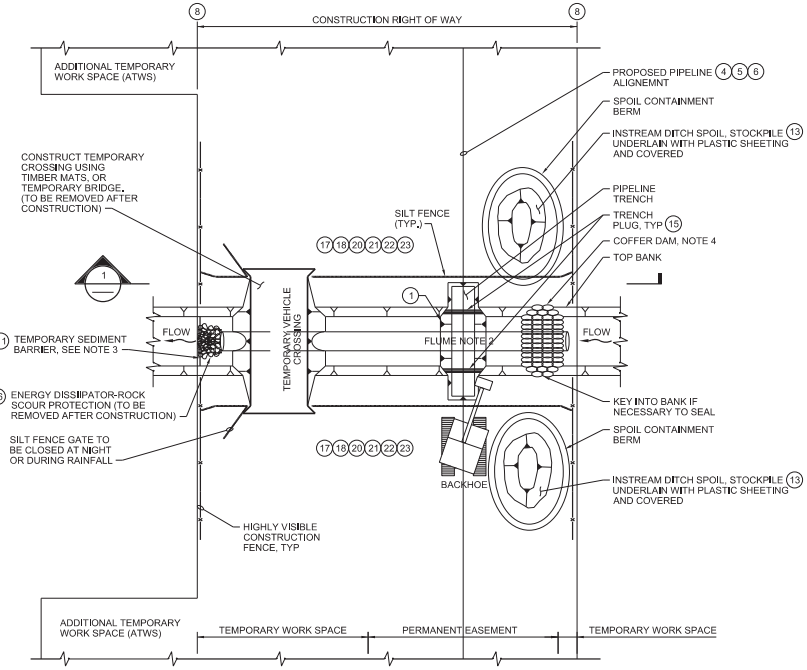


NOTES:

1. STAGING AREA WILL CONSIST OF GEOTEXTILE FABRIC COVERED W/ 6" OF 4" QUARRY SPALLS. SILT FENCE WILL BE INSTALLED ON DOWNGRADIENT EDGES.
2. APPLICABLE KEYED NOTES: 8, 9 (IF NEAR WATER BODY), 13, 14, 24, 28 (IF ON SLOPE), AND 30 ON FIGURE 6A-1 AND DETAIL H ON FIGURE 6A-1.

B TYPCAL STAGING AREAS

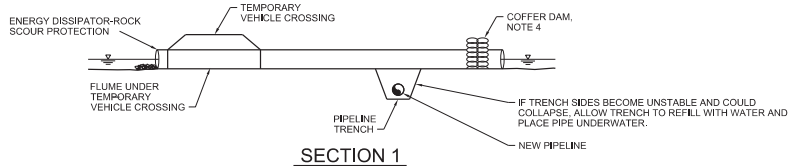
NTS



PLAN

NOTES:

1. PIPELINE PLACEMENT WITHIN RIGHT-OF-WAY CONCEPTUAL ONLY.
2. FLUME SIZED TO HANDLE STREAM FLOW.
3. CONSTRUCTION SEDIMENT BARRIERS ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY FOLLOWING CLEARING AND GRADING AND MAINTAIN UNTIL CONSTRUCTION OF THE CROSSING IS COMPLETE. EROSION CONTROL MEASURES SHALL BE REINSTATED IMMEDIATELY FOLLOWING BACKFILLING OF TRENCH AND STABILIZATION OF BANKS. BARRIERS MAY BE TEMPORARILY REMOVED TO ALLOW CONSTRUCTION ACTIVITIES BUT MUST BE REPLACED AT THE END OF EACH WORK DAY.
4. PROVIDE COFFER DAM AT BOTH ENDS OF FLUME FOR TIDAL AND LOW GRADIENT STREAMS AS NEEDED.
5. APPLICABLE KEYED NOTES: 1, 4, 5, 6, 8, 11, 13, 15, 16 (IF DIVERTED), 17, 18, 20, 21, 22, 23, ON FIGURE 6A-1.



SECTION 1

C TYPICAL FLOWING WATER BODY CROSSING METHOD

NTS

LEGEND:

(X) KEYED NOTE, SEE FIGURE 6A-1

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
B. OSTAPKOWICZ	A STEPHENSON	N WILLIAMS	R ATTANASIO

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OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

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EROSION SEDIMENT CONTROL TYPICALS

LOC:	OREGON AND WASHINGTON	from STA:	to STA:
PROJ: 199863	DATE: DECEMBER 2013	from MP:	to MP:
		DWG: FIG 6A-26	REVISION:

FILENAME: ESA Details FIG6A-26.dwg PLOT DATE: 2013\12\05 PLOT TIME: 11:46:13 AM

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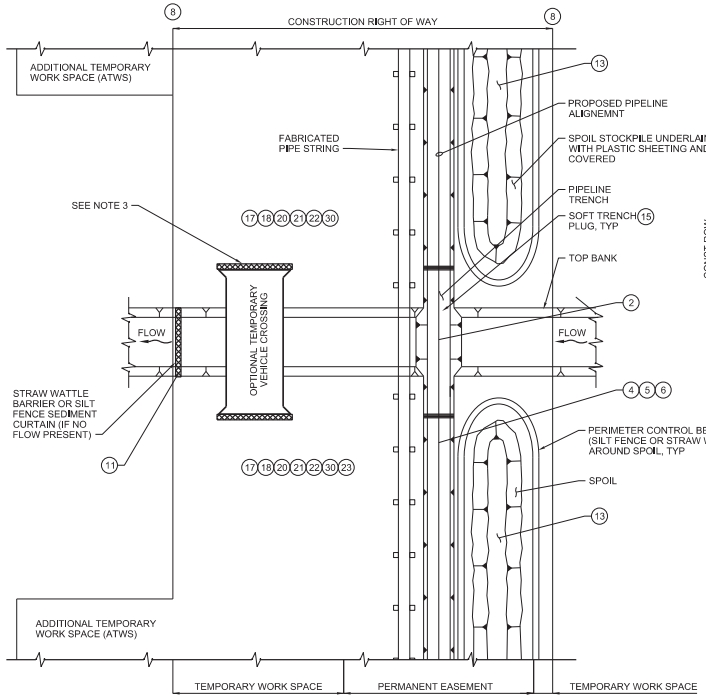


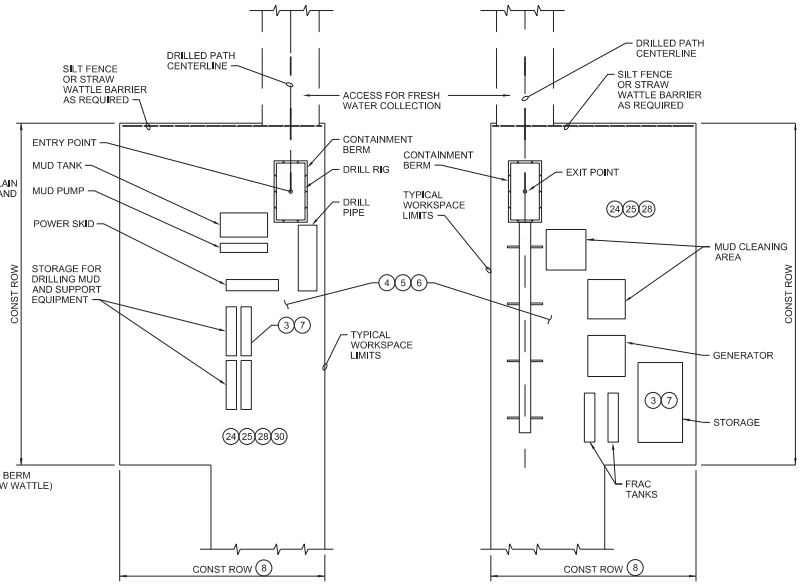
PLAN

NOTES:

1. METHOD APPLIES TO CROSSINGS WHERE NO FLOWING WATER IS PRESENT AT THE TIME OF CROSSING.
2. NO REFUELING OF MOBILE EQUIPMENT WITHIN 150 FEET OF DRY CHANNEL.
3. INSTALLATION OF TEMPORARY EQUIPMENT CROSSING IS OPTIONAL BASED ON OBSERVED SITE CONDITIONS. CROSSING SHALL BE TIMBER MATS OR TEMPORARY BRIDGE.
4. CONSTRUCTION SEDIMENT BARRIERS ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY FOLLOWING CLEARING AND GRADING AND MAINTAIN UNTIL CONSTRUCTION OF THE CROSSING IS COMPLETE. EROSION CONTROL MEASURES SHALL BE REINSTALLED IMMEDIATELY FOLLOWING BACKFILLING OF TRENCH AND STABILIZATION OF BANKS. BARRIERS MAY BE TEMPORARILY REMOVED TO ALLOW CONSTRUCTION ACTIVITIES BUT MUST BE REPLACED AT THE END OF EACH WORK DAY.
5. IN-STREAM SPOIL TO BE STORED OUT OF THE STREAM CHANNEL AND WITHIN THE CONSTRUCTION RIGHT OF WAY.
6. BACKFILL WITH NATIVE MATERIAL.
7. RESTORE CROSSING CHANNEL TO APPROXIMATE PRE-CONSTRUCTION PROFILE AND SUBSTRATE.
8. RESTORE CROSSING BANKS TO APPROXIMATE ORIGINAL CONDITION AND STABILIZE WITH EROSION CONTROL MEASURES.
9. APPLICABLE KEYED NOTES: 2, 4, 5, 6, 8, 11, 13, 15, 17, 18, 20, 21, 22, 23 ON FIGURE 6A-1.

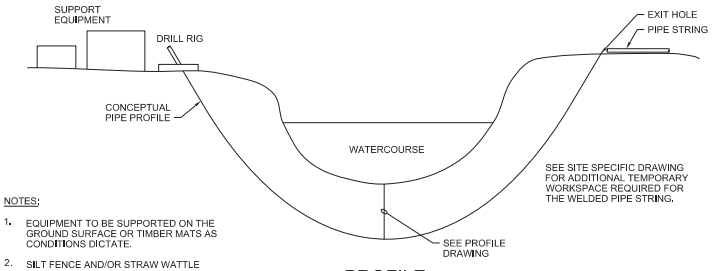
D TYPICAL NON-FLOWING WATER BODY CROSSING METHOD

1"=30'-0"



SITE PLAN ENTER SIDE

SITE PLAN EXIT SIDE



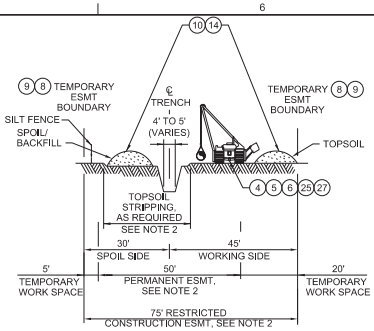
PROFILE

NOTES:

1. EQUIPMENT TO BE SUPPORTED ON THE GROUND SURFACE OR TIMBER MATS AS CONDITIONS DICTATE.
2. SILT FENCE AND/OR STRAW WATTLE BARRIER TO BE USED AS REQUIRED.
3. FOLLOW SITE SPECIFIC DRAWING PROVIDED IN THE CONSTRUCTION DRAWINGS.
4. CONFIGURATIONS SHOWN ARE TYPICAL.
5. APPLICABLE KEYED NOTES: 3, 4, 5, 6, 7, 8, 24, 25, 28 (IF SLOPED) ON FIGURE 6A-1.

E TYPICAL HORIZONTAL DRILL (HDD) SITE PLAN AND PROFILE

NTS



NOTES:

1. CONSTRUCTION EASEMENT WILL TYPICALLY BE 75' WIDE, CONSISTING OF A 50' PERMANENT EASEMENT, AND 25' OF TEMPORARY WORK SPACE. EXTRA TEMPORARY WORK SPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL AND RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.
2. THIS DRAWING REFLECTS "TRENCH AND SPOIL SIDE" TOPSOIL STRIPPING PROCEDURE, AS NEEDED. SALVAGE TOPSOIL OVER TRENCH AND UNDER THE SPOIL PILE AT LOCATIONS IDENTIFIED ON THE CONSTRUCTION ALIGNMENT SHEETS, OR AS DIRECTED BY THE COMPANY'S INSPECTOR. DEPTH OF TOPSOIL STRIPPING IS NOT TO EXCEED 12". MINIMUM WIDTH OF TOPSOIL STRIPPING ON THE WORKING SIDE OF THE TRENCH IS 12".
3. STOCKPILE TOPSOIL AS SHOWN OR IN ANY CONFIGURATION APPROVED BY THE COMPANY'S INSPECTOR, AS NEEDED. KEEP TOPSOIL CLEAN OF ALL CONSTRUCTION DEBRIS, MAINTAIN A MINIMUM 12" OF SEPARATION BETWEEN TOPSOIL AND SUBSOIL PILES.
4. NO REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 50 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 150 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
5. CONSTRUCT WHEN DRY, IF POSSIBLE. IF SITE BECOMES WET AT TIME OF TRENCHING, AVOID SOIL COMPACTION BY UTILIZING TIMBER MATS OR PREFABRICATE EQUIPMENT MATS.
6. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS (STRAW BALES AND/OR SILT FENCE) AT DOWN SLOPE EDGE OF RIGHT-OF-WAY ALONG WETLAND EDGE IF EVIDENT, OTHERWISE INSTALL BARRIER ON BOTH EDGES.
7. RESTRICT ROOT GRUBBING TO ONLY THAT AREA OVER THE DITCHLINE AND DITCH SPOIL AREAS. GRIND STUMPS IF NECESSARY IN OTHER AREAS TO FACILITATE CONSTRUCTION.
8. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
9. LEAVE HARD PLUGS AT THE EDGE OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
10. INSTALL TIMBER MATS THROUGH ENTIRE WETLAND AREA. EQUIPMENT NECESSARY FOR RIGHT-OF-WAY CLEARING MAY MAKE ONE (1) PASS THROUGH THE WETLAND BEFORE MATS ARE INSTALLED.
11. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
12. TRENCH THROUGH WETLANDS.
13. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND AND ADJACENT TO ALIGNMENT, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN.
14. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, TRENCH PLUG REQUIREMENTS SHALL BE DETERMINED BY THE ENVIRONMENTAL INSPECTOR, BACKFILL TRENCH.
15. REMOVE ANY TIMBER MATS OR PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
16. GENERALLY, SEEDING IN WETLANDS WILL NOT BE NECESSARY SINCE WETLANDS REVEGETATE QUICKLY AND SOD WILL REMAIN INTACT EXCEPT OVER TRENCH. THE CONTRACTOR SHALL SEED ANY WETLANDS THAT MAY REQUIRE SEEDING AS DETERMINED BY THE ENVIRONMENT INSPECTOR.
17. FLAG WETLAND BOUNDARIES PRIOR TO CLEARING.
18. INSTALL TEMPORARY SLOPE BREAKER UPSLOPE WITHIN 100 FEET OF WETLAND BOUNDARY IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
19. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL.
20 APPLICABLE KEYED NOTES: 4, 5, 6, 8, 9, 10, 14, 25, 27 ON FIGURE 6A-1.

F TYPICAL WETLANDS CROSSINGS

1"=20'-0"

LEGEND:

(X) KEYED NOTE, SEE FIGURE 6A-1

NO.	DATE	REVISION	BY	APVD

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EROSION SEDIMENT CONTROL TYPICALS

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		from MP:	to MP:
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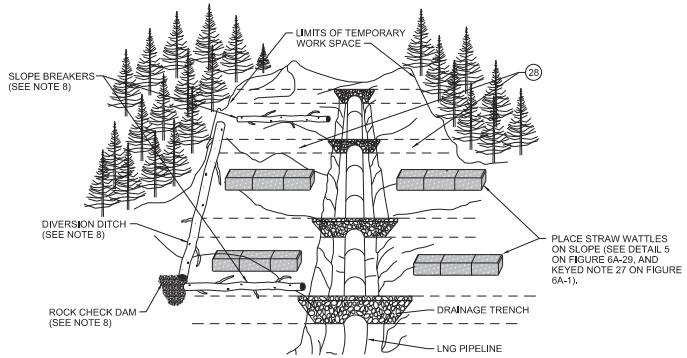
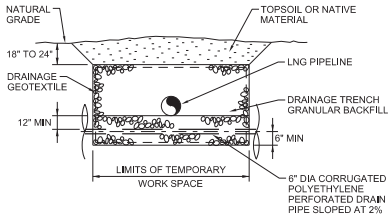
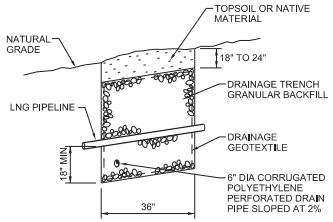


PLAN



CROSS SECTION



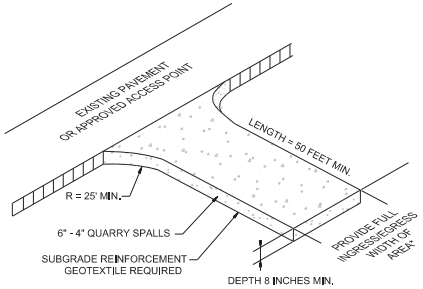
SIDE VIEW

NOTES:

1. INSTALL DRAINAGE TRENCH AND PIPING WITHIN DISTURBED SLOPES ACROSS CONSTRUCTION EASEMENT AT LOCATION AND ORIENTATION SHOWN ON THE CONSTRUCTION DRAWING.
2. DRAINAGE TRENCH GRANULAR BACKFILL COMPACTED TO 91% OF ASTM D698 IN ALL TRENCH AREAS OUTSIDE LNG PIPE ZONE.
3. PLACE DRAINAGE GEOTEXTILE BETWEEN NATIVE MATERIAL AND DRAINAGE TRENCH GRANULAR BACKFILL ON ALL SIDES, TOP, AND BASE OF TRENCH.
4. PLACE 6" DIAMETER CORRUGATED POLYETHYLENE PERFORATED DRAIN PIPE AT 2% SLOPE IN DIRECTION SHOWN IN DRAWING.
5. PLACE 6" DIAMETER OUTLET PIPE AT LOCATIONS SHOWN ON DRAWING.
6. CONNECT 6" DIAMETER CORRUGATED POLYETHYLENE PERFORATED DRAIN PIPE TO 6" DIAMETER NON-PERFORATED OUTLET PIPE AND DAYLIGHT AT LOCATIONS SHOWN ON DRAWING.
7. INSTALL ROCK CHECK DAM AT OUTLET OF NON-PERFORATED PIPE.
8. ON STEEP SLOPES AS NEEDED, ADD SLOPE BREAKER, DIVERSION DITCH AND ROCK CHECK DAM AT LOCATION AND ORIENTATION SHOWN ON THE CONSTRUCTION DRAWINGS. SEE DETAIL 6 ON SHEET C-182.
9. SLOPE BREAKERS (DETAIL 6 ON FIGURE 6A-30) TO BE USED AT TOE OF SLOPE.
10. ADDITIONAL INFORMATION FOR STEEP SLOPE CONSTRUCTION SHOWN IN DETAIL 7 ON FIGURE 6A-30.
11. APPLICABLE KEYED NOTES; 28 ON FIGURE 6A-1.

G TYPICAL PIPELINE CROSSING - STEEP SLOPE

NTS



NOTES:

1. A STABILIZED CONSTRUCTION ENTRANCE WILL BE INSTALLED AT THE JUNCTION OF TEMPORARY CONSTRUCTION ACCESS GRAVELED ROADS AND PAVED ACCESS ROADS. IF TRACKING IS OBSERVED VACUUMING, SWEEPING, OR OTHER BMP'S SUCH AS THE INSTALLATION OF A TRUCK WHEEL WASH (DETAIL 8 ON FIGURE 6A-31) WILL BE IMPLEMENTED.

H TYPICAL CONSTRUCTION ENTRANCE

NTS

LEGEND:

(X) KEYED NOTE, SEE FIGURE 6A-1

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EROSION SEDIMENT CONTROL TYPICALS

LOC: OREGON AND WASHINGTON		from STA:	to STA:
		from MP:	to MP:
PROJ: 199863	DATE: DECEMBER 2013	DWG: FIG 6A-28	REVISION:

FILENAME: ESA Details FIG6A-28.dwg PLOT DATE: 2013\12\05 PLOT TIME: 12:11:20 PM

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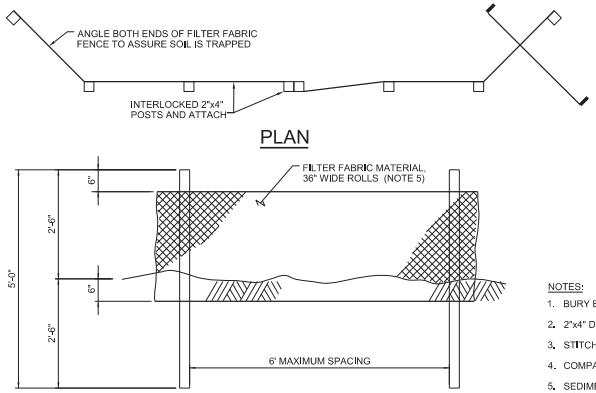
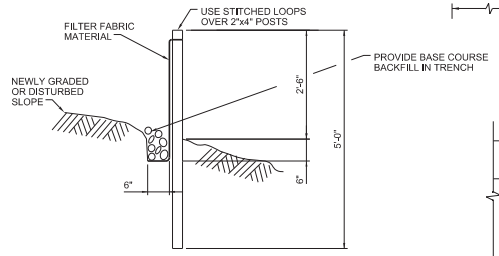


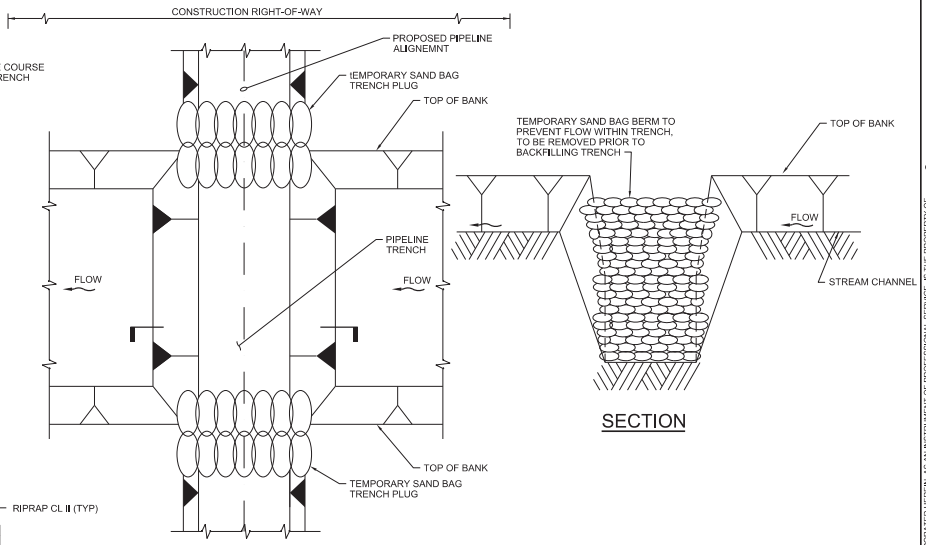


NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x4" DOUGLAS FIR OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.
5. SEDIMENT BARRIER MATERIAL SHALL HAVE A MINIMUM MESH AOS OF 0.60mm (#30 SIEVE), WITH A MINIMUM FABRIC STRENGTH OF 100 LBS.

DETAIL 1 - SILT FENCE

NTS



DETAIL 3 - TRENCH PLUG

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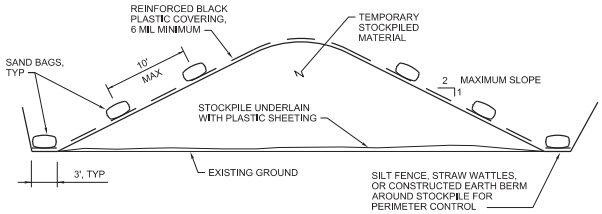
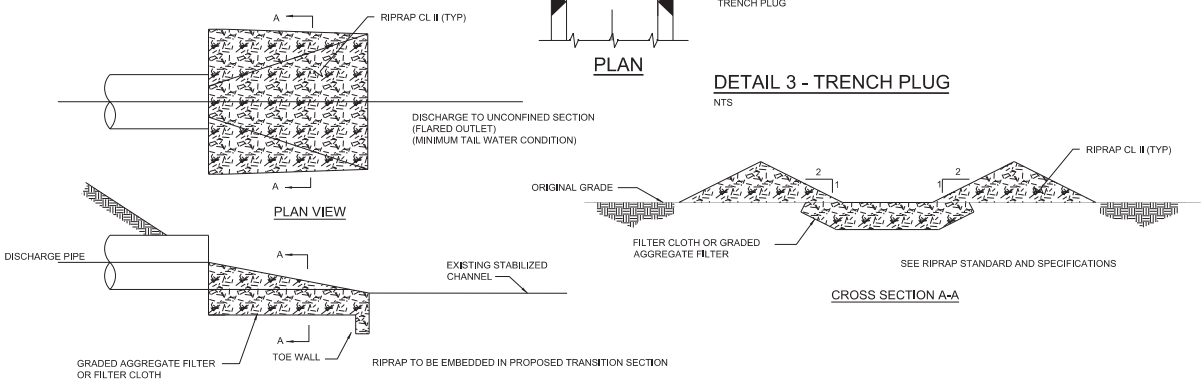


NOTES:

1. ALL SEAMS SHALL BE TAPED OR WEIGHTED DOWN FULL LENGTH. ALL SEAMS SHALL HAVE A MINIMUM 12" OVERLAP.
2. SEAMS PARALLEL TO THE SLOPE CONTOUR SHALL HAVE THE UPHILL SHEET OVERLAP THE DOWN HILL SHEET.
3. NO SURFACE RUN-OFF SHALL BE ALLOWED TO RUN UNDER THE PLASTIC COVERING.
4. DRAINAGE FROM AREAS COVERED BY REINFORCED PLASTIC SHEETING SHALL BE CONTROLLED SUCH THAT NO DISCHARGE OCCURS DIRECTLY ONTO UNCONTROLLED DISTURBED AREAS OF THE CONSTRUCTION SITE.
5. ALL SAND BAGS SHALL BE MAINTAINED IN PLACE WITH ROPE.

DETAIL 2 - PLASTIC SHEETING

NTS

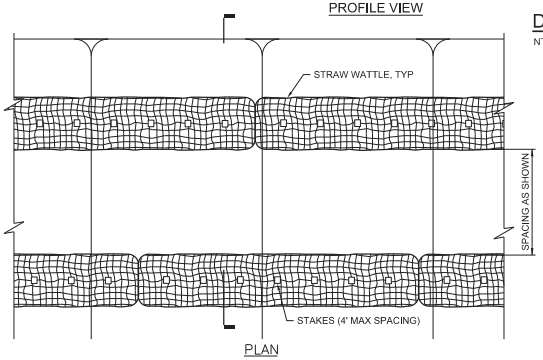


DETAIL 4 - RIPRAP PROTECTION

NTS

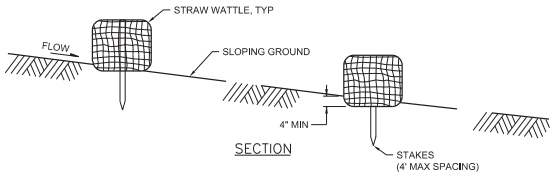
STRAW WATTLE NOTES:

1. STAKING OF WATTLES IS REQUIRED USING (2) 2"x2"x3' LONG WOOD STAKES OR APPROVED EQUAL.
2. DRIVE STAKES MINIMUM 12" INTO GROUND AND FLUSH WITH TOP OF WATTLES.
3. EMBED WATTLES MINIMUM OF 4" INTO GROUND SURFACE.
4. SEE KEYED NOTE 27 ON FIGURE 6A-1.



DETAIL 5 - STRAW WATTLES

NTS



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EROSION SEDIMENT CONTROL DETAILS

LOC: OREGON AND WASHINGTON		from STA:	to STA:
		from MP:	to MP:
PROJ: 199863	DATE: DECEMBER 2013	DWG: FIG 6A-29	REVISION:

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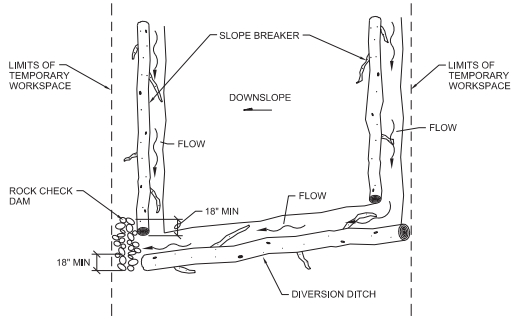

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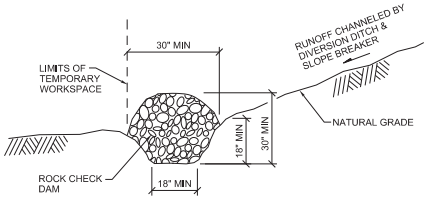
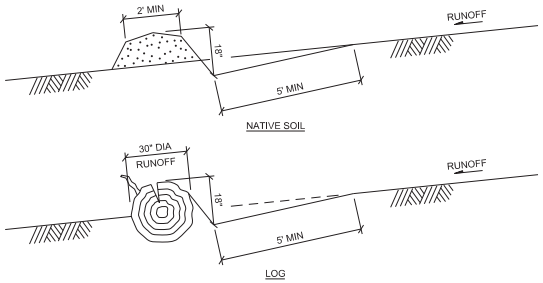




SLOPE BREAKER/DIVERSION DITCH CROSS SECTIONS

ROCK CHECK DAM NOTES:

1. ROCK CHECK DAM CONSISTS OF 4" TO 6" CRUSHED STONE. SEE SPECIFICATION FOR 4" TO 6" CRUSHED STONE.
2. CONSTRUCT ROCK CHECK DAM ON DOWNSLOPE END OF DIVERSION DITCH AS SHOWN ON DETAIL.
3. CONSTRUCT ROCK CHECK DAM TO A MINIMUM OF 18" BEYOND EDGES OF LOGS USED AS DIVERSION DITCH OR SLOPE BREAKER AS SHOWN ON DETAIL.
4. ROCK CHECK DAM MINIMUM WIDTH AND HEIGHT EQUAL TO 30" AS SHOWN IN DETAIL.
5. EMBED ROCK CHECK DAM INTO NATURAL GRADE A MINIMUM OF 18" BELOW EXISTING GROUND SURFACE AS SHOWN IN DETAIL.

SLOPE BREAKER NOTES:

1. SLOPE BREAKERS SHALL BE CONSTRUCTED OF COMPACTED NATIVE SOIL OR LOG AND INSTALLED AT LOCATION AS SHOWN ON THE CONSTRUCTION DRAWINGS OR AS DIRECTED BY THE INSPECTOR. (TOPSOIL SHALL NOT BE USED)
2. SLOPE BREAKERS SHALL BE ORIENTED AS SHOWN OR OTHER PATTERN AS DIRECTED BY THE INSPECTOR TO DIRECT THE WATER OFF THE RIGHT OF WAY.
3. SLOPE BREAKERS SHALL BE CONSTRUCTED AT 2-8% GRADIENT ACROSS THE SLOPE.
4. THE SLOPE BREAKERS SHALL BE 18" DEEP (AS MEASURED FROM THE TROUGH TO THE TOP OF THE SLOPE BREAKER). THE TROUGH WILL BE A MINIMUM OF 5' WIDE ACROSS THE WIDTH OF THE RIGHT OF WAY.

   THE OUTLET OF THE SLOPE BREAKER MUST FREELY DISCHARGE ALL RUNOFF OFF THE DISTURBED RIGHT-OF-WAY INTO A DIVERSION DITCH, A STABLE WELL VEGETATED AREA, OR INTO AN ENERGY DISSIPATOR.

   WHERE SLOPE BREAKERS EXTEND BEYOND THE EDGE OF THE CONSTRUCTION R.O.W. AS APPROVED, DIRECT RUNOFF INTO STABLE, WELL VEGETATED AREAS, THESE LOCATIONS MUST BE CONFIRMED BY THE INSPECTOR.

FLOW ENERGY DISSIPATOR NOTES:

1. THE OUTLET SHALL CONTAIN AN ENERGY DISSIPATOR IF THE INSPECTOR DETERMINES EXISTING VEGETATION IS NOT SUFFICIENTLY STABLE TO PREVENT EROSION. THE ENERGY DISSIPATOR SHALL BE CONSTRUCTED AS FOLLOWS.

   - OUTFALL END OF DISSIPATOR SHOULD BE LOWER THAN SLOPE BREAKER END

   - ROCK CHECK DAM SHOULD BE KEYED INTO THE END OF THE SLOPE BREAKER

DIVERSION DITCH NOTES:

1. DIVERSION DITCH SHALL BE CONSTRUCTED OF COMPACTED NATIVE SOIL OR LOG AND INSTALLED AT LOCATION AS SHOWN ON THE CONSTRUCTION DRAWINGS OR AS DIRECTED BY THE INSPECTOR. (TOPSOIL SHALL NOT BE USED)
2. DIVERSION DITCH SHALL BE ORIENTED AS SHOWN OR OTHER PATTERN AS DIRECTED BY THE INSPECTOR TO DIRECT THE WATER OFF THE RIGHT OF WAY.
3. UPSLOPE END OF DIVERSION DITCH SHALL EXTEND A MINIMUM OF 30" UPSLOPE OF SLOPE BREAKER AS SHOWN ON DETAIL.
4. THE DIVERSION DITCH SHALL BE 18" DEEP (AS MEASURED FROM THE TROUGH TO THE TOP OF THE SLOPE BREAKER). THE TROUGH WILL BE A MINIMUM OF 5' WIDE ACROSS THE WIDTH OF THE RIGHT OF WAY.
5. THE OUTLET OF THE DIVERSION DITCH MUST FREELY DISCHARGE ALL RUNOFF OFF THE DISTURBED RIGHT-OF-WAY INTO A STABLE. WELL VEGETATED AREA OR INTO AN ENERGY DISSIPATOR.
6. WHERE DIVERSION DITCH EXTENDS BEYOND THE EDGE OF THE CONSTRUCTION R.O.W. AS APPROVED, DIRECT RUNOFF INTO STABLE, WELL VEGETATED AREAS, THESE LOCATIONS MUST BE CONFIRMED BY THE INSPECTOR.

FLOW ENERGY DISSIPATOR NOTES:

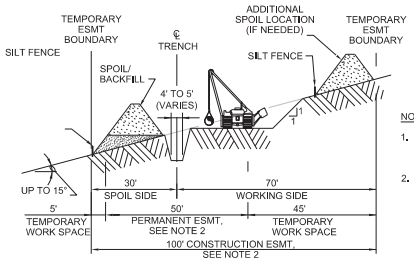
1. THE OUTLET SHALL CONTAIN AN ENERGY DISSIPATOR IF THE INSPECTOR DETERMINES EXISTING VEGETATION IS NOT SUFFICIENTLY STABLE TO PREVENT EROSION. THE ENERGY DISSIPATOR SHALL BE CONSTRUCTED AS FOLLOWS.

   - OUTFALL END OF DISSIPATOR SHOULD BE LOWER THAN DIVERSION DITCH END

   - ROCK CHECK DAM SHOULD BE KEYED INTO THE END OF THE SLOPE BREAKER

DETAIL 6 - TYPICAL SLOPE BREAKER, DIVERSION DITCH AND ROCK CHECK DAM

NTS

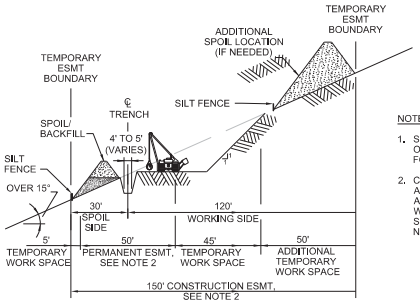


NOTES:

1. SIDE HILL CONSTRUCTION CUT AND FILL SHALL BE ALLOWED WHENEVER, IN THE OPINION OF THE CONTRACTOR, STEEP SIDE HILL CONSTRUCTION IS WARRANTED FOR PERSONAL AND/OR EQUIPMENT SAFETY CONSIDERATIONS.
2. CONSTRUCTION EASEMENT WILL TYPICALLY BE 100' WIDE, CONSISTING OF A 50' PERMANENT EASEMENT AND A 50' OF TEMPORARY WORK SPACE. EXTRA TEMPORARY WORK SPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL AND RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.

DETAIL 7.1 - EASEMENT FOR SIDE HILL CONSTRUCTION DETAIL

1"=20'-0"



NOTES:

1. SIDE HILL CONSTRUCTION CUT AND FILL SHALL BE ALLOWED WHENEVER, IN THE OPINION OF THE CONTRACTOR, STEEP SIDE HILL CONSTRUCTION IS WARRANTED FOR PERSONAL AND/OR EQUIPMENT SAFETY CONSIDERATIONS.
2. CONSTRUCTION EASEMENT WILL TYPICALLY BE 150' WIDE, CONSISTING OF A 50' PERMANENT EASEMENT, 50' OF TEMPORARY WORK SPACE AND 50' OF ADDITIONAL TEMPORARY WORK SPACE. EXTRA TEMPORARY WORK SPACE WILL BE NECESSARY AT MAJOR ROAD, RAIL AND RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.

DETAIL 7.2 - EASEMENT FOR SEVERE SIDE HILL CONSTRUCTION DETAIL

1"=30'-0"

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
B. OSTAPKOWICZ	A STEPHENSON	N WILLIAMS	R ATTANASIO

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

EROSION AND SEDIMENT CONTROL DETAILS

LOC: OREGON AND WASHINGTON		from STA:	to STA:
		from MP:	to MP:
PROJ: 199863	DATE: DECEMBER 2013	DWG: FIG 6A-30	REVISION:

FILENAME: ESA Details FIG6A-30.dgn PLOT DATE: 2013\12\05 PLOT TIME: 12:15:36 PM

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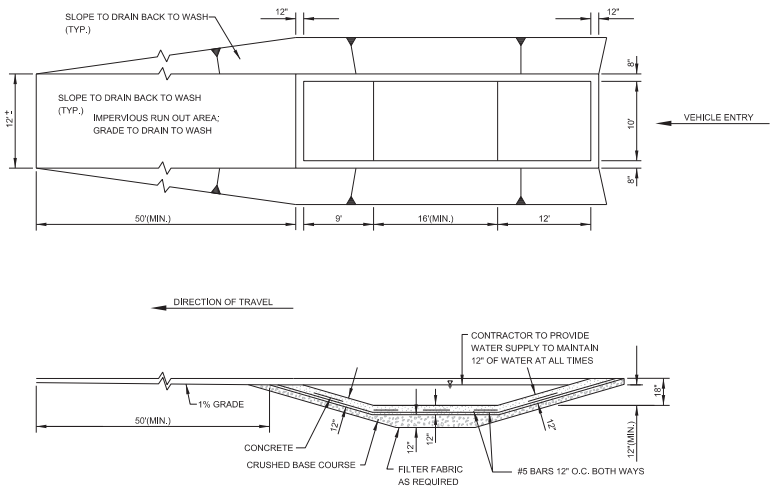
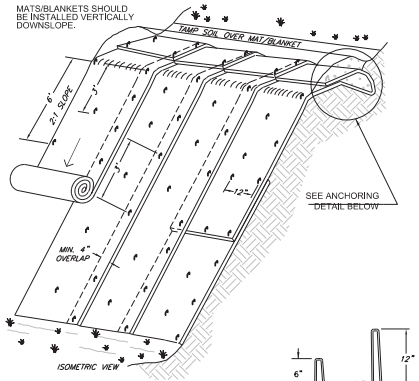


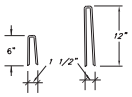
NOTES:
1. CONTRACTOR TO REMOVE ACCUMULATED SEDIMENT FROM WHEEL WASH; MAY BE PIPED TO AN APPROVED SEDIMENT TRAP.
2. USE GEOTEXTILE FABRIC WITH AGGREGATE FOR A TEMPORARY TIRE WASH.

DETAIL 8 - TIRE WASH (DRIVE THROUGH)

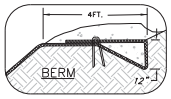
NTS



TYPICAL SLOPE SOIL STABLIZATION



STAPLES



ANCHORING DETAIL

NOTES:
1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS, MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTRACT WITH SOIL. DO NOT STRETCH.
3. STAKING OR STAPLING LAYOUT PER MANUFACTURER'S SPECIFICATIONS.

DETAIL 9 - EROSION BLANKETS SLOPE INSTALLATION

NTS

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
B. OSTAPKOWICZ	A STEPHENSON	N WILLIAMS	R ATTANASIO

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

EROSION AND SEDIMENT CONTROL DETAILS

LOC: OREGON AND WASHINGTON		from STA:	to STA:
		from MP:	to MP:
PROJ: 199863	DATE: DECEMBER 2013	DWG: FIG 6A-31	REVISION:

FILENAME: ESA Details FIG6A-31.dwg PLOT DATE: 2013\12\05 PLOT TIME: 12:26:00 PM

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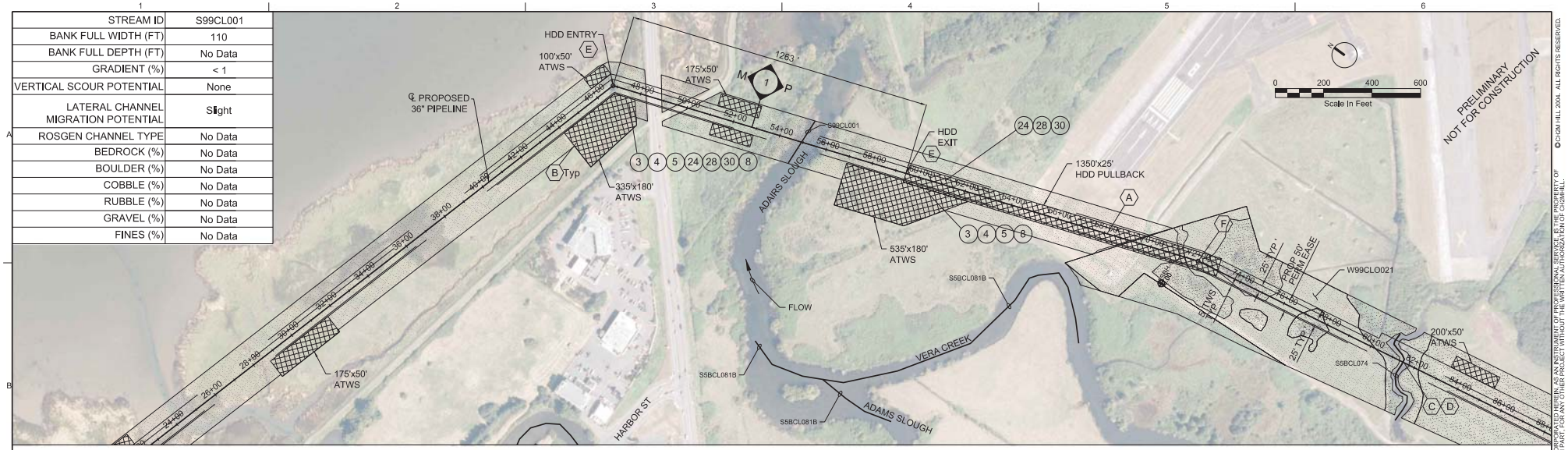
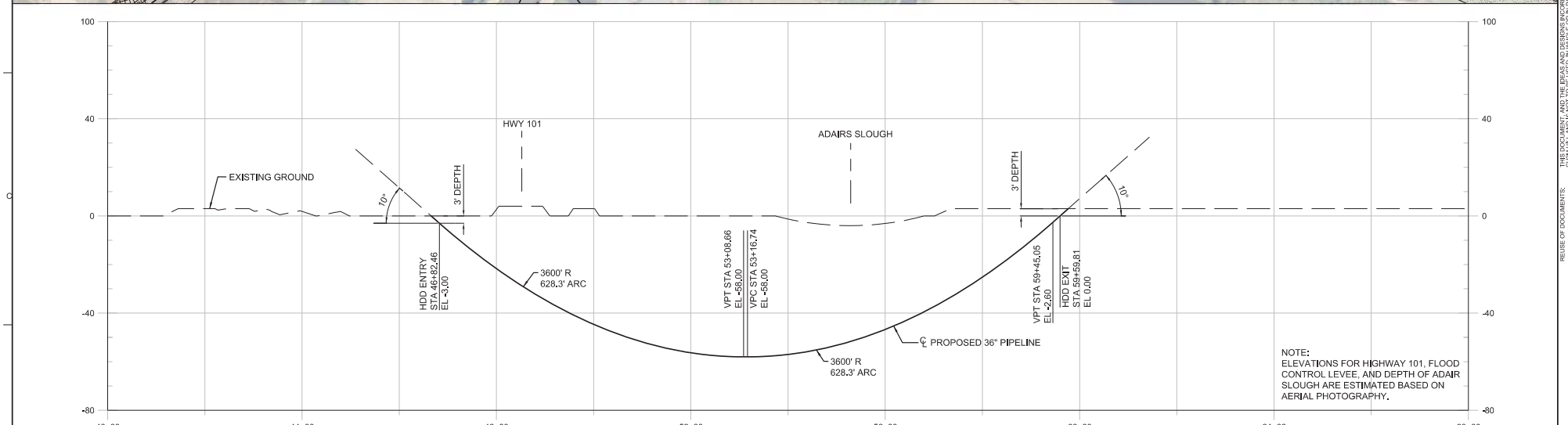
STREAM ID	S99CL001
BANK FULL WIDTH (FT)	110
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data





PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
T. COTTEN	K. KONG	M. BRICKER	XXXX

MATERIAL

SCALE: 1"=400'
VERIFY SCALE

LEGEND
- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- SECTION LINE
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- UTILITY LINE
- OVERHEAD POWER LINE
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG
OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

CH2MHILL

ESA Stream Crossing
Adair Slough

LOC: CLATSOP COUNTY, OREGON		from STA: 24+00	to STA: 86+00
		from MP: 0.45	to MP: 1.63
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-3	REVISION:

FILENAME: 2013\12\05 PLOT TIME: 1:05:13 PM

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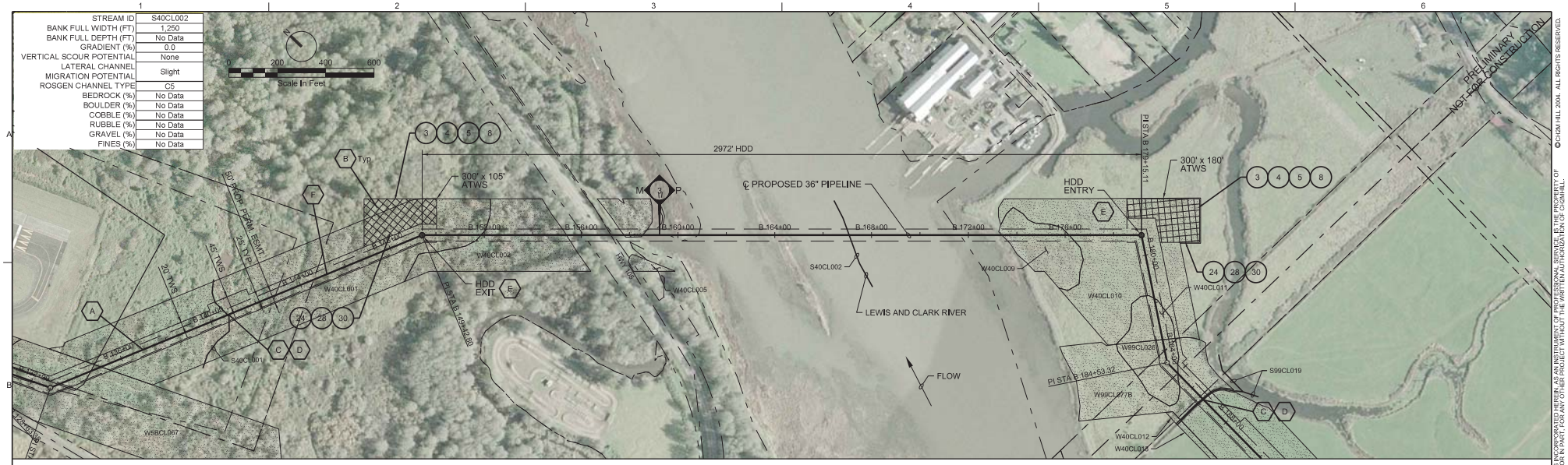
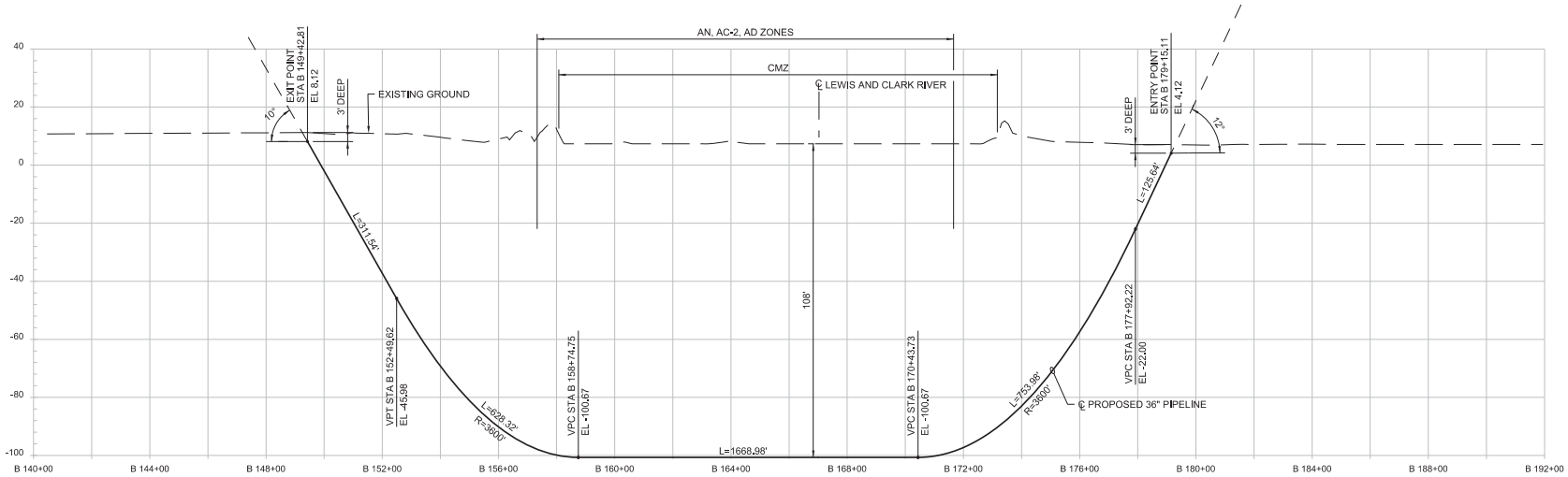
STREAM ID	S40CL002
BANK FULL WIDTH (FT)	1,250
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	0.0
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	C5
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data





PROFILE

HORIZ: 1"=400'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=400'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- PROPERTY LINE
- CITY LIMIT LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Lewis and Clark River

from STA:	B 149+42.81	to STA:	B 179+15.11
from MP:	2.86	to MP:	3.36

LOC:	CLATSOP COUNTY, OREGON				
PROJ:	199863	DATE:	DECEMBER, 2013	DWG: C-702	REVISION: 1

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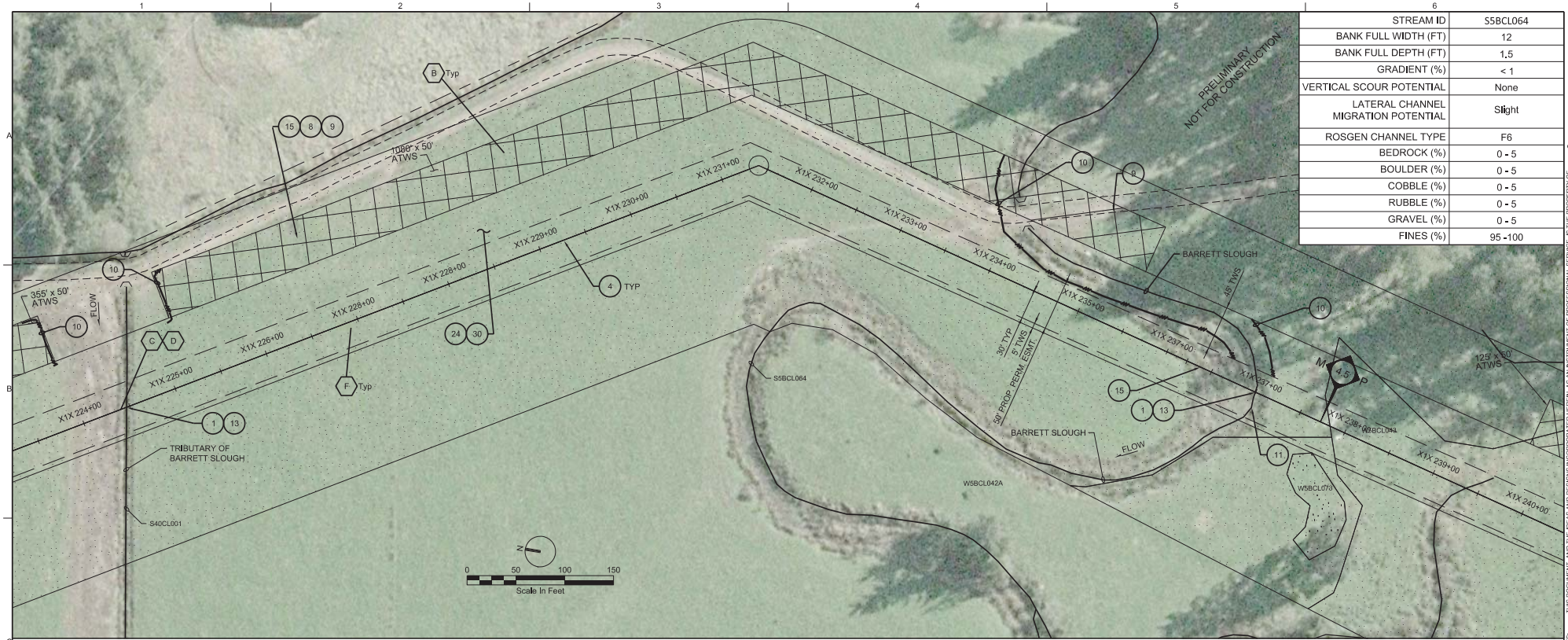
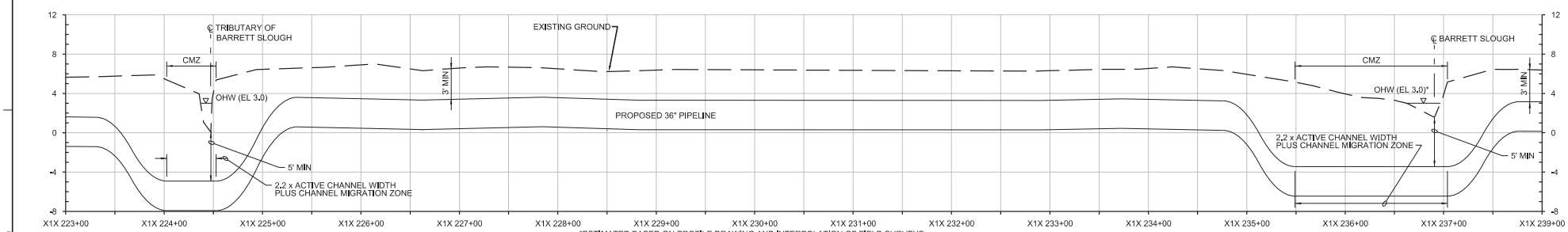


STREAM ID	S5BCL064
BANK FULL WIDTH (FT)	12
BANK FULL DEPTH (FT)	1.5
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	F6
BEDROCK (%)	0 - 5
BOULDER (%)	0 - 5
COBBLE (%)	0 - 5
RUBBLE (%)	0 - 5
GRAVEL (%)	0 - 5
FINES (%)	95 -100



*ESTIMATED BASED ON PROFILE DRAWING AND INTERPOLATION OF FIELD SURVEYS

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=100'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- DIVERSION DITCH
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Barrett Slough

LOC:	CLATSOP COUNTY , OREGON	from STA: X1X 224+00	to STA: X1X 240+00
		from MP: 4.2	to MP: 4.5
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIG 6A-5	REVISION: 1

FILENAME: C-703.dgn PLOT DATE: 2013\12\05 PLOT TIME: 2:57:57 PM

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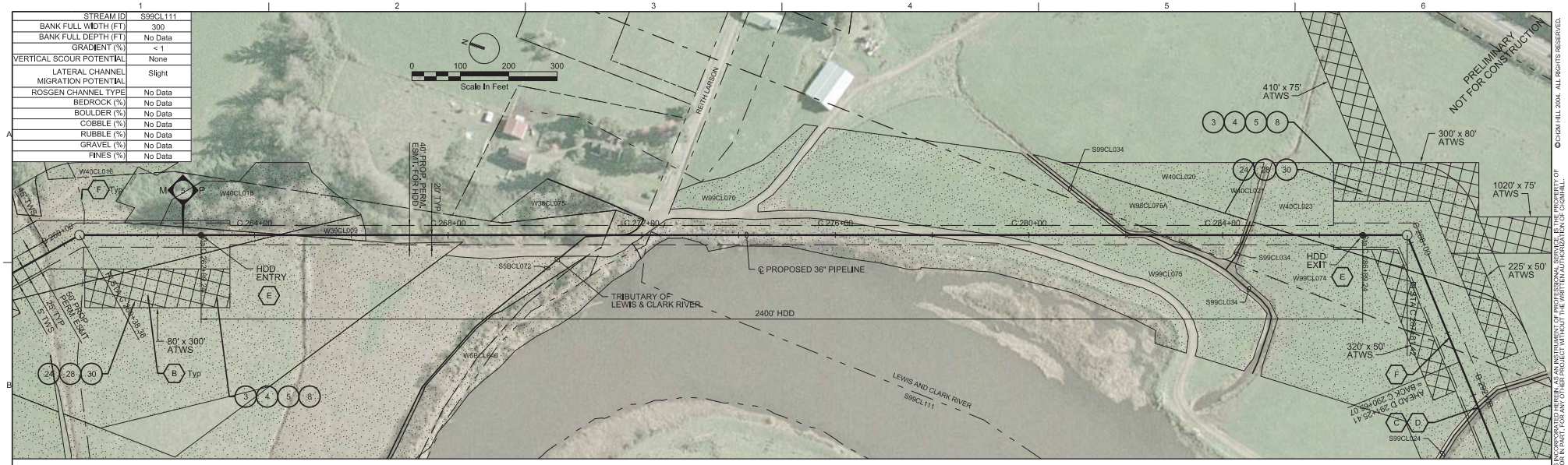
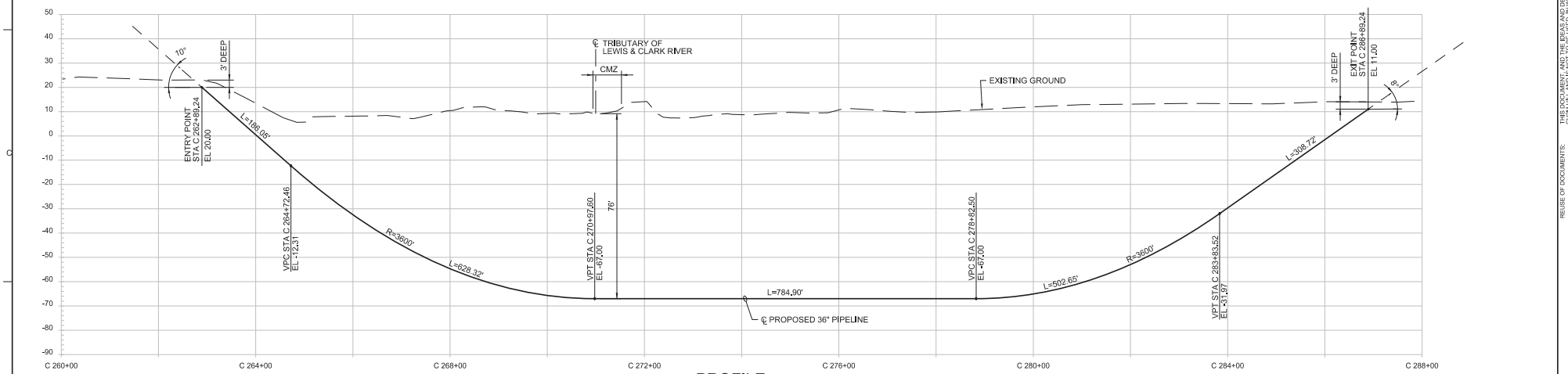
STREAM ID	S99CL111
BANK FULL WIDTH (FT)	300
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data





PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Lewis & Clark River

from STA:	C 262+89.24	to STA:	C 286+89.24
from MP:	5.02	to MP:	5.47

LOC:	CLATSOP COUNTY, OREGON				
PROJ:	199863	DATE:	DECEMBER, 2013	DWG:	Figure 6A-6
REVISION:	1				

FILENAME: C-705.dgn PLOT DATE: 2013\12\05 PLOT TIME: 3:05:14 PM

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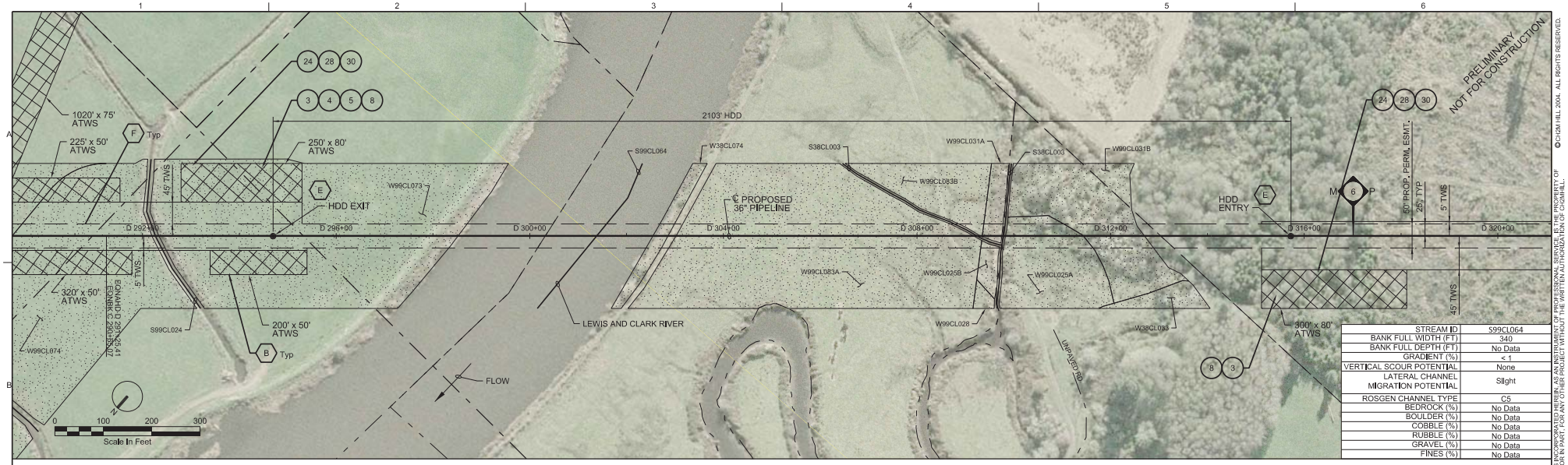
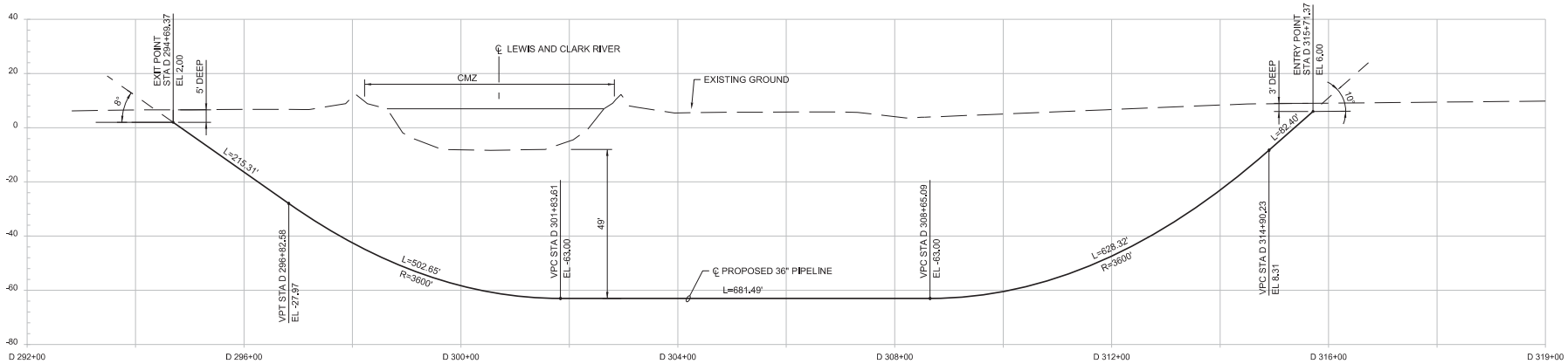


STREAM ID	S99CL064
BANK FULL WIDTH (FT)	340
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	C5
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Lewis and Clark River

from STA:	D 294+69.37	to STA:	D 315+71.37
from MP:	5.58	to MP:	5.98
LOC:	CLATSOP COUNTY, OREGON		
PROJ:	199863	DATE:	DECEMBER, 2013
DWG:	C-706	REVISION:	1

FILENAME: C-706.dgn PLOT DATE: 2013\12\05 PLOT TIME: 3:12:36 PM

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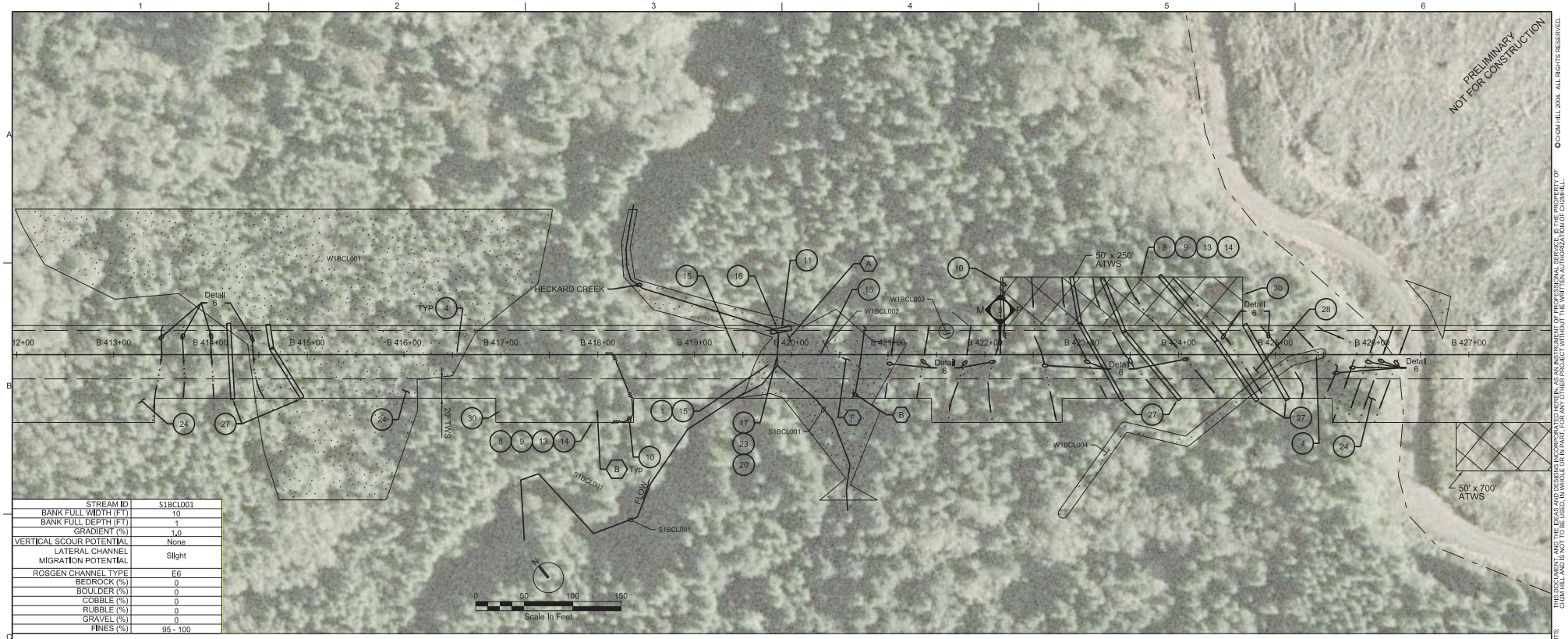
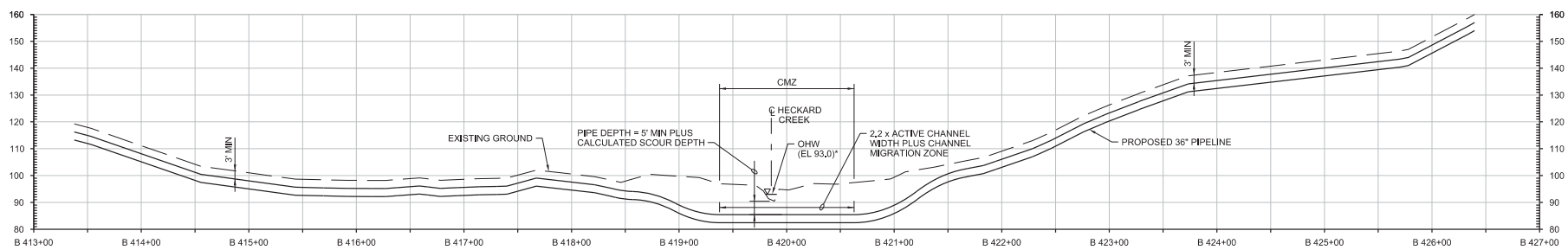


STREAM ID	S1BCL001
BANK FULL WIDTH (FT)	10
BANK FULL DEPTH (FT)	1
GRADIENT (%)	1.0
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	E6
BEDROCK (%)	0
BOULDER (%)	0
COBBLE (%)	0
RUBBLE (%)	0
GRAVEL (%)	0
FINES (%)	95 - 100



*ESTIMATED BASED ON PROFILE DRAWING AND INTERPOLATION OF FIELD SURVEYS.

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=100'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- DIVERSION DITCH
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Heckard Creek

LOC:	CLATSOP COUNTY , OREGON	from STA: B 413+00	to STA: B 427+00
		from MP: 7.8	to MP: 8.1
PROJ: 199863	DATE: DECEMBER, 2013	DWG: C-708	REVISION: 1

FILENAME: C-708.dgn PLOT DATE: 2013\12\05 PLOT TIME: 3:42:08 PM

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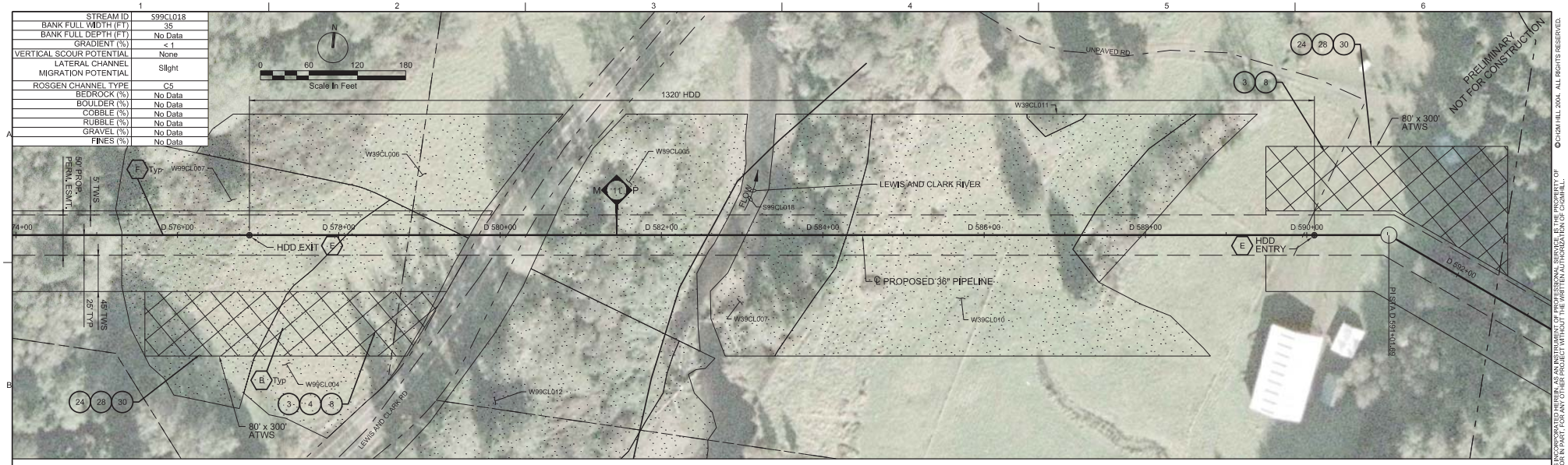
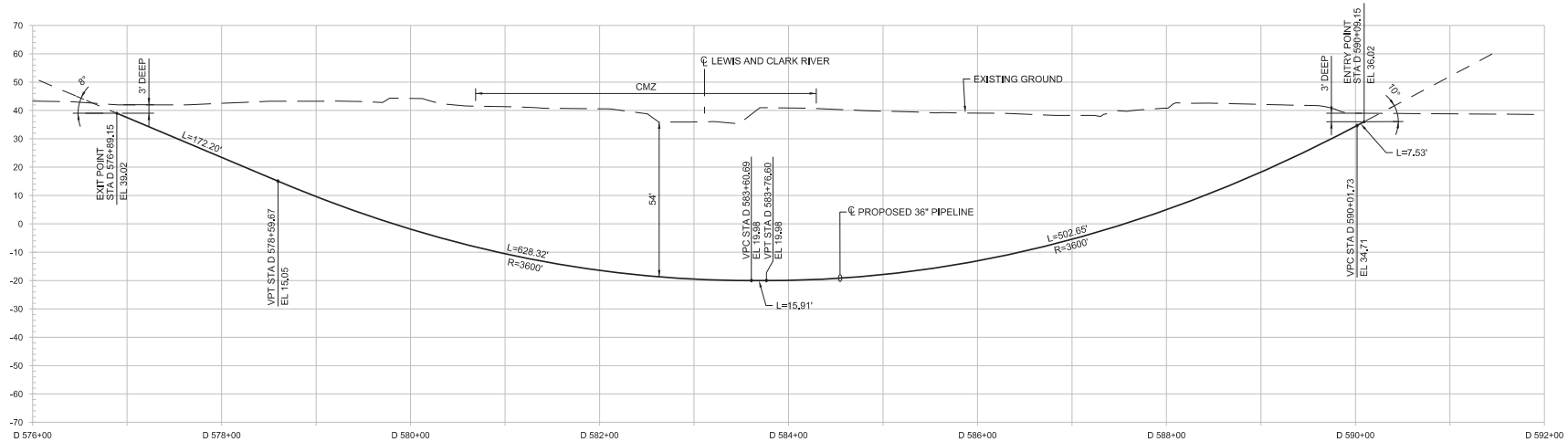
STREAM ID	S99CL018
BANK FULL WIDTH (FT)	35
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	C5
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data





PROFILE

HORIZ: 1"=120'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=120'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Lewis and Clark River

from STA:	D 576+89.15	to STA:	D 590+09.15
from MP:	10.91	to MP:	11.16

LOC:	CLATSOP COUNTY, OREGON		
PROJ:	199863	DATE:	DECEMBER, 2013
DWG:	C-709	REVISION:	1

FILENAME: C-709.dgn PLOT DATE: 2013\12\05 PLOT TIME: 3:45:53 PM

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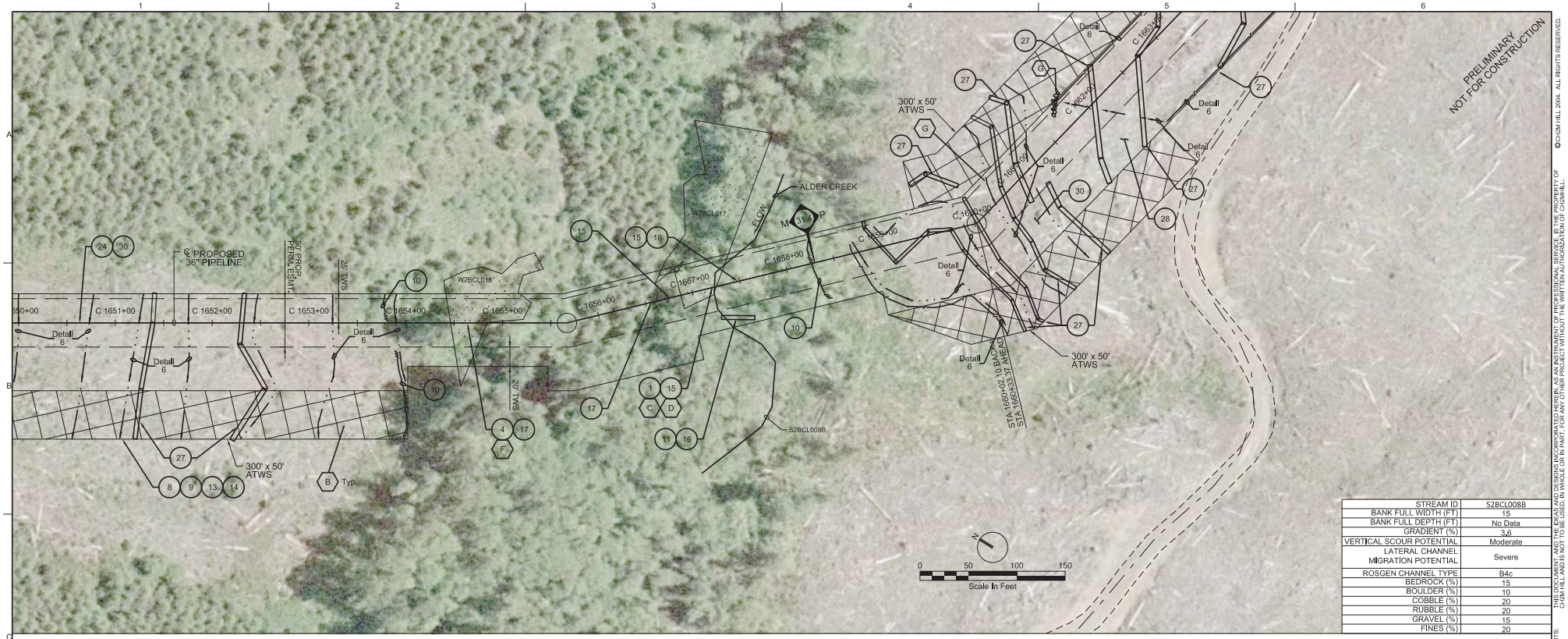
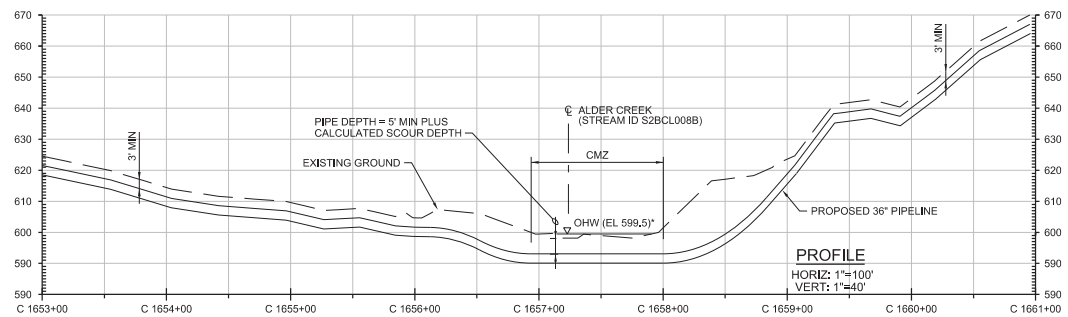


STREAM ID	S2BCL008B
BANK FULL WIDTH (FT)	15
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	3.8
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	B4c
BEDROCK (%)	15
BOULDER (%)	10
COBBLE (%)	20
RUBBLE (%)	20
GRAVEL (%)	15
FINES (%)	20



*ESTIMATED BASED ON PROFILE DRAWING AND INTERPOLATION OF FIELD SURVEYS.

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON ROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=100'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- DIVERSION DITCH
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Alder Creek

from STA:	C 1651+00	to STA:	C 1663+00
from MP:	31.3	to MP:	31.5

LOC:	CLATSOP COUNTY , OREGON		
PROJ:	199863	DATE:	DECEMBER, 2013
DWG:	C-710	REVISION:	1

FILENAME: C-710.dgn PLOT DATE: 2013\12\05 PLOT TIME: 3:53:24 PM

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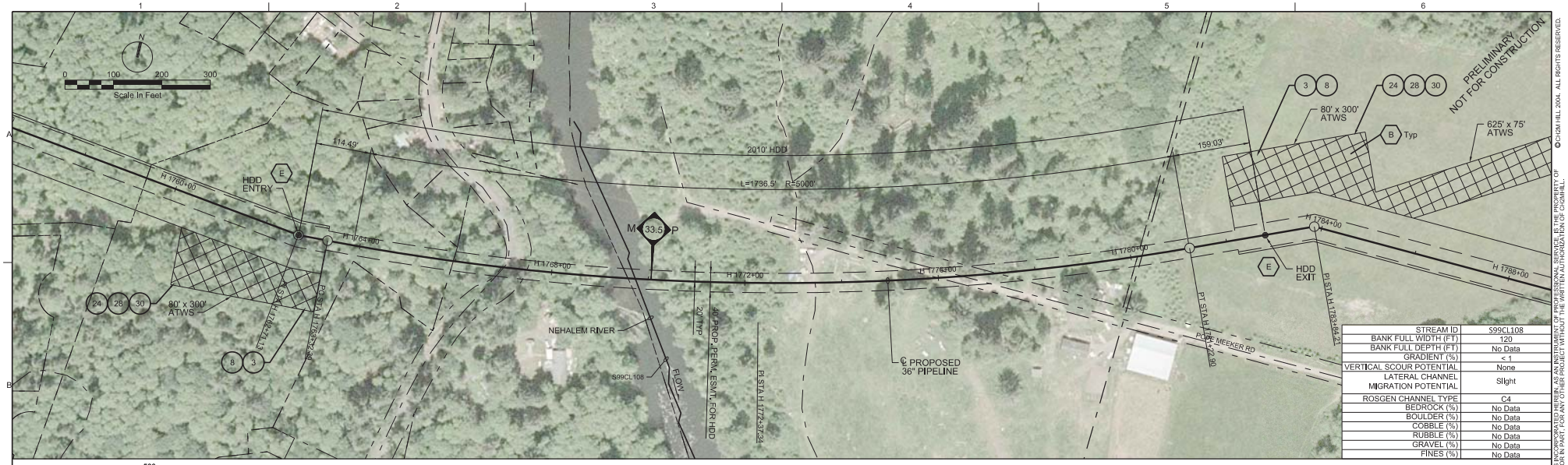
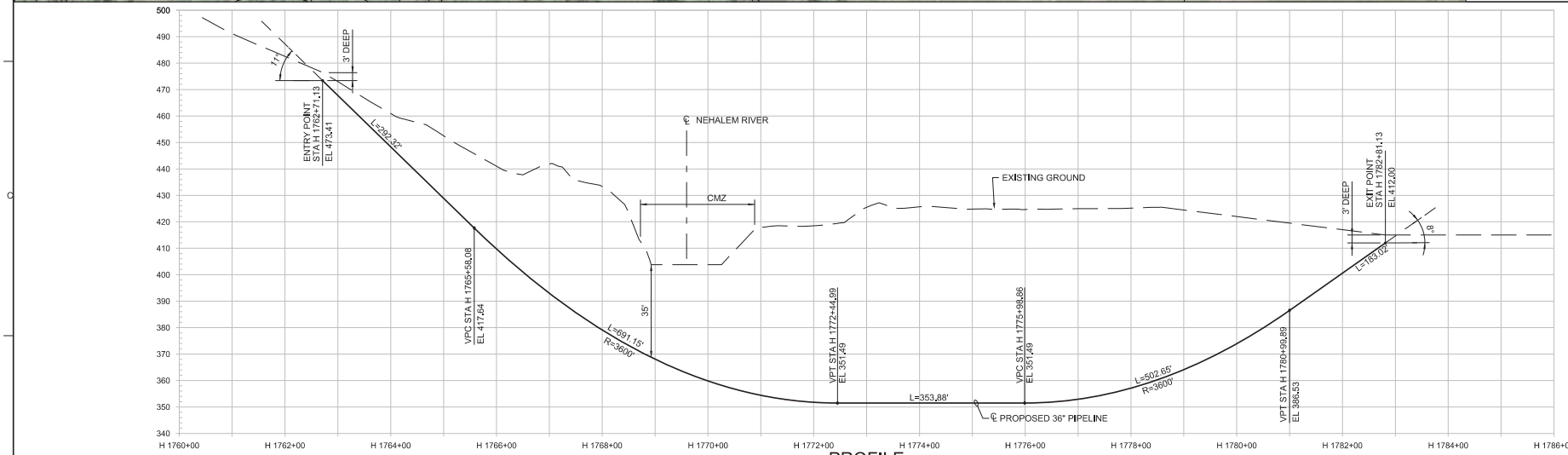


STREAM ID	S99CL108
BANK FULL WIDTH (FT)	120
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	C4
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=200'

VERIFY SCALE: BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1". IF NOT ONE INCH THEN ADJUST SCALE ACCORDINGLY

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- PROPERTY LINE
- CITY LIMIT LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Nehalem River

LOC: CLATSOP COUNTY, OREGON		from STA: H 1762+71.13	to STA: H 1782+81.13
		from MP: 33.44	to MP: 33.58
PROJ: 199863	DATE: DECEMBER, 2013	DWG: C-711	REVISION: 1

FILENAME: C-711.dgn PLOT DATE: 2013\12\05 PLOT TIME: 4:00:22 PM

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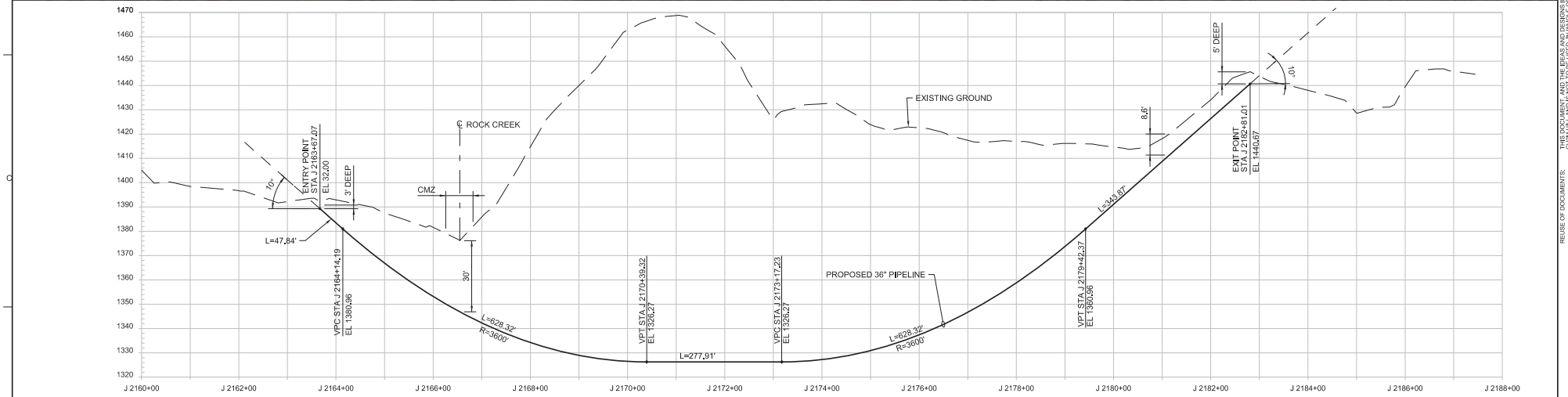
STREAM ID	S8BCL005
BANK FULL WIDTH (FT)	20
BANK FULL DEPTH (FT)	3
GRADIENT (%)	2.2
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	F5b
BEDROCK (%)	15 - 20
BOULDER (%)	0 - 5
COBBLE (%)	5 - 10
RUBBLE (%)	20 - 25
GRAVEL (%)	15 - 20
FINES (%)	55 - 60



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=200'
VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Rock Creek

from STA:	J 2163+67.07	to STA:	J 2182+81.01
from MP:	40.91	to MP:	41.27
DWG:	C-712	REVISION:	1

LOC: CLATSOP COUNTY, OREGON
PROJ: 199863 DATE: DECEMBER, 2013

FILENAME: C-712.dgn PLOT DATE: 2013\12\05 PLOT TIME: 4:06:09 PM

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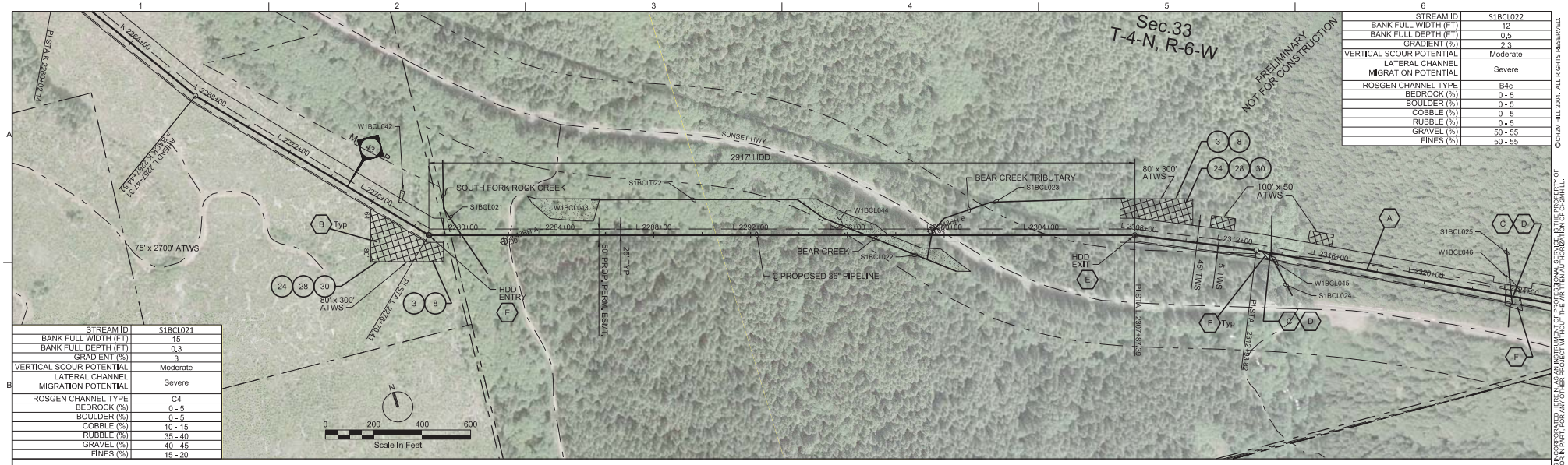
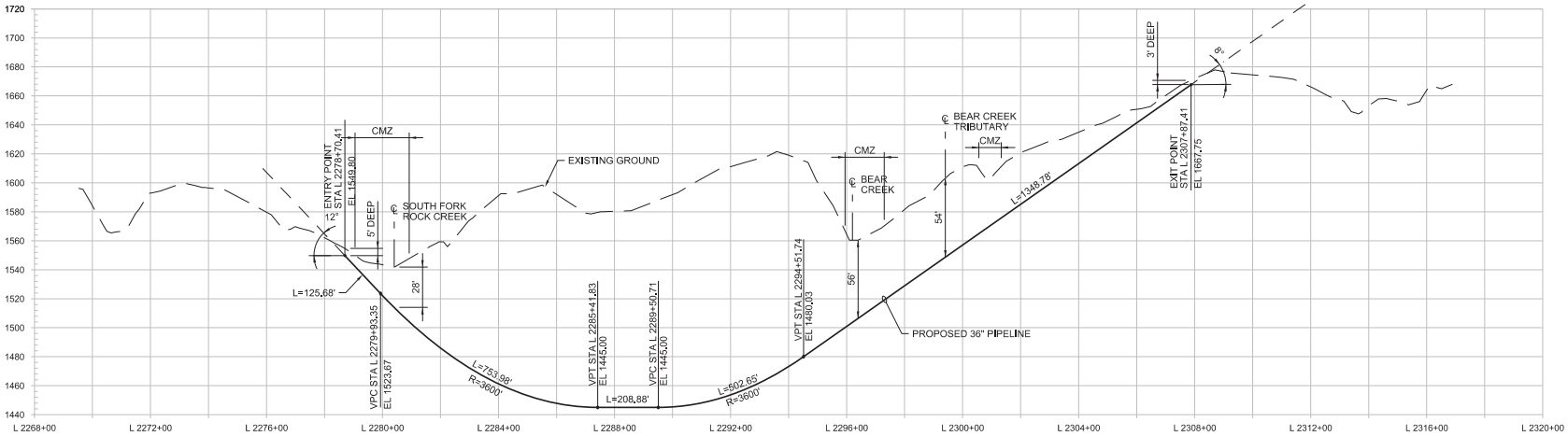


STREAM ID	S1BCL022
BANK FULL WIDTH (FT)	12
BANK FULL DEPTH (FT)	0.5
GRADIENT (%)	2.3
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	B4c
BEDROCK (%)	0 - 5
BOULDER (%)	0 - 5
COBBLE (%)	0 - 5
RUBBLE (%)	0 - 5
GRAVEL (%)	50 - 55
FINES (%)	50 - 55

STREAM ID	S1BCL021
BANK FULL WIDTH (FT)	15
BANK FULL DEPTH (FT)	0.3
GRADIENT (%)	3
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	C4
BEDROCK (%)	0 - 5
BOULDER (%)	0 - 5
COBBLE (%)	10 - 15
RUBBLE (%)	35 - 40
GRAVEL (%)	40 - 45
FINES (%)	15 - 20



PROFILE

HORIZ: 1"=400'
VERT: 1"=80'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
R SMETANA	J PFEIFER	M BRICKER	XXX

SCALE: 1"=400'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
South Fork Rock Creek and Bear Creek

from STA: L 2278+70.41	to STA: L 2307+87.39		
LOC: CLATSOP COUNTY, OREGON	from MP: 43.07	to MP: 43.63	
PROJ: 199863	DATE: DECEMBER, 2013	DWG: C-715	REVISION: 1

FILENAME: C-715.dgn PLOT DATE: 2013\12\05 PLOT TIME: 4:09:40 PM

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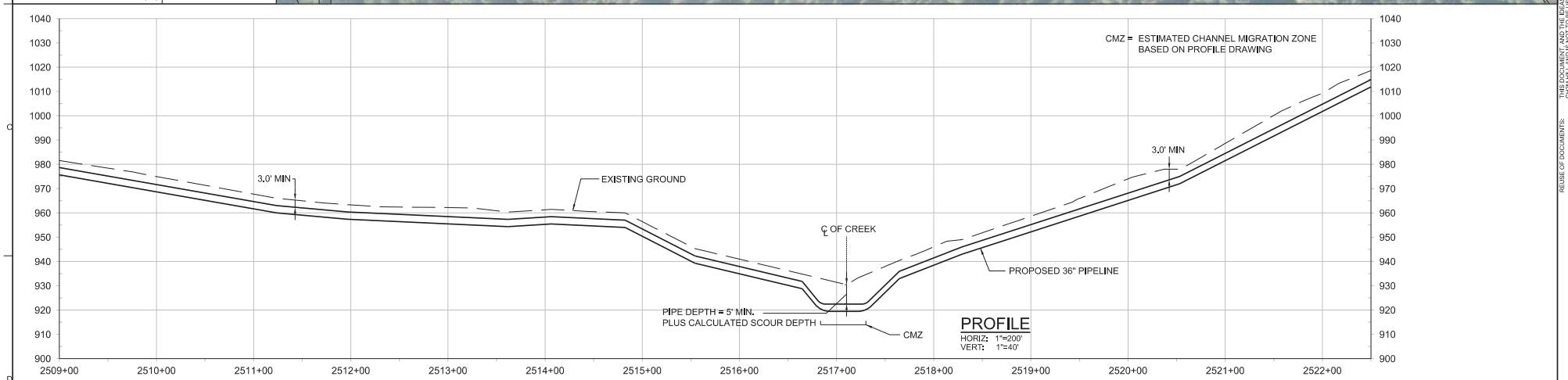
STREAM ID	S6BCO002
BANK FULL WIDTH (FT)	35
BANK FULL DEPTH (FT)	5
GRADIENT (%)	1
VERTICAL SCOUR POTENTIAL	Slight
LATERAL CHANNEL MIGRATION POTENTIAL	Moderate
ROSGEN CHANNEL TYPE	B3
BEDROCK (%)	80 -85
BOULDER (%)	0 - 5
COBBLE (%)	0 - 5
RUBBLE (%)	10 - 15
GRAVEL (%)	5 - 10
FINES (%)	5 - 10



NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
North Fork Wolf Creek

LOC: COLUMBIA COUNTY, OREGON		from STA: 2498+00	to STA: 2536+00
		from MP: 47.3	to MP: 48.0
PROJ: 199863	DATE: DECEMBER, 2013	DWG:	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 2:02:19 PM

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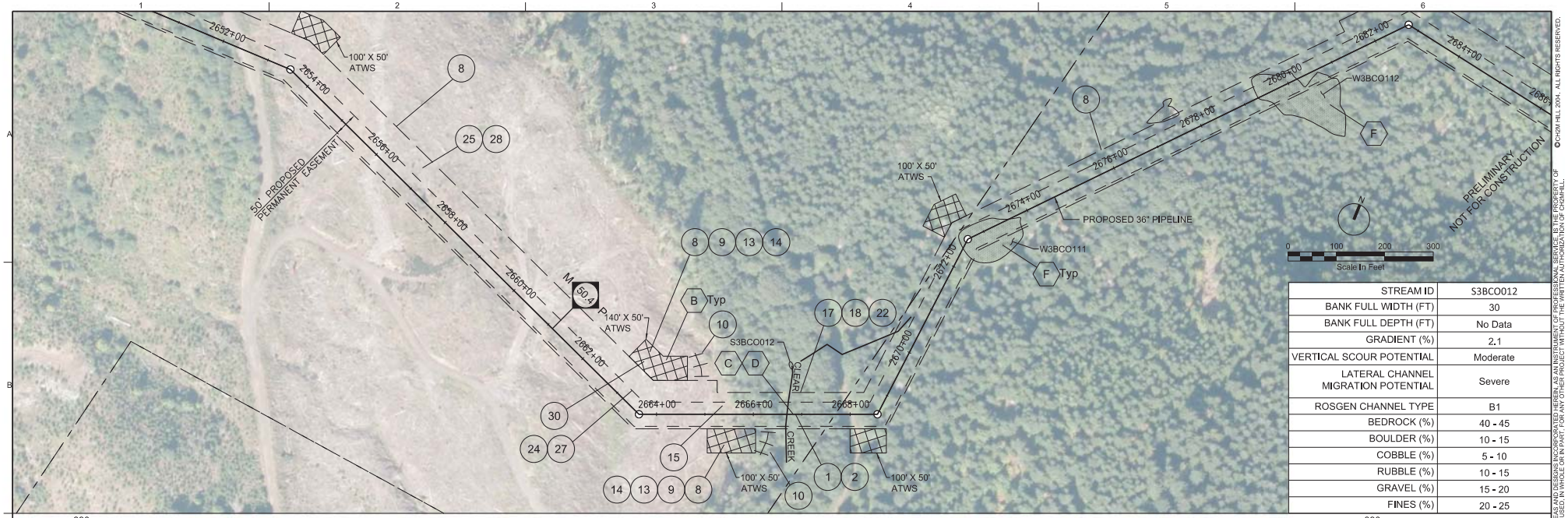
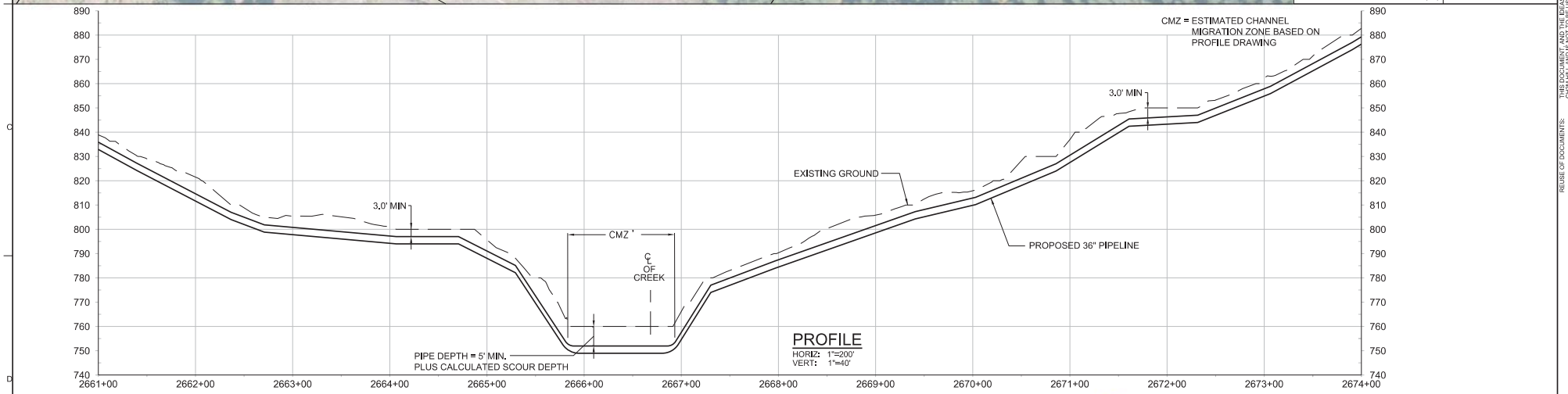


STREAM ID	S3BCO012
BANK FULL WIDTH (FT)	30
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	2.1
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	B1
BEDROCK (%)	40 - 45
BOULDER (%)	10 - 15
COBBLE (%)	5 - 10
RUBBLE (%)	10 - 15
GRAVEL (%)	15 - 20
FINES (%)	20 - 25



NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

CH2MHILL

ESA Stream Crossing
Clear Creek

LOC:	COLUMBIA COUNTY, OREGON	from STA: 2652+00	to STA: 2684+00
		from MP: 50.2	to MP: 50.8
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-15	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:35:52 PM

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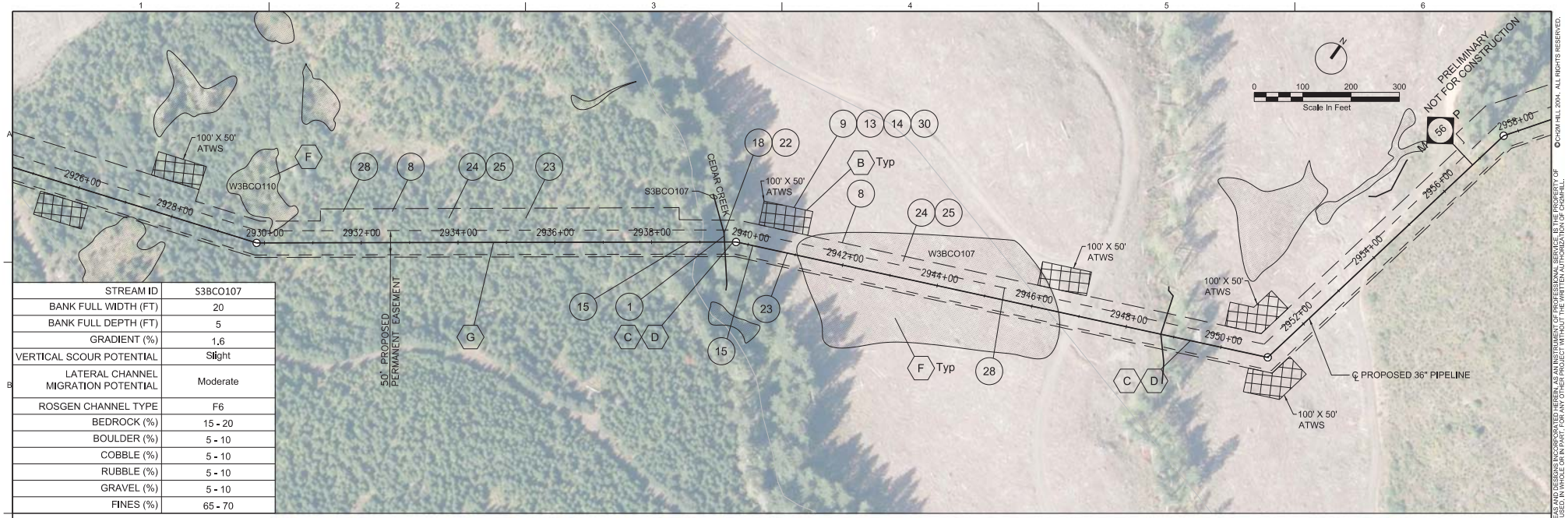
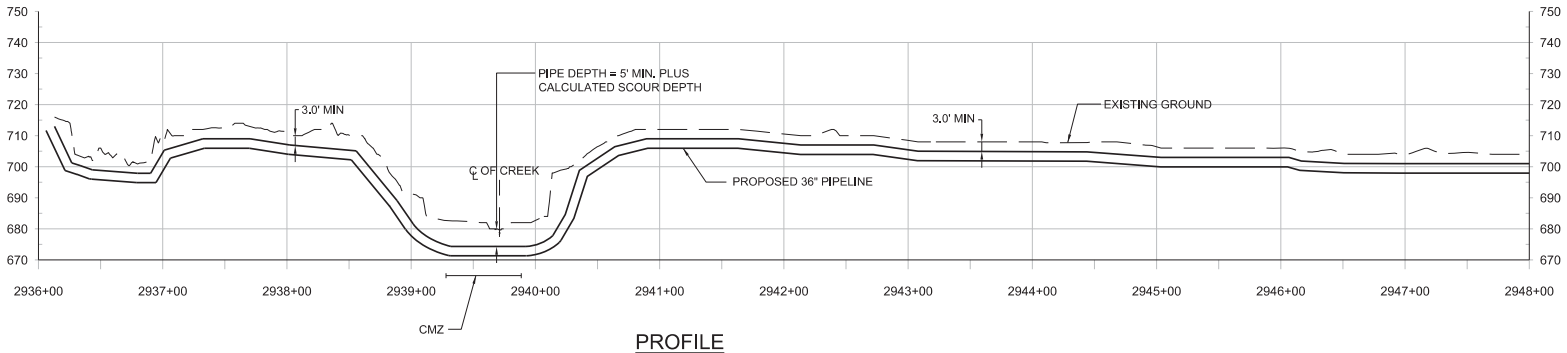


STREAM ID	S3BCO107
BANK FULL WIDTH (FT)	20
BANK FULL DEPTH (FT)	5
GRADIENT (%)	1.6
VERTICAL SCOUR POTENTIAL	Slight
LATERAL CHANNEL MIGRATION POTENTIAL	Moderate
ROSGEN CHANNEL TYPE	F6
BEDROCK (%)	15 - 20
BOULDER (%)	5 - 10
COBBLE (%)	5 - 10
RUBBLE (%)	5 - 10
GRAVEL (%)	5 - 10
FINES (%)	65 - 70

CMZ= ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

CH2MHILL

ESA Stream Crossing
Cedar Creek

LOC: COLUMBIA COUNTY, OREGON		from STA: 2926+00	to STA: 2958+00
		from MP: 55.4	to MP: 56.0
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-16	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:28:18 PM

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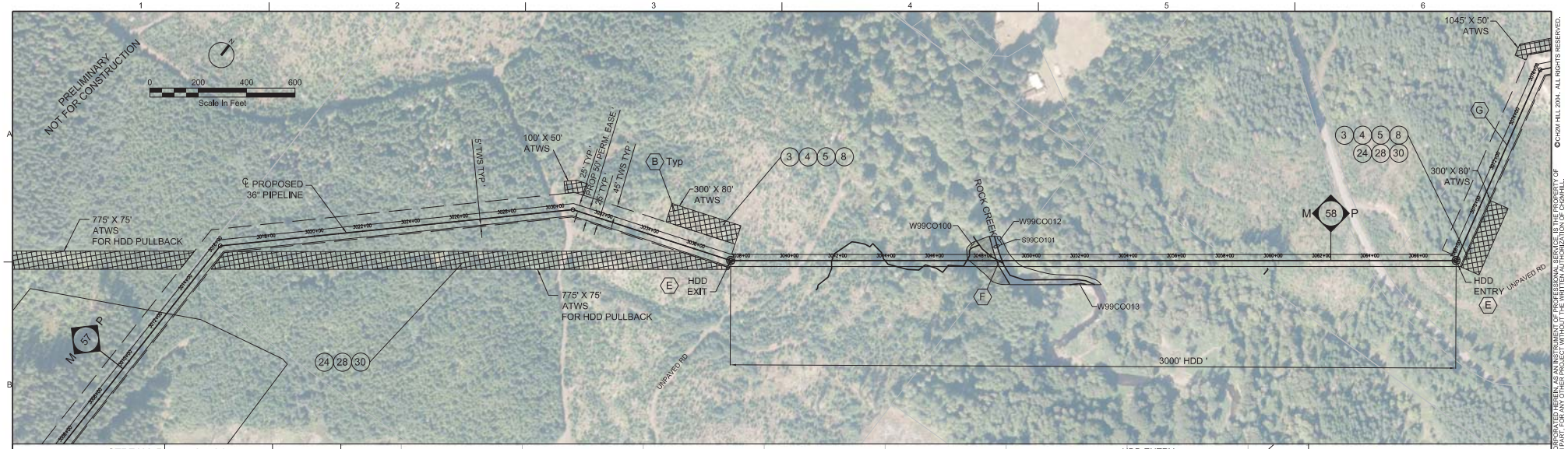
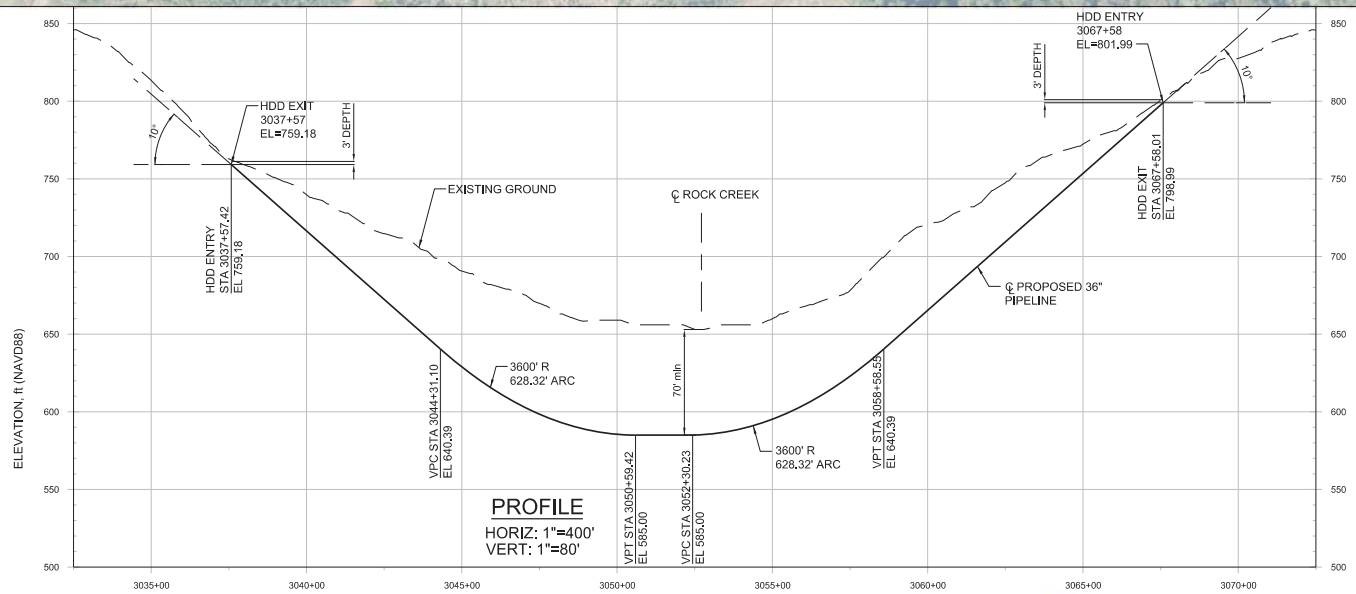


STREAM ID	S99CO101
BANK FULL WIDTH (FT)	30
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	0 - 5
BOULDER (%)	0 - 5
COBBLE (%)	0 - 5
RUBBLE (%)	0 - 5
GRAVEL (%)	0 - 5
FINES (%)	95 - 100



NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
T. COTTEN	K. KONG	M. BRICKER	XXXX

MATERIAL

SCALE: 1"=400'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- SECTION LINE
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- UTILITY LINE
- OVERHEAD POWER LINE
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Rock Creek

LOC:	COLUMBIA COUNTY, OREGON	from STA: 3008+00	to STA: 3076+00
		from MP: 57	to MP: 58.3
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-17	REVISION:

FILENAME: HDD Sheets.dgn PLOT DATE: 2013\12\05 PLOT TIME: 12:40:46 PM

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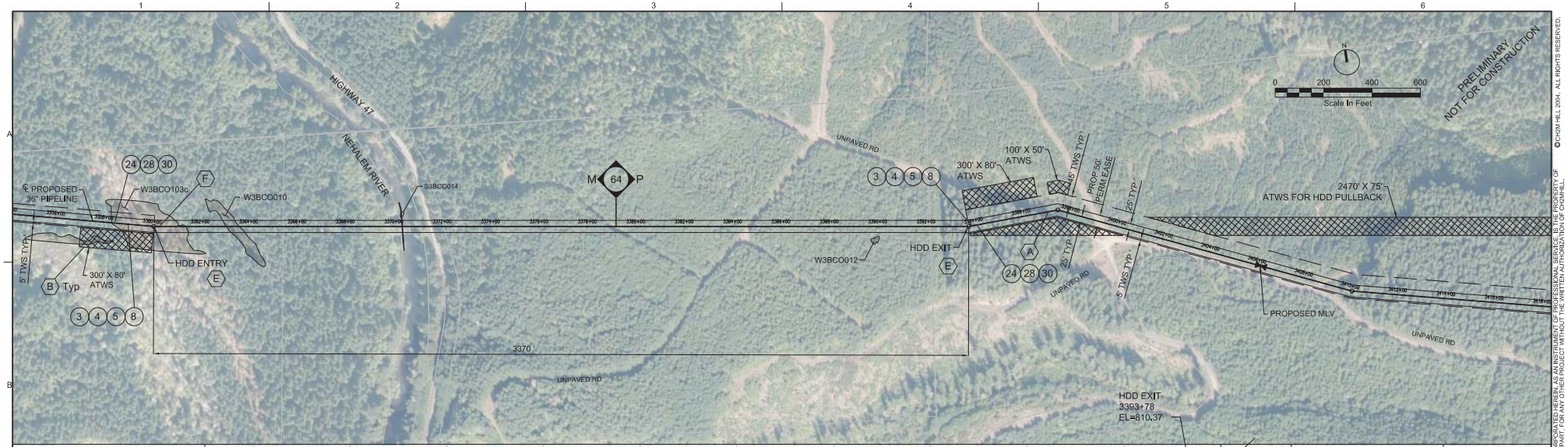

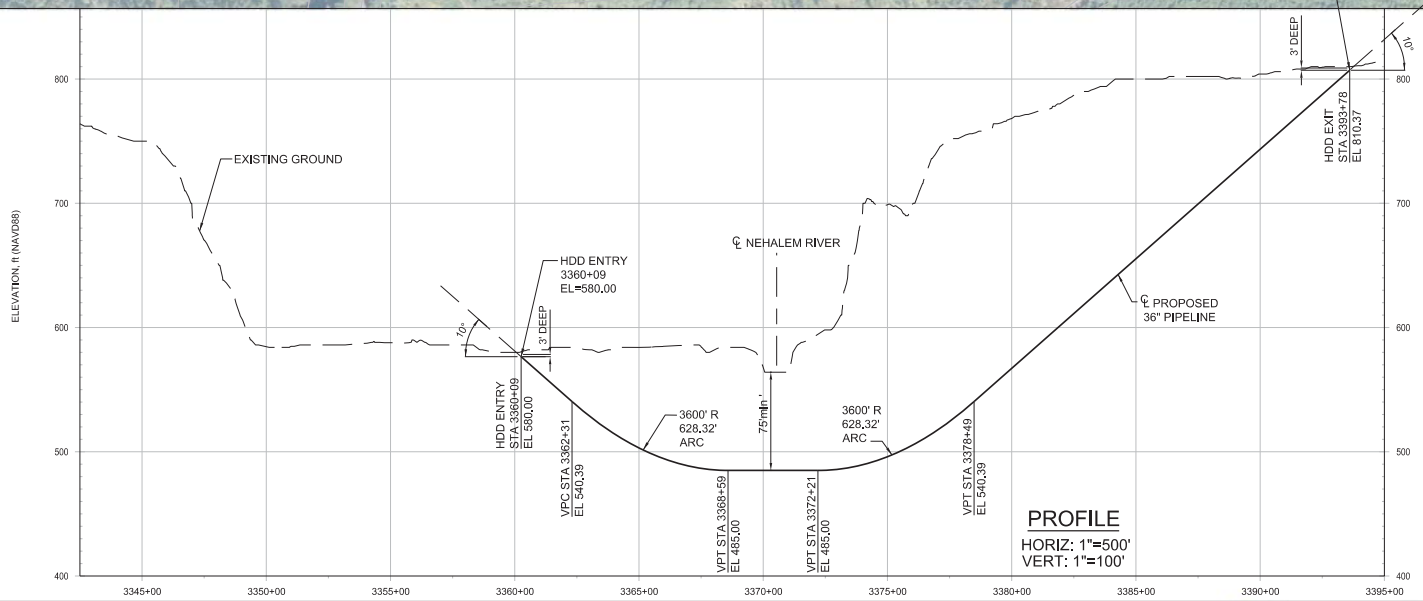

STREAM ID	S3BCO014
BANK FULL WIDTH (FT)	30
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data

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NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
T. COTTEN	K. KONG	M. BRICKER	XXXX

MATERIAL

SCALE: 1"=400'
VERIFY SCALE

LEGEND
- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- SECTION LINE
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- UTILITY LINE
- OVERHEAD POWER LINE
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG
OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

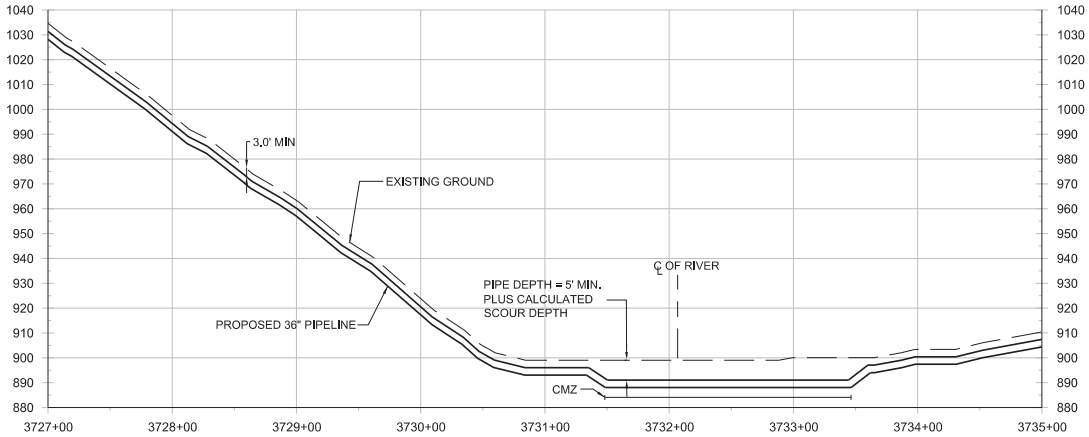
CH2MHILL

ESA Stream Crossing
Nehalem RIver

		from STA: 3356+00	to STA: 3416+00
LOC:	COLUMBIA COUNTY, OREGON	from MP: 63.6	to MP: 64.7
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-18	REVISION:

FILENAME: HDD Sheets.dgn PLOT DATE: 2013\12\05 PLOT TIME: 12:47:28 PM

STREAM ID	S99CO020
BANK FULL WIDTH (FT)	18.5
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	< 1
VERTICAL SCOUR POTENTIAL	None
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



CMZ= ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

PROFILE

HORIZ: 1"=200'
VERT: 1"=100'

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

CH2MHILL

ESA Stream Crossing
Clatskanie River

LOC: COLUMBIA COUNTY, OREGON		from STA: 3720+00	to STA: 3750+00
		from MP: 70.4	to MP: 71.0
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-19	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:31:42 PM

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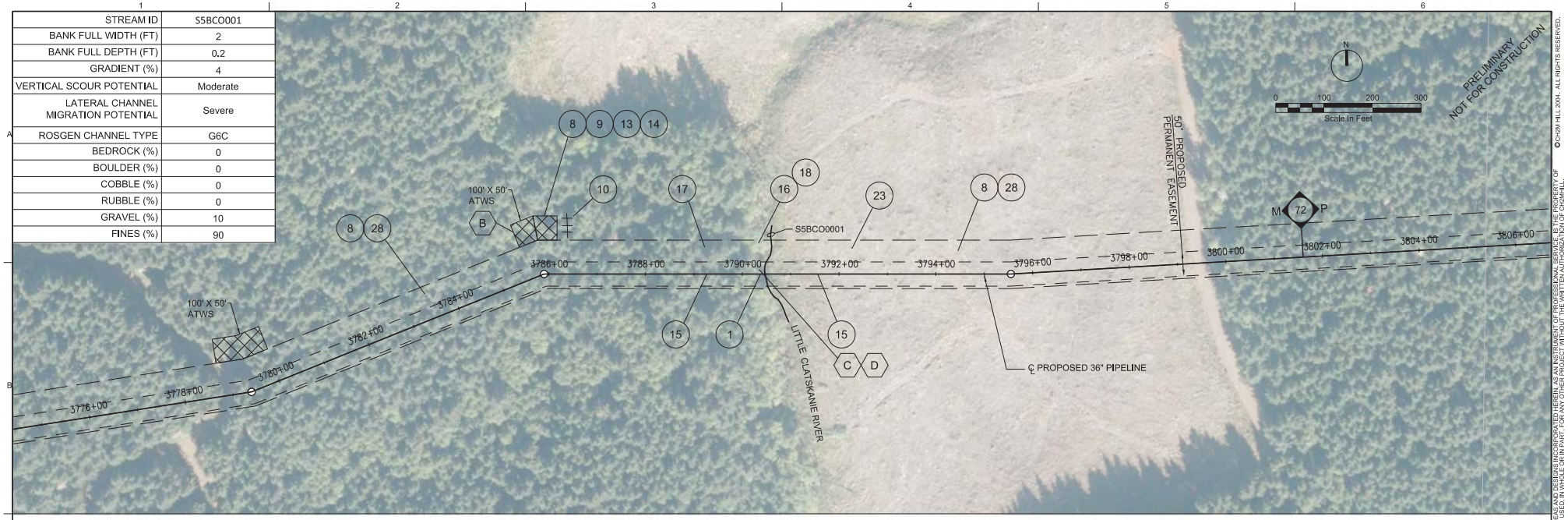
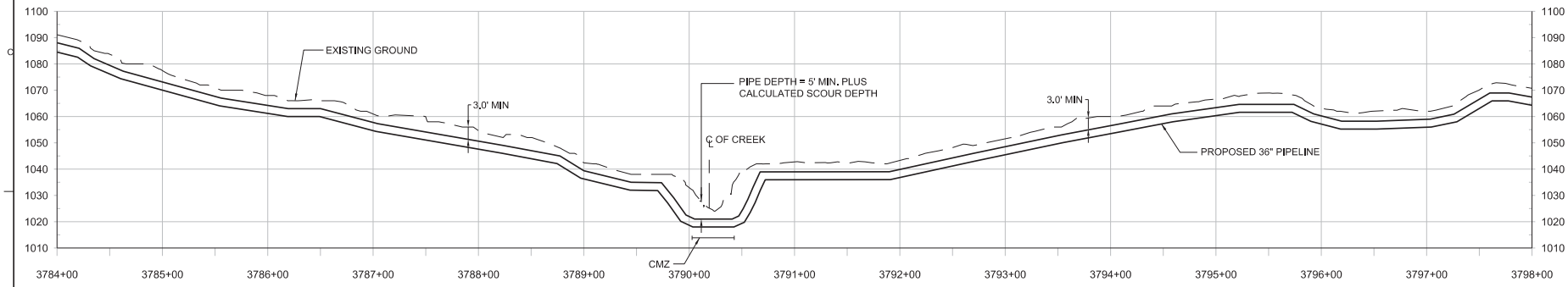
STREAM ID	S5BCO001
BANK FULL WIDTH (FT)	2
BANK FULL DEPTH (FT)	0.2
GRADIENT (%)	4
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	G6C
BEDROCK (%)	0
BOULDER (%)	0
COBBLE (%)	0
RUBBLE (%)	0
GRAVEL (%)	10
FINES (%)	90



CMZ= ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Little Clatskanie River

LOC: COLUMBIA COUNTY, OREGON		from STA: 3776+00	to STA: 3806+00
		from MP: 71.5	to MP: 72.1
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-20	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:46:49 PM

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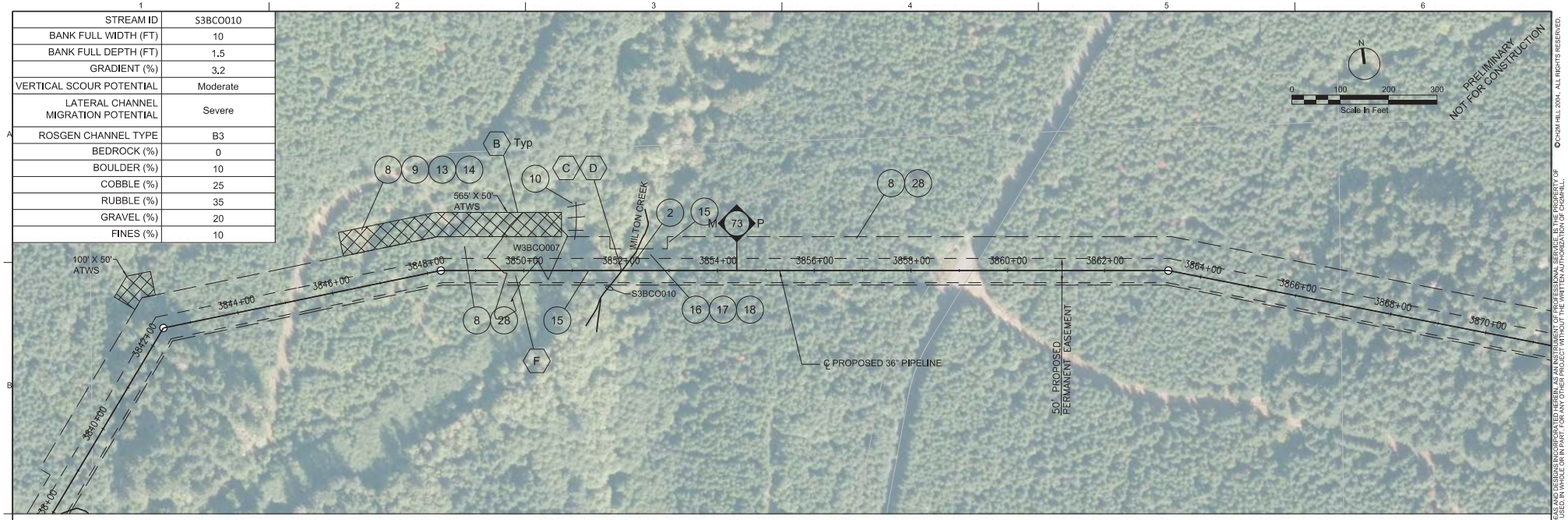
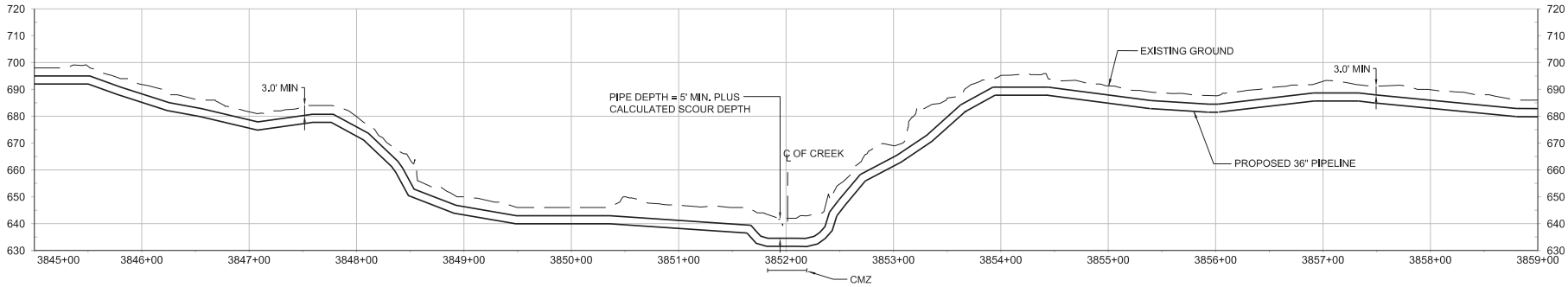
STREAM ID	S3BCO010
BANK FULL WIDTH (FT)	10
BANK FULL DEPTH (FT)	1.5
GRADIENT (%)	3.2
VERTICAL SCOUR POTENTIAL	Moderate
LATERAL CHANNEL MIGRATION POTENTIAL	Severe
ROSGEN CHANNEL TYPE	B3
BEDROCK (%)	0
BOULDER (%)	10
COBBLE (%)	25
RUBBLE (%)	35
GRAVEL (%)	20
FINES (%)	10





PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Milton Creek

LOC:	COLUMBIA COUNTY, OREGON	from STA: 3840+00	to STA: 3870+00
		from MP: 72.7	to MP: 73.3
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-21	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:59:25 PM

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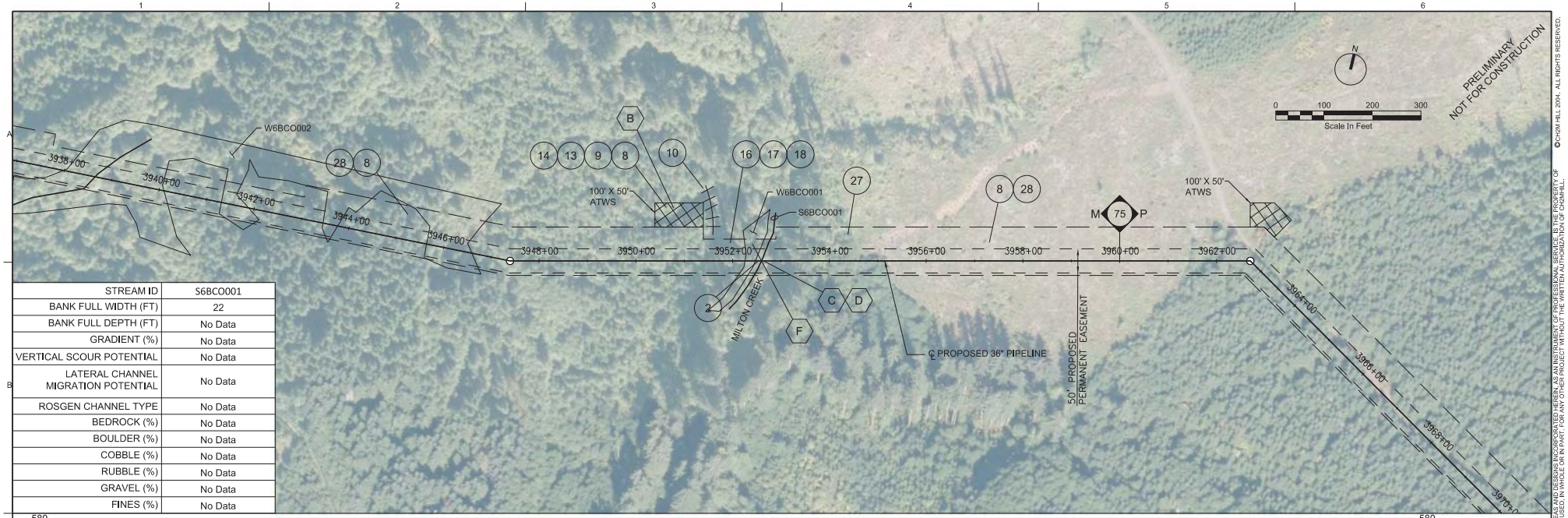
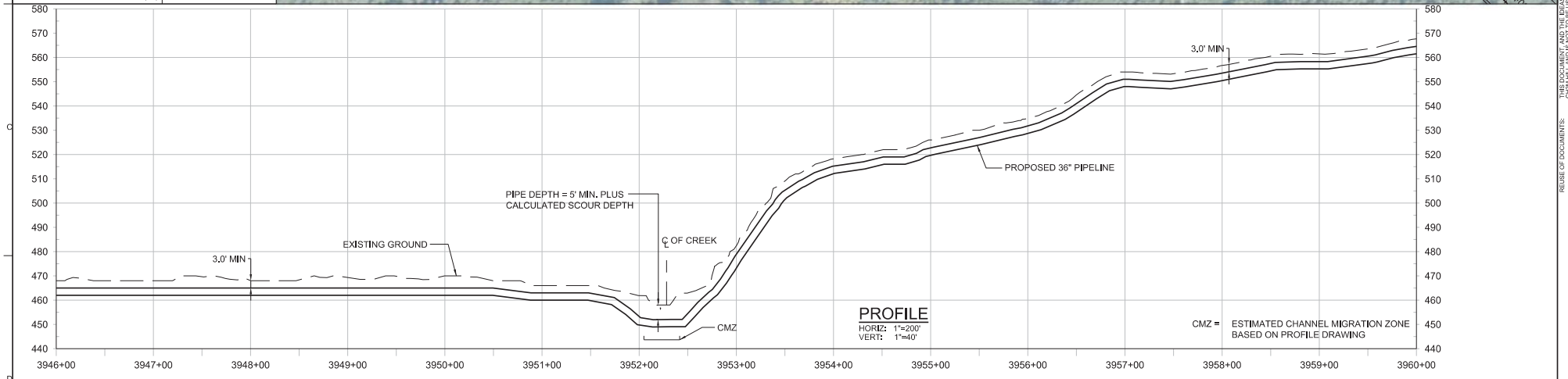


STREAM ID	S6BCO001
BANK FULL WIDTH (FT)	22
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	No Data
VERTICAL SCOUR POTENTIAL	No Data
LATERAL CHANNEL MIGRATION POTENTIAL	No Data
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Milton Creek

LOC: COLUMBIA COUNTY, OREGON		from STA: 3938+00	to STA: 3968+00
		from MP: 74.6	to MP: 75.2
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-22	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:56:00 PM

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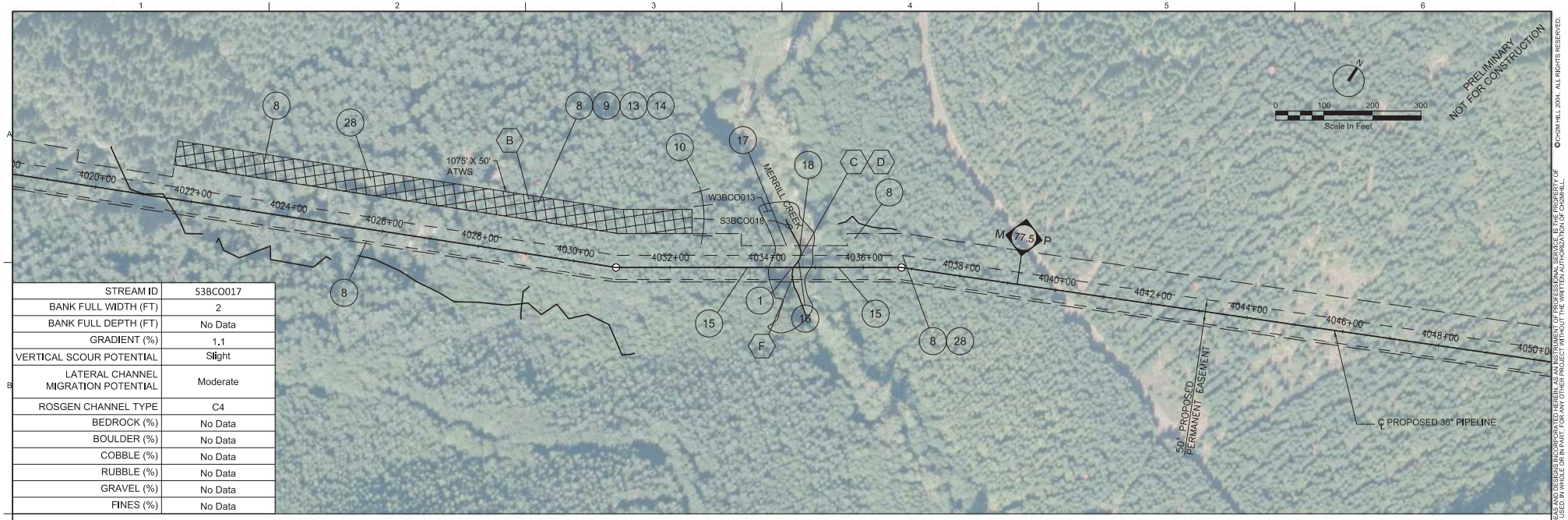
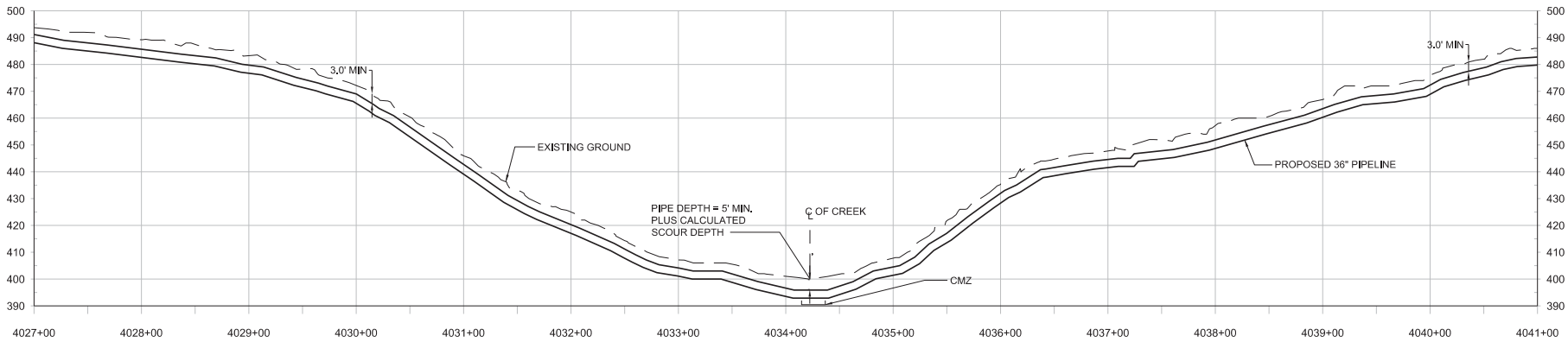


STREAM ID	S3BCO017
BANK FULL WIDTH (FT)	2
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	1.1
VERTICAL SCOUR POTENTIAL	Slight
LATERAL CHANNEL MIGRATION POTENTIAL	Moderate
ROSGEN CHANNEL TYPE	C4
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



PROFILE

HORIZ: 1"=200'
VERT: 1"=40'

CMZ = ESTIMATED CHANNEL MIGRATION ZONE BASED ON PROFILE DRAWING

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

ESA Stream Crossing
Merrill Creek

		from STA: 4020+00	to STA: 4048+00
LOC:	COLUMBIA COUNTY, OREGON	from MP: 76.1	to MP: 76.7
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-23	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:53:28 PM

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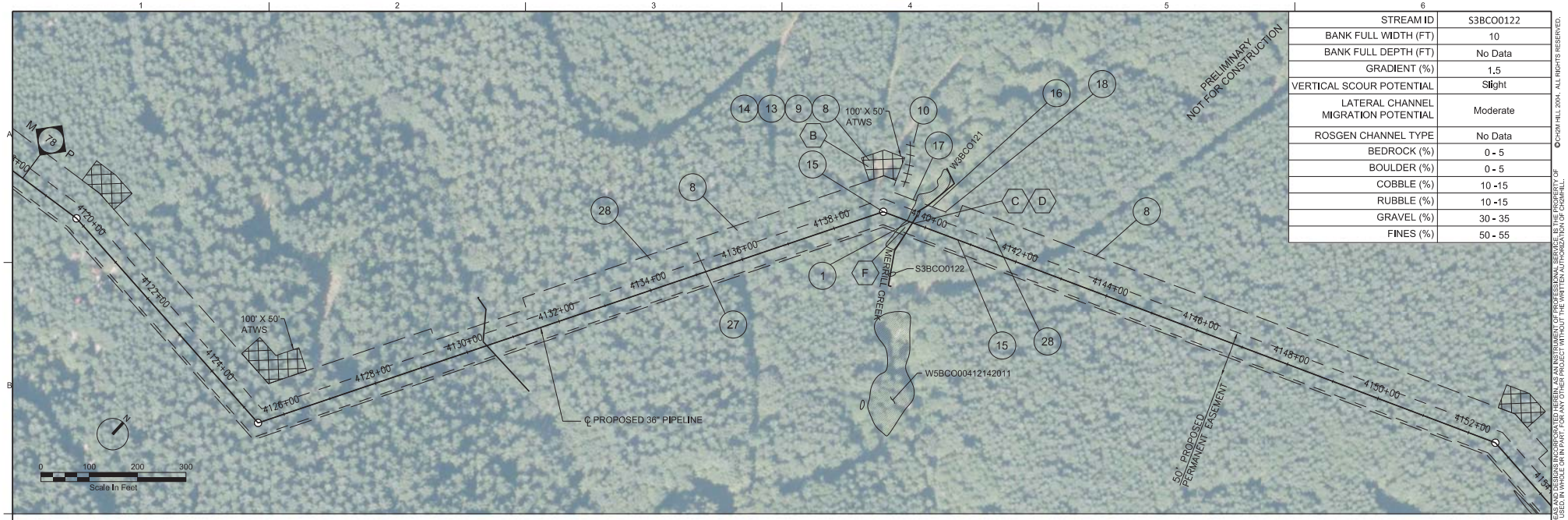
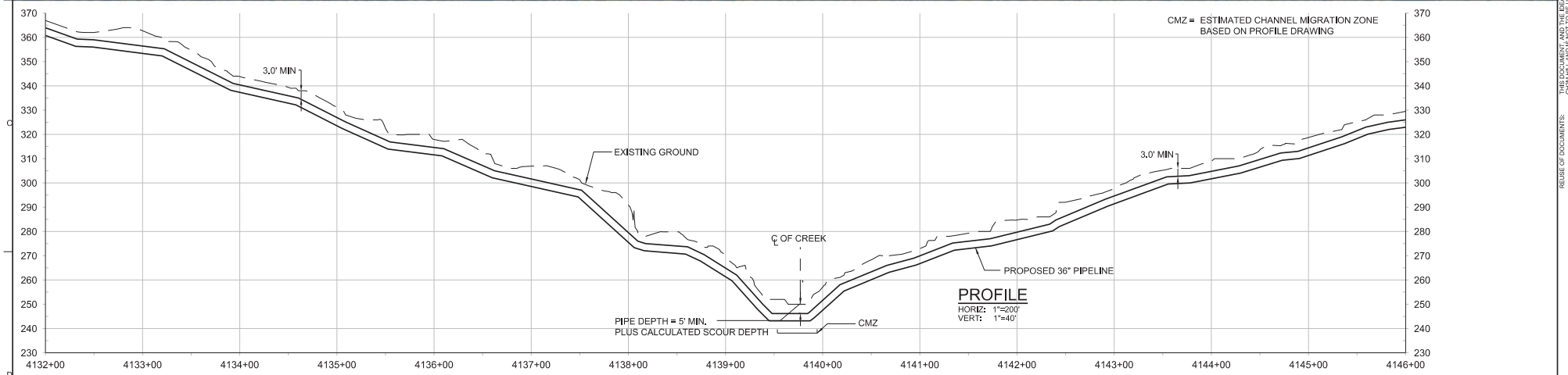
STREAM ID	S3BCO0122
BANK FULL WIDTH (FT)	10
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	1.5
VERTICAL SCOUR POTENTIAL	Slight
LATERAL CHANNEL MIGRATION POTENTIAL	Moderate
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	0 - 5
BOULDER (%)	0 - 5
COBBLE (%)	10 -15
RUBBLE (%)	10 -15
GRAVEL (%)	30 - 35
FINES (%)	50 - 55





NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

SCALE: 1"=200'

VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- EDGE OF ROADWAY
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- FLOWLINE OR EDGE OF STREAM
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- SILT FENCE
- HIGHLY VISIBLE FENCE
- SLOPE BREAK
- SEDIMENT BARRIER
- STRAW WATTLE
- DRAINAGE TRENCH AND PIPING
- DEBRIS FLOW BARRIER
- ROCK CHECK DAM OR TOE BUTTRESS
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND PIPELINE

CH2MHILL

ESA Stream Crossing
Tributary to Merrill Creek

LOC: COLUMBIA COUNTY, OREGON		from STA: 4120+00	to STA: 4152+00
		from MP: 78.0	to MP: 78.6
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-24	REVISION:

FILENAME: HDD Stream Crossing Sheet.dgn PLOT DATE: 2013\12\05 PLOT TIME: 1:49:51 PM

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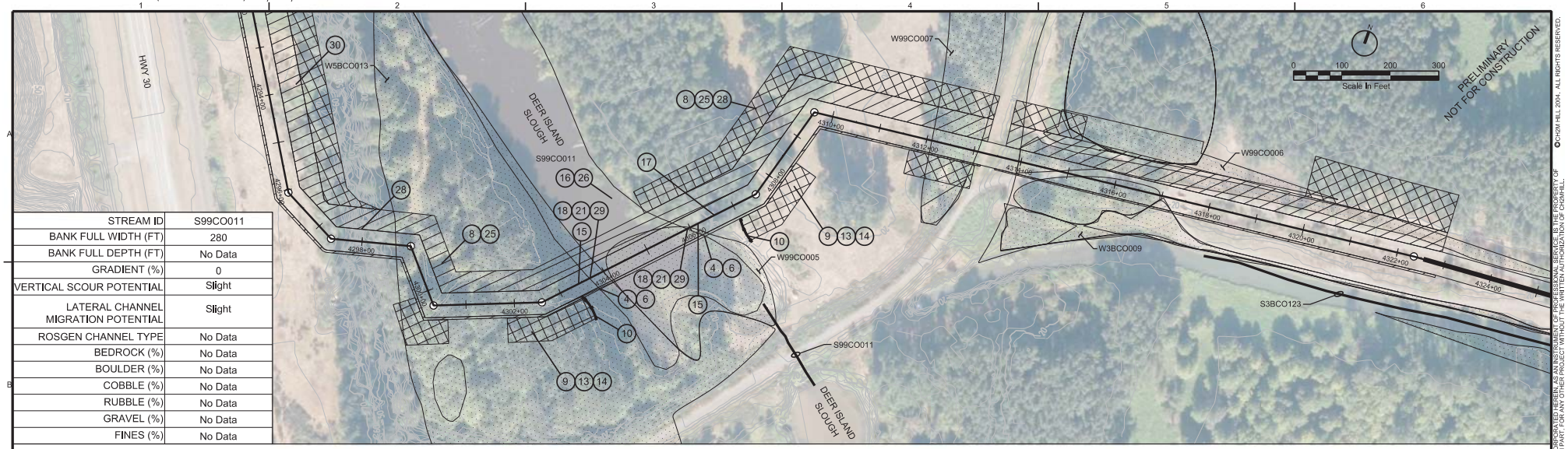
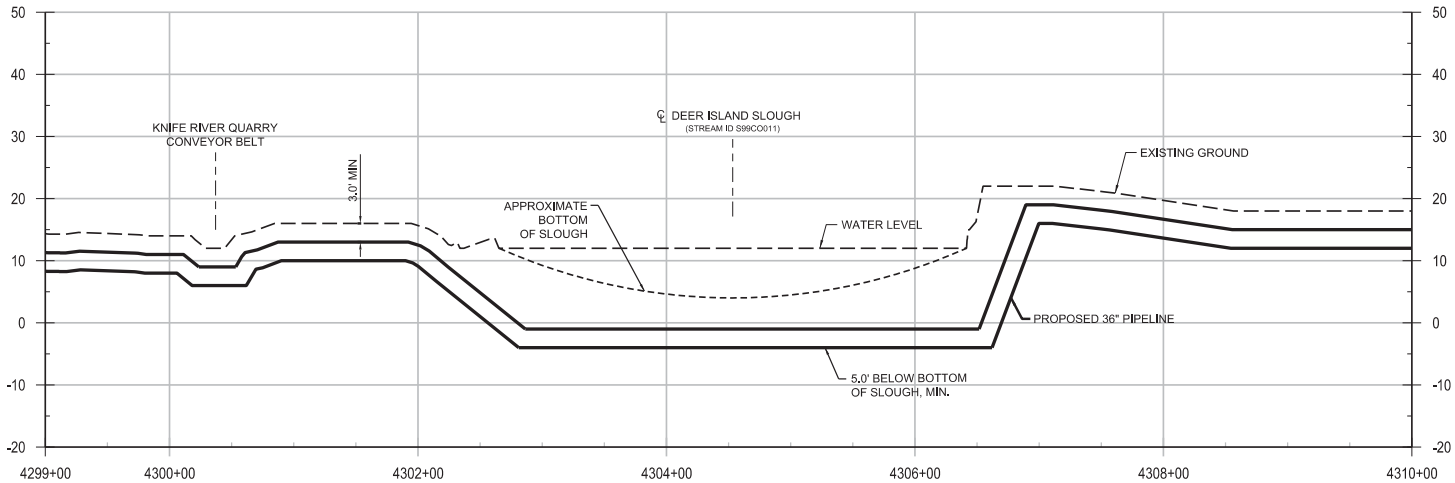


STREAM ID	S99CO011
BANK FULL WIDTH (FT)	280
BANK FULL DEPTH (FT)	No Data
GRADIENT (%)	0
VERTICAL SCOUR POTENTIAL	Slight
LATERAL CHANNEL MIGRATION POTENTIAL	Slight
ROSGEN CHANNEL TYPE	No Data
BEDROCK (%)	No Data
BOULDER (%)	No Data
COBBLE (%)	No Data
RUBBLE (%)	No Data
GRAVEL (%)	No Data
FINES (%)	No Data



PROFILE

HORIZ: 1"=100'
VERT: 1"=20'

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD
T. COTTEN	K. KONG	M. BRICKER	XXXX

MATERIAL

SCALE: 1"=100'
VERIFY SCALE

LEGEND

- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- SECTION LINE
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- UTILITY LINE
- OVERHEAD POWER LINE
- KEY NOTE, SEE FIGURE 1I-5

OregonLNG

OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

Stream Crossing
Deer Island Slough

LOC:	COLUMBIA COUNTY, OREGON	from MP: 81.3	to MP: 82.0
PROJ: 199863	DATE: AUGUST, 2014	DWG: FIGURE 6A-25	REVISION:

from STA: 4292+00 to STA: 4330+00

FILENAME: HDD Sheets.dgn PLOT DATE: 7/31/2014 PLOT TIME: 4:47:08 PM

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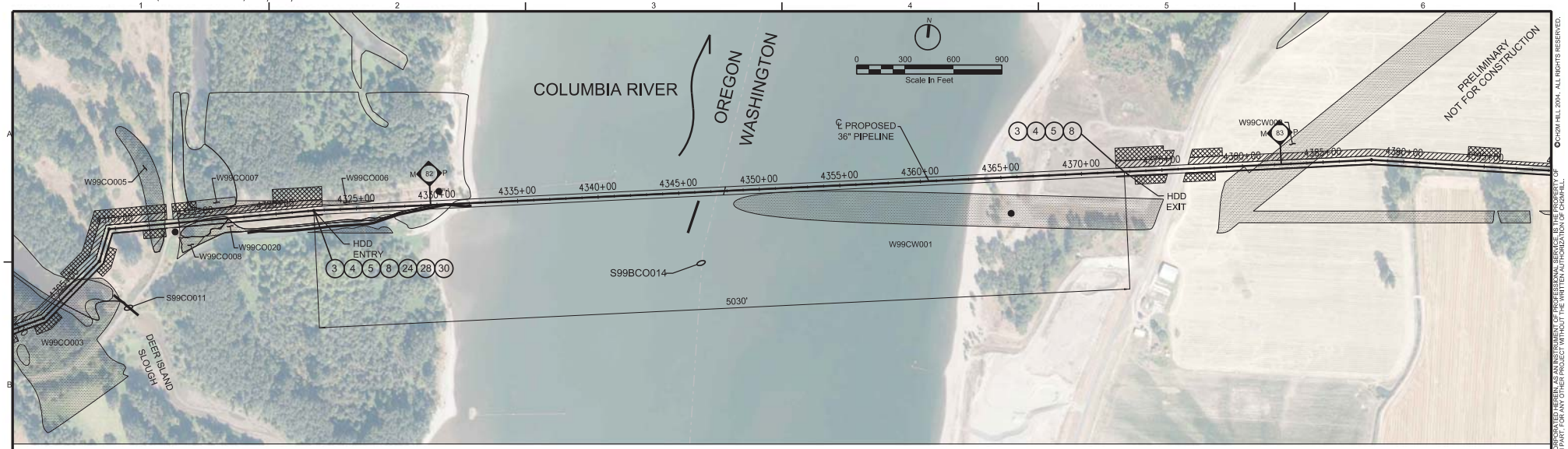
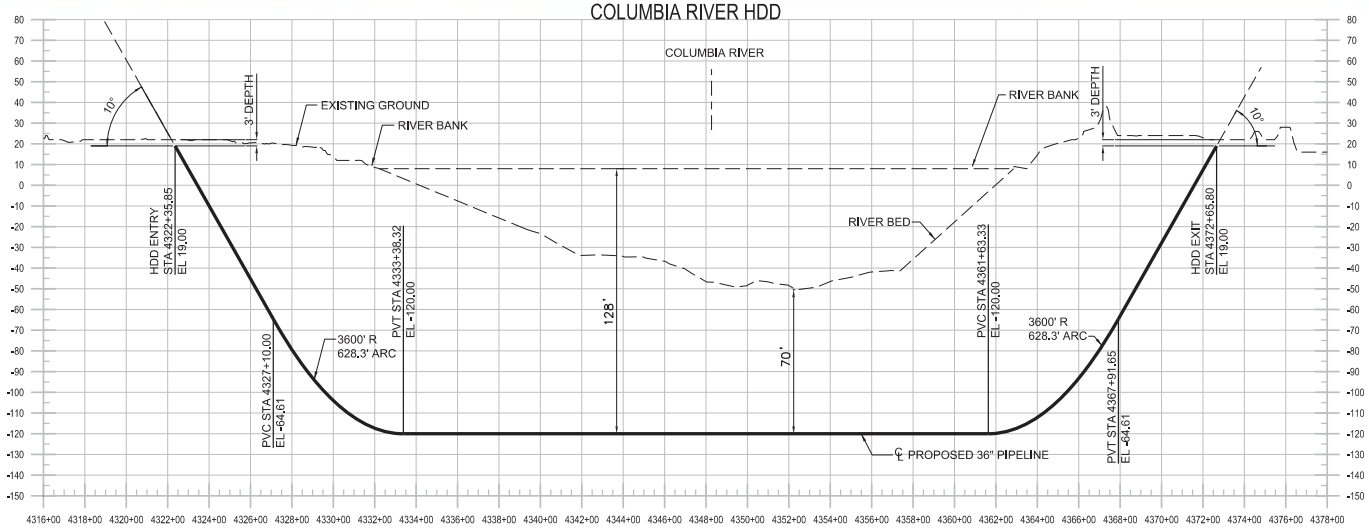
20140811-5160 FERC PDF (Unofficial) 8/11/2014 3:46:27 PM



COLUMBIA RIVER HDD



PROFILE

HORIZ: 1"=600'
VERT: 1"=60'

NOTE:
BOTTOM OF COLUMBIA RIVER CHANNEL INFORMATION FROM "CHANNEL STAUS COLUMBIA RIVER", USACE FEB, 2000

NO.	DATE	REVISION	BY	APVD

DSGN T. COTTEN | DR K. KONG | CHK M. BRICKER | APVD XXXX

MATERIAL

SCALE: 1"=600'
VERIFY SCALE

LEGEND
- TWS (TEMPORARY WORK SPACE)
- ATWS (ADDITIONAL TEMPORARY WORK SPACE)
- PROPOSED ALIGNMENT MILE POST
- MAIN LINE VALVE
- HDD (HORIZONTAL DIRECTIONAL DRILL) ACCESS POINT
- WETLAND BOUNDARY
- TYPICALS, SEE FIGURES 6A-26, 6A-27, AND 6A-28
- COUNTY LINE
- PERMANENT EASEMENT LINE
- ALIGNMENT PI (POINT OF INTERSECTION)
- SECTION LINE
- ROADWAY CENTERLINE
- CITY LIMIT LINE
- PROPERTY LINE
- UTILITY LINE
- OVERHEAD POWER LINE
- KEY NOTE, SEE FIGURE 6A-1

OregonLNG
OREGON PIPELINE COMPANY
WARRENTON TO WOODLAND
PIPELINE

CH2MHILL

HDD Exhibit
Columbia RIver at MP 82.5

		from STA: 4295+00	to STA: 4390+00
LOC:	COLUMBIA COUNTY, OREGON	from MP: 81.9	to MP: 82.9
PROJ: 199863	DATE: AUGUST, 2014	DWG: FIGURE A-3	REVISION:

FILENAME: HDD Sheets.dgn PLOT DATE: 7/31/2014 PLOT TIME: 4:48:43 PM

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APPENDIX G4

STREAM CHANNEL ASSESSMENT AND SCOUR ANALYSIS

Channel Response Matrix for Pipeline Crossings of Perennial Endangered Species Act Streams

PREPARED FOR: Oregon LNG

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COPIES: Jay Lorenz/CH2M HILL

DATE: May 16, 2013

Introduction

This technical memorandum presents the results of a high-level stream channel assessment and scour analysis for the waterbodies crossed by the Oregon Pipeline. Oregon LNG proposes to construct and operate the Oregon Pipeline and associated LNG terminal. The Oregon Pipeline consists of approximately 86.8 miles of 36-inch-diameter pipeline to be constructed between Warrenton, Oregon, and Woodland, Washington, crossing three counties, Clatsop, Columbia, and Cowlitz. The pipeline will cross numerous intermittent and perennial streams and rivers. Specific scour analyses and migration studies may be performed at a later date for specific crossings as required by Oregon LNG and/or permitting agencies.

This stream channel assessment combines an evaluation of channel morphology and channel-forming processes to simplify a wide variety of channels into a manageable analysis framework. Channel segments (subreach units) are areas of streams that respond to disturbances in a similar fashion based on similarities in channel-forming processes. The assessment of channel conditions provides a context for evaluating the influence of changes in land management or activities on channel conditions and processes. Major changes in channel morphology (scour) are caused by changes in discharge, sediment supply, and vegetation in the channel. The scour analysis focuses on fluvial-dominated stream channels and provides a first-cut method of identifying stream crossings with a potential for vertical and/or lateral scouring (i.e., lateral channel migration).

Methods

Streams with perennial flow regimes and supporting Federal Endangered Species Act (ESA)-listed salmonids were evaluated to determine which pipeline crossings have a predisposition for vertical scouring or lateral migration. A total of 120 streams crossed by the Oregon Pipeline have perennial flow regimes, support ESA-listed salmonids, or have designated critical habitat. Twenty-four of those streams support ESA-listed salmonids or have designated critical habitat. Although some intermittent and ephemeral drainages not supporting ESA-listed salmonids will require further investigation prior to final engineering design, these sites were not included at this time for this study.

Stream segment slope (gradient) and channel confinement provide a useful orientation for stream classification and provide a method to distinguish between the possible responses of a stream channel to disturbances. Channel confinement is the ratio of the valley or floodplain width to the channel width.

Stream slope at potential pipeline crossings was determined from field reconnaissance surveys. Where field reconnaissance surveys were not conducted, channel gradient was determined from 1:24,000 U.S. Geological Survey (USGS) topographic maps by measuring the distance between a contour line upstream and a contour line downstream of the crossing, or by using Washington 10-meter Digital Elevation Model (DEM) elevations. Channel confinement was determined by measuring the valley width or floodplain (distance between contour lines on either side of the channel at the crossing based on a 1:24,000 USGS topographic map) and comparing this width to the channel width (ordinary high water [OHW] width).

After determining channel gradient, channel confinement, and valley width at Pipeline crossings, streams were grouped into categories based on their similarities and channel characteristics. Streams with specific similarities are expected to have similar responses to disturbances or be predisposed to specific conditions. These responses or conditions are based in part on the Washington Department of Natural Resources (DNR) Watershed Assessment Methodology (1994) Channel Response Matrix. This approach is also consistent with previous pipeline projects in the area that have included multiple waterbody crossings. In addition, the Rosgen channel type (Rosgen, 1996), which was identified by channel characteristics collected during field reconnaissance surveys, was used to verify and support DNR Channel Response Matrix characteristics.

Ephemeral drainages (defined as streams with flows generated by periodic surface runoff along the Pipeline route were not analyzed for scour events. Ephemeral drainages, as defined in the assessment method, only flow during and shortly after a large precipitation event and lack the hydrological and morphological characteristics of a perennial or intermittent stream. Ephemeral drainages may not have a well-defined channel and may be vegetated. Therefore, ephemeral drainages are not considered to have vertical or lateral scour potential. However, ephemeral drainages could experience mass wasting events, such as landslides or slope failure, which could affect the pipeline. Landslide and slope failure potential along the Pipeline are further evaluated in Resource Report 6 — Geologic Resources.

In addition to ephemeral drainages, non-ESA intermittent streams were also excluded as they are primarily minor waterways with generally lower scour risk. However, as discussed above, they may still experience mass wasting events that could affect the pipeline.

According to Rosgen (1996) and personal communication with Janine Castro of the U.S. Fish and Wildlife Service (Castro, 2009), only streams with a gradient of less than 4 percent typically have the potential for significant lateral scouring at the reach level. Streams with a greater than 4 percent gradient have no functional floodplain and therefore have no, or little, potential for lateral channel migration at the reach scale.

At ESA stream crossings and within Federal Emergency Management Agency floodways, the pipeline will be buried at a depth that minimizes the risk of exposure from vertical scour and channel migration. The actual depth of the pipeline will be determined during final engineering to address risks of vertical scour and channel migration.

Results

Stream channels with similar characteristics are expected to respond to disturbances similarly or be predisposed to specific events. Channel slope can be used as a surrogate for stream energy, which is the dominant aspect controlling channel morphology. Channel confinement controls the characteristics of potential channel responses and manifests the long-term history of a valley (DNR, 1994). Increased entrenchment is one possible channel response to disturbance. Entrenchment is defined as the vertical containment and the degree to which a channel is incised in the valley floor (DNR, 1994).

Channel slope and confinement are general indicators of a stream's transport capacity and the balance between sediment supply and transport capacity (DNR, 1994). The Channel Response Matrix provides a simple method for categorizing potential channel responses in terms of gradient and channel confinement and is based on geomorphic reasoning and professional experience. The matrix differentiates between fluvial and mass-wasting dominated channels. Twenty percent channel slope typically defines the upper limit of fluvially dominated channel systems (DNR, 1994).

The DNR Channel Response Matrix shows a channel's predisposition to specific events given specific channel characteristics. These characteristics are based on channel slope, channel confinement, and valley width. The potential channel responses based on these characteristics include fine sediment deposition, bank erosion, wood loss, debris flow scour, and debris flow deposition. Channel reaches can be grouped into source, transport, and response reaches using gradient as the criterion. Reaches greater than 20 percent gradient are considered source reaches, 3 to 20 percent gradient are transport reaches, and less than 3 percent gradient are response reaches.

Six gradient groupings are used to generally correspond to gradients associated with changes in channel morphology that reflect relative transport capacity and the response potential (DNR, 1994).

The 24 streams evaluated using this methodology were categorized into six distinct groups based on slope, channel width, and confinement (Table 1). Table 2 (located at the end of this technical memorandum) provides specific stream crossing ID numbers, stream slope (gradient %), valley width, confinement, and vertical and/or lateral scour potential for each of the 24 ESA perennial streams.

TABLE 1
Channel Response Matrix for Pipeline Crossings of Perennial Waterbodies and Streams Supporting ESA-listed Salmonids

	Scour Potential of Evaluated Stream Crossings (Vertical/Lateral)					
Channel Type	**None (at Reach Scale)/Slight**	**Slight/Moderate**	**Moderate/Severe**	**Moderate to Severe/None**	**Severe/None**	**Severe (Mass Wasting Dominated)/None**
Valley Width (VW) > 4 Channel Width (CW) (Unconfined)	11	3	7	1		
2 CW < VW < 4 CW (Moderately Confined)	1					
VW < 2 CW (Confined)	1					
Gradient and Typical Channel Bed Morphology						
Channel Gradient Percentage (Stream Type)	< 1 (Pool-Riffle)	1 to 2 (Pool-Riffle, Plane-Bed)	2 to 4 (Plane-Bed, Forced Pool-Riffle)	4 to 8 (Step-Pool)	8 to 20 (Cascade)	> 20 (Colluvial)

Source: DNR, 1994.

Notes: Valley width (VW) = distance between first contour lines on either side of channel (1:24,000 scale USGS). Channel width (CW) = OHW channel width.

Based on DNR (1994) Standard Watershed Analysis Methodology, six channel types with the potential for either lateral (bank erosion causing channel migration) and/or vertical (debris flow) scour potential were identified for streams being crossed by the pipeline. Of the 24 perennial/ ESA stream crossings, 11 possess some potential for vertical scouring or debris flow events, while 23 have at least some potential for lateral channel migration.

Unconfined channels with slopes less than 1 percent (11 streams) are associated with:

- Fine sediment deposition
- Bank erosion
- Wood accumulation

Unconfined channels with slopes between 1 and 2 percent (3 streams) are associated with:

- Wood loss
- Scour potential
- Fine sediment deposition
- Bank erosion

Unconfined channels with slopes between 2 and 4 percent (7 streams) are associated with:

- Dam break flood
- Debris flow deposition
- Bank erosion
- Coarse sediment deposition
- Scour potential
- Wood loss

Unconfined channels with slopes between 4 and 8 percent (1 stream) are associated with:

- Debris flow scour/debris flow deposition
- Dam break flood
- Wood loss

Moderately confined channels with slopes less than 1 percent (1 stream) are associated with:

- Fine sediment deposition
- Bank erosion
- Wood accumulation

Confined channels with slopes less than 1 percent (1 stream) are associated with:

- Coarse sediment deposition
- Wood loss

Ten of the evaluated waterways will be crossed via horizontal directional drilling (HDD). Of these 10 crossings, one (Bear Creek) has more than a slight vertical scour potential. Of the remaining nine HDD crossings, all have no vertical scour potential and have a slight lateral scour potential. The remaining crossing has a severe lateral scour potential (Bear Creek).

This high-level method of scour potential determination relies exclusively on gradient, valley width, and channel width, excluding additional factors such as substrate type. For certain waterways, historical observation and empirical evidence suggest that the scour potential may be different than that estimated by this model. In these cases, engineering will determine the accurate depth for the pipe crossing.

Conclusions

Of the 24 perennial ESA streams being crossed by the pipeline, 11 have a slight or higher potential for vertical scouring. Of these, eight have a moderate or higher potential for vertical scouring. One channel has a severe potential for vertical scouring, and eight channels are mass-wasting dominated (MWD). The only stream with moderate/severe vertical scour potential is an intermediate waterway. Seven of the MWD streams are classified as intermediate, with the one remaining classified as minor. Thirteen streams have no vertical scour potential. Of the streams evaluated, five are considered major streams (100 feet or greater in width as defined by the Federal Energy Regulatory Commission's *Wetland and Waterbody Construction and Mitigation Procedures* [2003]), none of which have a slight or higher potential for experiencing vertical scouring flows (no vertical scour potential).

One crossing (Little Clatskanie River) has no or negligible potential for lateral channel migration (lateral scouring) at the reach scale, 13 have a slight potential, 3 have a moderate potential, and 7 have a severe potential for lateral channel migration. Of the seven streams with a severe potential for lateral scour, all are intermediate waterbodies. The five major stream crossings have a slight potential for lateral channel migration. Potential for vertical scour and channel migration will be used to inform engineers which streams require special attention regarding depth of pipeline during final design.

Literature Cited

Castro, J.M. 2009. Personal communications with Janine Castro, Ph.D. Geomorphologist, U.S. Fish and Wildlife Service, Portland, Oregon. April 9, 2009.

Federal Energy Regulatory Commission. 2003. *Wetland and Waterbody Construction and Mitigation Procedures*. http://www.ferc.gov/industries/gas/enviro/guidelines.asp. January 17, 2003.

Rosgen, D. 1996. *Applied River Morphology*. Wildland Hydrology, Pagosa Springs, Colorado.

Washington Department of Natural Resources (DNR). 1994. *Board Manual: Standard Methodology for Conducting Watershed Analysis Under Chapter 222-22 WAC*. Washington Department of Natural Resources, Olympia, Washington.

TABLE 2
Oregon Pipeline Crossings of Perennial ESA Streams

Stream ID	MP at Crossing	Crossing Method	Flow Regime	Waterbody Type	Waterbody	Valley Width (ft)[a]	OHW Width (ft)	Channel Confinement[b]	Gradient (%)[c]	Vertical Scour Potential[d]	Lateral Channel Migration Potential[e]
S99CL001	1.0	HDD	Perennial	Major	Adairs Slough	5,258	110	Unconfined	<1	None	Slight
S5BCLo74	1.5	HDD	Perennial	Intermediate	Vera Creek	4,960	20	Unconfined	<1	None	Slight
S40CL002	3.1	HDD	Perennial	Major	Lewis and Clark River	5,808	1250	Unconfined	<1	None	Slight
S5BCL064	4.5	Dry/Flume	Perennial	Intermediate	Barrett Slough	3,844	12	Unconfined	<1	None	Slight
S99CL064	5.7	HDD	Perennial	Major	Lewis and Clark River	2,261	340	Unconfined	<1	None	Slight
S1BCL001	7.9	Dry/Flume	Perennial	Intermediate	Heckard Creek	1,139	10	Unconfined	<1	None	Slight
S99CL018	11.0	HDD	Perennial	Intermediate	Lewis and Clark River	1,365	35	Unconfined	<1	None	Slight
S2BCL008A	25.4	Dry/Flume	Perennial	Intermediate	Little Fishhawk Creek	104	15	Unconfined	<1	None	Slight
S2BCL008B	31.4	Open cut	Perennial	Intermediate	Alder Creek	421	15	Unconfined	3.6	Moderate	Severe
S99CL108	33.5	HDD	Perennial	Major	Nehalem River	3,601	120	Moderately Confined	<1	None	Slight
S8BCL005	41.0	Open cut	Perennial	Intermediate	Rock Creek	470	20	Unconfined	2.2	Moderate	Severe
S1BCL021	43.1	Dry/Flume	Perennial	Intermediate	South fork Rock Creek	2,302	15	Unconfined	3.0	Moderate	Severe
S1BCL022	43.4	HDD	Perennial	Intermediate	Bear Creek	436	12	Unconfined	2.3	Moderate	Severe
S6BCO002	47.5	Dry/Flume	Perennial	Intermediate	North Fork Wolf Creek	143	30	Unconfined	1.0	Slight	Moderate
S3BCO012	50.5	Dry/Flume	Perennial	Intermediate	Clear Creek	780	30	Unconfined	2.1	Moderate	Severe
S3BCO107	55.7	Dry/Flume	Perennial	Intermediate	Cedar Creek	976	10	Unconfined	1.6	Slight	Moderate
S3BCO101	57.7	HDD	Perennial	Intermediate	Rock Creek	1,157	30	Unconfined	<1	None	Slight
S3BCO014	63.8	HDD	Perennial	Intermediate	Nehalem River	113	30	Moderately Confined	<1	None	Slight
S99CO020	70.7	Open cut	Perennial	Intermediate	Clatskanie River	219	19	Unconfined	<1	None	Slight
S5BCO001	71.8	Open cut	Perennial	Minor	Little Clatskanie River	244	2	Unconfined	4	Moderate/Severe	None
S3BCO010	73.0	Open cut	Perennial	Intermediate	Milton Creek	317	12	Unconfined	3.2	Moderate	Severe
S3BCO018	76.4	Open cut	Perennial	Minor	Merril Creek	376	1	Unconfined	1.1	Slight	Moderate
S99CO011	81.6	Open cut	Perennial	Intermediate	Deer Island Slough	780	38	Unconfined	2.1	Moderate	Severe
S99BCO014	82.4	HDD	Perennial	Major	Columbia River	5,637	3300	Confined	<1	None	Slight

[a] Valley width (VW) = distance between first contour lines on either side of channel (1:24,000 scale U.S. Geological Survey).

[b] Channel confinement based on Channel Response Matrix (Table E-2) in DNR (1994):

VW > 4CW = Unconfined
2CW < VW < 4CW = Moderately Confined
VW < 2CW = Confined

[c] Where gradient not field collected, used 1:24,000 USGS topographic maps. Gradient listed as 0.0% means gradient < 1%.

[d] For vertical scour potential, “None” means on a reach scale. There will still likely be pool scour etc.

[e] Lateral channel migration potential based on DNR (1994):

TABLE 2
Oregon Pipeline Crossings of Perennial ESA Streams

Stream ID	MP at Crossing	Crossing Method	Flow Regime	Waterbody Type	Waterbody	Valley Width (ft)[a]	OHW Width (ft)	Channel Confinement[b]	Gradient (%)[c]	Vertical Scour Potential[d]	Lateral Channel Migration Potential[e]

None = Could be microbank erosion but not lateral channel migration.
Slight = Unconfined or moderately confined channel with gradient < 1%.
Moderate = Unconfined or moderately confined channel with gradient 1% - 2%.
Severe = Unconfined or moderately confined channel with gradient 2% - 4%.
Stream ID = stream identification number
ft = feet
MP = milepost

APPENDIX G5

RIPARIAN AREAS CROSSED BY THE OREGON LNG PIPELINE

Appendix G5

Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
1	S99CL001	110	Adairs Slough	HDD	Perennial	0.00	2	PEM2, PSS2, ST2	88 PSS2	400
1.5	S5BCL074	20	Vera Creek	Flume	Perennial	0.49	2	PEM2, PEM3, PSS2, PSS3, ST2	18 PSS2; 7 PSS3	400
2.6	S40CL001	50	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.47	3	PSS2, ST3	87 PSS2	200
3.1	S40CL002	1250	Lewis and Clark River	HDD	Perennial	0.00	2	ST2		400
3.5	S99CL019	13	Tributary of Jeffers Slough	Flume	Perennial	0.23	3	PEM5, ST3		400
4.1	S5BCL059	1.5	Tributary of Barrett Slough	Flume	Perennial	0.10	3	PEM5, ST3		400
4.2	S5BCL062	2	Tributary of Barrett Slough	Open Cut	Intermittent	0.12	3	PEM5, ST3		200
4.3	S5BCL063	4.5	Tributary of Barrett Slough	Open Cut	Intermittent	0.06	3	PEM5, ST3		200
4.5	S5BCL064	12	Barrett Slough	Flume	Perennial	0.00	2	DF4, PEM2, PEM5, PFO2, ST2	5 DF4, 0 PFO2	400
4.6	S5BCL066	3	Tributary of Barrett Slough	Open Cut	Intermittent	0.11	3	BP6, PEM2, PEM5, ST3		200
4.8	S5BCL068	8	Tributary of Green Slough	Open Cut	Intermittent	0.30	3	PEM3, PEM5, ST3		200
4.8	S5BCL069	7	Tributary of Green Slough	Open Cut	Intermittent	0.40	3	PEM3, PEM5, ST3		200
4.9	SBCL070	2	Unnamed	Open Cut	Intermittent	0.20	2	AW5, DF4, ST2	4 DF4	0
5	S5BCL071	5	Unnamed	HDD	Intermittent	0.54	3	DF4, PEM5, PFO2, ST3	11 DF4, 30 PFO2	200
5.2	S5BCL072	7	Tributary of Lewis and Clark River	HDD	Perennial	0.09	2	DF4, PEM2, PEM5, PFO2, PSS2, ST2	55 DF4, 4 PFO2, 0 PSS2	400
5.2	S99CL111	300	Lewis and Clark River	HDD	Perennial	0.00	2	BP5, DF4, PEM2, PEM5, PSS2, ST2	31 DF4, 0 PSS2	400
5.4	S99CL034	20	Tributary of Lewis and Clark River	HDD	Perennial	0.08	2	BP5, PEM2, PEM5, ST2		400
5.5	S99CL024	13	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.10	2	PEM5, ST2		200
5.7	S99CL064	340	Lewis and Clark River	HDD	Perennial	0.00	2	NO4, PEM2, PEM3, PEM5, ST2		400
5.8	S38CL003	8	Tributary of Lewis and Clark River	HDD	Intermittent	0.41	3	PEM2, PEM3, PEM5, PSS2, ST3	11 PSS2	200

Appendix G5

Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
7.9	S1BCL001	10	Heckard Creek	Flume	Perennial	0.02	2	CF4, PEM2, PEM3, PFO2, ST2	72 CF4, 17 PFO2	400
8.1	S1BCL050	10	Unnamed	Open Cut	Intermittent	0.13	3	CF4, CF5, PEM3	68 CF4, 30 CF5, 2 PEM3	200
8.6	S1BCL002	4	Tributary of Lewis and Clark River	Open Cut	Intermittent	1.17	2	CF4, ST2	99 CF4	200
8.8	S1BCL018	25	Tributary of Lewis and Clark River	Flume	Perennial	1.29	2	CF4, PEM2, ST2	95 CF4	400
9.1	S1BCL003	3	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.86	2	CF4, ST2	99 CF4	200
9.3	S1BCL004	4	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.82	3	CF5, ST3	99 CF5	200
9.7	S1BCL005	8	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.97	2	CF4, CF5, ST2	88 CF4, 9 CF5	200
9.7	S1BCL006	3	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.96	2	CF4, ST2	99 CF4	200
9.9	S1BCL007	3	Tributary of Lewis and Clark River	Open Cut	Intermittent	0.97	2	CF4, ST2	99 CF4	200
10	S1BCL008	10	Tributary of Lewis and Clark River	Flume	Perennial	0.98	2	CF4, ST2	99 CF4	400
11	S99CL018	35	Lewis and Clark River	HDD	Perennial	0.00	2	BP6, CF3, NO5, PEM2, PEM5, PFO2, ST2	6 CF3, 41 PFO2	400
12.8	S1BCL016	8	Tributary of Speelyai Creek	Flume	Perennial	1.03	2	CF4, ST2	99 CF4	400
13.8	S5BCL040	0.8	Tributary of Youngs River	Flume	Perennial	2.02	2	BP5, CF4, ST2	99 CF4	400
13.8	S5BCL041	2	Tributary of Youngs River	Flume	Perennial	2.03	2	BP5, CF4, ST2	99 CF4	400
13.9	S5BCL042	5	Tributary of Youngs River	Open Cut	Intermittent	2.05	2	CF4, ST2	98 CF4	200
13.9	S5BCL043	20	Tributary of Youngs River	Open Cut	Intermittent	2.08	2	CF4, ST2	95 CF4	200
14.1	S5BCL045	8	Tributary of Youngs River	Flume	Perennial	2.15	2	CF4, ST2	99 CF4	400
14.2	S5BCL044	5	Tributary of Youngs River	Flume	Perennial	2.16	2	CF4, ST2	99 CF4	400
14.8	S5BCL038	2	Tributary of Youngs River	Open Cut	Intermittent	2.28	2	CF4, DF4, ST2	84 CF4, 15 DF4	200

Appendix G5

Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
15.3	S5BCL035	3	Tributary of Youngs River	Open Cut	Intermittent	2.09	2	CF4, CF5, ST2	0 CF4, 99 CF5	200
15.6	S5BCL030	4	Tributary of Youngs River	Flume	Perennial	2.11	2	CF4, CF5, ST2	77 CF4, 22 CF5	400
15.6	S5BCL034	4	Tributary of Youngs River	Flume	Perennial	2.08	2	CF4, CF5, ST2	58 CF4, 41 CF5	400
15.8	S5BCL031	5	Tributary of Youngs River	Flume	Perennial	2.25	2	CF4, DF3, DF4, PEM2, PEM3, ST2	11 CF4, 5 DF3, 72 DF4	400
16.1	S99CL016	7	Bayney Creek	Flume	Perennial	2.49	3	DF3, ST3	99 DF3	400
16.6	S5BCL032	3	Tributary of Youngs River	Open Cut	Intermittent	2.98	2	CF4, DF3, PEM3, ST2	96 CF4, 3 DF3	200
17.3	S5BCL077	6	Tributary of Youngs River	Flume	Perennial	3.61	2	CF4, ST2	99 CF4	400
17.8	S5BCL078	6	Tributary of Youngs River	Open Cut	Intermittent	4.05	2	DF3, PEM2, ST2	95 DF3	200
17.8	S5BCL079	5	Tributary of Youngs River	Open Cut	Intermittent	4.09	2	DF3, PEM2, ST2	90 DF3	200
17.9	S5BCL080	4	Tributary of Youngs River	Open Cut	Intermittent	4.20	2	DF3, ST2	99 DF3	200
18.4	S5BCL076	4	Tributary of Rock Creek	Flume	Perennial	4.64	3	CF4, DF4, PEM2, ST3	78 CF4, 20 DF4	400
18.5	S1BCL009	10	Rock Creek	Flume	Perennial	4.78	3	CF4, DF3, DF4, PFO2, ST2, ST3	15 CF4, 35 DF3, 35 DF4, 14 PFO2	400
18.8	S1BCL010	5	Tributary of Youngs River	Open Cut	Intermittent	5.08	2	CF4, DF3, ST2	82 CF4, 16 DF3	200
19	S1BCL011	6	Tributary of Youngs River	Flume	Perennial	5.25	2	DF3, PEM3, PFO2, PFO3, ST2	97 DF3, 0 PFO2, 1 PFO3	400
19.14	S1BCO012	3	Unnamed	Open Cut	Intermittent	2.93	2	DF3, ST2	99 DF3	200
19.3	S1BCL014	8	Osgood Creek	Flume	Perennial	5.55	3	CF3, CF4, CF5, DF3, PEM2, PEM3, PFO2, ST3	30 CF3, 33 CF4, 14 CF5, 15 DF3, 0 PFO2	400
19.6	S2BCL013A	7	Tributary of Osgood Creek	Flume	Perennial	5.79	3	CF3, CF4, PEM3, PFO2, ST3	13 CF3, 64 CF4, 14 PFO2	400
20.1	S2BCL013B	35	Fox Creek	Flume	Perennial	6.10	3	CF4, DF3, ST3	71 CF4	400
21.4	S38CL013	3	South Fork Youngs River	Flume	Perennial	7.16	2	CF4, DF3, ST2	71 CF4	400
21.6	S42CL003	3	Unnamed	Open Cut	Intermittent	2.83	2	CF4, DF3, ST2	81 CF4	200
21.8	S5BCL058	15	Tributary of Youngs River	Flume	Perennial	7.58	2	CF3, CF4, ST2	16 CF3	400

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
22.1	S5BCL049	2.5	Tributary of Youngs River	Flume	Perennial	7.85	3	CF4, DF3, PEM2, ST2, ST3	95 CF4	400
22.2	S5BCL048	5	Tributary of Youngs River	Open Cut	Intermittent	7.92	3	CF4, DF3, ST3	98 CF4	200
22.5	S6BCL016	2	Tributary of Youngs River	Open Cut	Intermittent	8.20	2	CF4, DF3, PEM2, PFO2, ST2	20 CF4, 63 DF3, 10 PFO2	200
22.6	S6BCL013	1	Tributary of Youngs River	Open Cut	Intermittent	8.28	2	CF4, DF3, PEM2, ST2	88 CF4	200
22.6	S6BCL014	4	Tributary of Youngs River	Open Cut	Intermittent	8.29	2	CF4, DF3, ST2	96 CF4	200
22.6	S6BCL015	2	Tributary of Youngs River	Open Cut	Intermittent	8.23	2	CF4, DF3, PEM2, PFO2, ST2	36 CF4, 44 DF3, 12 PFO2	200
22.8	S6BCL010	2	Tributary of Youngs River	Open Cut	Intermittent	8.49	2	CF4, ST2	98 CF4	200
22.8	S6BCL011	2	Tributary of Youngs River	Open Cut	Intermittent	8.45	2	CF4, ST2	99 CF4	200
22.8	S6BCL017	3.5	Tributary of Youngs River	Open Cut	Intermittent	8.51	2	CF4, ST2	99 CF4	200
22.9	S6BCL018	4	Tributary of Fall Creek	Open Cut	Intermittent	8.62	3	CF4, ST3	99 CF4	200
23	S6BCL019	20	Tributary of Fall Creek	Flume	Perennial	8.66	3	CF3, CF4, ST3	54 CF3, 43 CF4	400
23.1	S6BCL020	3	Tributary of Fall Creek	Open Cut	Intermittent	8.77	3	CF3, ST3	99 CF3	200
23.4	S38CL014	10	Fall Creek	Flume	Perennial	9.11	3	CF3, CF4, DF3, ST3	40 CF3, 42 CF4, 14 DF3	400
24.3	S5BCL016	3.5	Tributary of Fishhawk Creek	Open Cut	Intermittent	2.36	3	CF4, ST3	99 CF4	200
24.4	S5BCL017	3.5	Tributary of Fishhawk Creek	Open Cut	Intermittent	2.34	3	CF4, PEM2, ST3	94 CF4, 4 PEM2	200
24.4	S5BCL018	6	Tributary of Fishhawk Creek	Flume	Perennial	2.32	3	CF4, PEM2, ST3	98 CF4, 1 PEM2	400
24.8	S2BCL001	7	Tributary of Fishhawk Creek	Open Cut	Intermittent	2.09	3	CF4, PSS2, ST3	82 CF4, 11 PSS2	200
24.8	S2BCL002	25	Tributary of Fishhawk Creek	Open Cut	Intermittent	2.08	3	CF4, PSS2, ST3	84 CF4, 9 PSS2	200
25.1	S2BCL003	8	Tributary of Fishhawk Creek	Open Cut	Intermittent	1.97	3	CF4, ST3	97 CF4	200

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
25.2	S2BCL004	3	Tributary of Fishhawk Creek	Open Cut	Intermittent	1.96	3	CF4, ST3	96 CF4	200
25.2	S2BCL005	10	Tributary of Fishhawk Creek	Flume	Perennial	1.96	3	CF4, PEM2, ST3	97 CF4, 1 PEM2	400
25.3	S2BCL007	3	Tributary of Fishhawk Creek	Flume	Perennial	1.95	3	CF3, CF4, PEM2, ST3	10 CF3, 88 CF4, 0 PEM2	400
25.4	S2BCL008A	15	Tributary of Fishhawk Creek	Flume	Perennial	1.95	3	CF3, CF4, PEM2, ST3	10 CF3, 88 CF4, 0 PEM2	400
25.7	S2BCL009	10	Tributary of Little Fishhawk Creek	Flume	Perennial	4.29	3	CF4, DF3, ST3	80 CF4, 18 DF3	400
25.7	S2BCL010	4	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	4.27	3	CF4, ST3	98 CF4	200
25.9	S2BCL012	10	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	4.19	3	CF4, PEM2, ST3	94 CF4	200
26.3	S5BCL019	1.2	Tributary of Little Fishhawk Creek	Flume	Perennial	3.87	2	CF4, ST2	100 CF4	400
26.5	S5BCL029	1.5	Tributary of Little Fishhawk Creek	Flume	Perennial	3.68	2	CF4, ST2	99 CF4	400
26.6	S5BCL027	1	Tributary of Little Fishhawk Creek	Flume	Perennial	3.63	2	CF4, ST2	99 CF4	400
26.6	S5BCL028	2	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	3.63	2	CF4, ST2	99 CF4	200
26.8	S5BCL023	1.3	Tributary of Little Fishhawk Creek	Flume	Perennial	3.40	3	CF3, CF4, PEM2, ST3	61 CF3, 38 CF4	400
26.8	S5BCL025	1.4	Tributary of Little Fishhawk Creek	Flume	Perennial	3.41	3	CF3, CF4, PEM2, ST3	48 CF3, 51 CF4	400
27	S5BCL022	3	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	3.27	3	CF3, CF4, ST3	50 CF3, 50 CF4	200
27.2	S5BCL021	6	Tributary of Little Fishhawk Creek	Flume	Perennial	3.05	3	CF3, CF4, PEM2, ST3	19 CF3, 79 CF4	400
27.3	S5BCL020	1.8	Tributary of Little Fishhawk Creek	Flume	Perennial	2.97	3	CF3, CF4, CF5, PEM2, ST3	18 CF3, 81 CF4, 1 CF5	400
27.4	S5BCL015	4	Tributary of Little Fishhawk Creek	Flume	Perennial	2.89	3	CF4, CF5, ST3	99 CF4, 1 CF5	400
27.6	S5BCL014	2.4	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	2.68	3	CF4, ST3	99 CF4	200
27.8	S5BCL012	2	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	2.55	3	CF3, CF4, ST3	11 CF3, 87 CF4	200

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
27.8	S5BCL013	2	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	2.56	3	CF3, CF4, ST3	12 CF3, 87 CF4	200
27.9	S5BCL011	3	Tributary of Little Fishhawk Creek	Open Cut	Intermittent	2.46	3	CF4, CF5, ST3	49 CF4, 50 CF5	200
28.1	S5BCL010	3.5	Tributary of Little Fishhawk Creek	Flume	Perennial	2.35	3	CF4, CF5, ST3	4 CF4, 96 CF5	400
28.4	S5BCL007	6	Tributary of East Humbug Creek	Open Cut	Intermittent	1.24	3	CF4, ST3	98 CF4	200
28.5	S5BCL004	7	Tributary of East Humbug Creek	Open Cut	Intermittent	1.13	3	CF4, ST3	98 CF4	200
28.5	S5BCL005	4	Tributary of East Humbug Creek	Open Cut	Intermittent	1.19	3	CF4, ST3	99 CF4	200
29	S5BCL001	3	Tributary of East Humbug Creek	Open Cut	Intermittent	0.79	3	CF4, ST3	97 CF4	200
29	S5BCL002	2	Tributary of East Humbug Creek	Open Cut	Intermittent	0.81	3	CF4, DF3, ST3	73 CF4, 25 DF3	200
29.4	S6BCL007	1	Tributary of East Humbug Creek	Open Cut	Intermittent	0.81	3	CF3, CF4, ST3	2 CF3, 98 CF4	200
29.4	S6BCL008	1.5	Tributary of East Humbug Creek	Open Cut	Intermittent	0.80	3	CF3, CF4, ST3	1 CF3, 98 CF4	200
29.5	S6BCL005	6	Tributary of East Humbug Creek	Flume	Perennial	0.78	3	CF4, ST3	98 CF4	400
29.5	S6BCL006	7	Tributary of East Humbug Creek	Flume	Perennial	0.79	3	CF3, CF4, ST3	1 CF3, 98 CF4	400
29.9	S6BCL004	5	Tributary of East Humbug Creek	Open Cut	Intermittent	0.59	3	CF3, CF4, ST3	15 CF3, 84 CF4	200
30.9	S2BCL021	2	Tributary of East Humbug Creek	Open Cut	Intermittent	0.72	3	CF4, ST3	99 CF4	200
31.4	S2BCL008B	15	Alder Creek	Flume	Perennial	0.00	2	CF3, CF4, PEM2, PEM3, ST2	32 CF3, 63 CF4	400
31.6	S6BCL001	3.5	Tributary of Alder Creek	Open Cut	Intermittent	0.21	2	CF4, ST2	99 CF4	200
32	S3BCL001	6	Tributary of Nehalem River	Open Cut	Intermittent	0.69	2	CF3, CF4, ST2	3 CF3, 95 CF4	200
32	S3BCL002	6	Tributary of Nehalem River	Open Cut	Intermittent	0.68	3	CF3, CF4, ST2, ST3	24 CF3, 73 CF4	200
32.1	S3BCL003	4	Tributary of Nehalem River	Open Cut	Intermittent	0.67	3	CF3, CF4, ST2, ST3	25 CF3, 72 CF4	200

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
32.1	S3BCL004	6	Tributary of Nehalem River	Open Cut	Intermittent	0.66	2	CF4, ST2	98 CF4	200
32.3	S3BCL005	8	Tributary of Nehalem River	Open Cut	Intermittent	0.67	3	CF3, CF4, ST3	68 CF3, 27 CF4	200
32.3	S3BCL006	10	Tributary of Nehalem River	Open Cut	Intermittent	0.67	3	CF3, CF4, ST3	74 CF3, 22 CF4	200
32.4	S3BCL007	8	Tributary of Nehalem River	Open Cut	Intermittent	0.68	3	CF3, CF4, ST3	83 CF3, 12 CF4	200
33.5	S99CL108	120	Nehalem River	HDD	Perennial	0.00	2	BP4, BP5, BP6, CF3, DF3, ST2	32 CF3, 37 DF3	400
34.4	S5BCL046	2	Tributary of Nehalem River	Flume	Perennial	1.06	2	CF4, PEM3, ST2	99 CF4	400
36.2	S3BCL101	10	Unnamed	Flume	Perennial	0.26	3	CF4, ST2, ST3	92 CF4	400
36.3	S3BCL102	5	Unnamed	Flume	Perennial	0.27	3	CF4, ST2, ST3	93 CF4	400
37.5	S8BCL004	5	Tributary of North Fork Quartz Creek	Flume	Perennial	0.47	3	CF3, CF4, PEM3, ST2, ST3	66 CF3, 2 CF4	400
37.7	S8BCL003	2.3	Tributary of North Fork Quartz Creek	Open Cut	Intermittent	0.54	3	CF4, PEM3, ST3	35 CF4	200
38.5	S8BCL001	2	Tributary of South Form Quartz Creek	Flume	Perennial	1.28	3	CF3, CF4, PSS3, ST2, ST3	7 CF3, 87 CF4, 5 PSS3	400
39.6	S1BCL029	2.6	Tributary of Military Creek	Open Cut	Intermittent	0.28	3	CF3, CF4, PFO2, ST3	23 CF3, 38 CF4, 39 PFO2	200
39.8	S1BCL027	1.5	Tributary of Military Creek	Open Cut	Intermittent	0.17	3	BP4, CF3, CF4, ST3	1 BP4, 25 CF3, 73 CF4	200
39.8	S1BCL028	2.6	Tributary of Military Creek	Open Cut	Intermittent	0.18	3	BP4, CF4, ST3	2 BP4, 97 CF4	200
41	S8BCL005	20	Rock Creek	HDD	Perennial	0.00	2	CF4, DF3, PEM2, PFO2, PSS3, ST2	67 CF4, 10 DF3, 15 PFO2, 6 PSS3	400
42.3	S8BCL009	11	Tributary of South Fork Rock Creek	Flume	Perennial	0.00	2	CF4, CF5, DF3, DF4, PFO2, ST2	46 CF4, 7 CF5, 22 DF3, 4 DF4, 19 PFO2	400
42.7	S1BCL020	6	Tributary of South Fork Rock Creek	Flume	Perennial	0.03	2	CF4, DF3, ST2	77 CF4, 22 DF3	400
43.1	S1BCL021	15	South Fork Rock Creek	HDD	Perennial	0.00	2	CF3, CF4, DF3, PEM3, ST2	17 CF3, 66 CF4, 15 DF3	400
43.4	S1BCL022	12	Bear Creek	HDD	Perennial	0.00	2	BP6, CF3, DF3, PFO2, ST2	78 CF3, 8 DF3, 7 PFO2	400

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
43.5	S1BCL023	1.3	Tributary of Bear Creek	HDD	Intermittent	0.04	2	BP6, CF3, PFO2, ST2	81 CF3, 7 PFO2	200
43.7	S1BCL024	1.6	Tributary of Bear Creek	Flume	Perennial	0.09	2	BP4, CF3, PEM3, ST2	95 CF3	400
43.9	S1BCL025	4	Tributary of Bear Creek	Open Cut	Intermittent	0.12	2	BP4, CF3, PEM3, ST2	71 CF3	200
44	S1BCL026	3	Tributary of Bear Creek	Open Cut	Intermittent	0.11	2	BP4, CF3, PEM3, ST2	92 CF3	200
44.2	S1BTI001	6	Bear Creek	Flume	Perennial	0.18	2	BP4, CF3, PFO2, ST2	82 CF3, 5 PFO2	400
44.3	S1BTI002	1.8	Tributary of Bear Creek	Open Cut	Intermittent	0.27	3	BP4, CF3, PEM3, ST3	79 CF3	200
44.8	S5BTI001	8	Tributary of Wolf Creek	Flume	Perennial	2.70	3	CF3, PEM2, ST3	99 CF3	400
45.1	S1BTI003	4	Tributary of Wolf Creek	Open Cut	Intermittent	2.41	3	CF3, ST3	99 CF3	200
47.62	S6BCO002	30	North Fork Wolf Creek	Flume	Perennial	0.00	2	CF3, ST2	97 CF3	400
48.3	S1BCO000	3	Tributary of North Fork Wolf Creek	Flume	Perennial	0.64	3	BP5, CF4, CF5, PEM3, ST3	37 CF4, 55 CF5	400
50.5	S3BCO012	30	Clear Creek	Flume	Perennial	0.03	2	BP3, CF4, CF5, DF3, ST2	32 CF4, 42 CF5, 20 DF3	400
53.6	S3BCO002	1	Fall Creek	Flume	Perennial	2.28	2	BP4, CF3, CF4, PEM3, ST2	70 CF3, 25 CF4	400
55.7	S3BCO107	10	Cedar Creek	Flume	Perennial	0.01	2	CF3, CF4, PEM3, ST2	24 CF3, 45 CF4	400
55.8	S3BCO106	4	Tributary of Cedar Creek	Flume	Perennial	0.21	2	BP5, CF3, CF4, CF5, PEM3, ST2	11 CF3, 1 CF4, 58 CF5	400
57.7	S3BCO100	10	Tributary of Rock Creek	HDD	Perennial	0.01	2	BP5, CF4, CF5, ST2	22 CF4, 66 CF5	400
57.7	S3BCO101	30	Rock Creek	HDD	Perennial	0.00	2	CF5, ST2	92 CF5, 8 ST2	400
57.7	S3BCO101B	10	Braided Channel to Rock Creek	HDD	Perennial	0.00	2	CF5, ST2	87 CF5, 13 ST2	400
63.8	S3BCO014	30	Nehalem River	HDD	Perennial	0.00	2	BP6, CF4, DF3, ST2	77 CF4, 13 DF3	400
66.3	S3BCO103	1	Tributary of Oak Ranch Creek	Open Cut	Intermittent	0.68	3	BP5, CF5, PEM3, ST3	91 CF5	200
67.7	S6BCO004	3	Unnamed	Open Cut	Intermittent	0.38	3	CF3, CF4, ST3	2 CF3, 98 CF4	200
68	S6BCO003	3	Unnamed	Flume	Perennial	0.49	3	CF4, ST3	100 CF4	400
70.2	S3BCO003	1	Tributary of Clatskanie River	Flume	Perennial	0.59	2	CF4, PEM3, ST2	99 CF4	400

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Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
70.7	S99CO020	18.5	Clatskanie River	Flume	Perennial	0.00	2	BP6, CF3, CF4, CF5, ST2	39 CF3, 25 CF4, 32 CF5	400
71	S99CO021	1	Unnamed	Flume	Perennial	0.19	3	CF4, PEM3, ST3	99 CF4	400
71.8	S5BCO001	2	Little Clatskanie River	Flume	Perennial	0.06	2	CF3, CF4, ST2	49 CF3, 51 CF4	400
72.7	S3BCO008	2	Tributary of Milton Creek	Flume	Perennial/ Intermittent	0.24	2	CF3, ST2	100 CF3	400
73	S3BCO010	12	Milton Creek	Flume	Perennial	0.02	2	CF4, DF3, PEM/PSS/PFO3, ST2	36 CF4, 12 DF3, 50 PEM/PSS/PFO3	400
73.5	S1BCO004	3	Apilton Creek	Open Cut	Intermittent	0.54	3	CF3, CF4, PSS/PFO3, ST3	23 CF3, 66 CF4, 10 PSS/PFO3	200
73.6	S1BCO005	1	Tributary of Apilton Creek	Open Cut	Intermittent	0.58	3	CF3, PEM3, ST3	76 CF3	200
74.5	S5BCO011	5	Unnamed	Flume	Perennial	0.12	2	CF4, DF3, PFO3, ST2	58 CF4, 36 DF3, 2 PFO3	400
74.6	S5BCO010	30	Unnamed	Flume	Perennial	0.12	2	CF3, CF4, DF3, PFO3, ST2	20 CF3, 34 CF4, 40 DF3, 2 PFO3	400
74.9	S6BCO001	22	Milton Creek	Flume	Perennial	0.00	2	CF4, CF5, DF3, PFO3, ST2	65 CF4, 21 CF5, 10 DF3, 1 PFO3	400
76.3	S3BCO110	1	Tributary of Merrill Creek	Open Cut	Intermittent	0.24	2	CF3, ST2	100 CF3	200
76.4	S3BCO017	35	Merrill Creek	Flume	Perennial	0.00	3	CF3, CF4, PEM/PFO3	1 CF3, 92 CF4, 7 PEM/PFO3	400
78.2	S2BCO009	3	Tributary of Merrill Creek	Open Cut	Intermittent	0.38	2	CF3, ST2	99 CF3	200
78.4	S3BCO122	10	Tributary of Merrill Creek	Flume	Perennial	0.20	2	CF3, CF4, PSS/PFO3, ST2	43 CF3, 56 CF4, 1 PSS/PFO3	400
79	S3BCO119	1	Tributary of Merrill Creek	Open Cut	Intermittent	0.92	2	CF3, PEM3, ST2	69 CF3	200
79	S3BCO120	1	Tributary of Merrill Creek	Open Cut	Intermittent	0.87	2	CF3, PEM3, ST2	58 CF3	200
79.9	S3BCO115	1	Tributary of Merrill Creek	Flume	Perennial	2.01	2	CF3, DF3, PEM3, ST2	45 CF3, 50 DF3	400
81.6	S99CO011	280	Deer Island Slough	Flume	Perenniall	0.46	2	PEM, PFO, ST	63 PFO	400
82	S3BCO123	20	Dyna Nobel Channel	HDD	Perennial	0.45	2	BP, NO, PEM, PFO, PSS, ST	21 PFO, 5 PSS	400
82.3	S99CO014	3300	Columbia River	HDD	Perennial	0.00	2	BP, NO, PEM, ST		400
83.3	S99CW020	10	Burris Creek	Flume	Perennial	0.00		NO		400
85.8	S99CW021	2	Unnamed	Flume	Perennial	0.36		PEM		400

Appendix G5

Riparian Areas Crossed by the Oregon LNG Pipeline

Milepost	Stream ID [a]	Stream Width [b]	Waterbody [c]	Crossing Method [d]	Stream Type	Miles to Salmonid Habitat	ODFW Stream Type	ODFW Habitat Type [e]	Riparian Cover [f] (%)	Approximate Width of Riparian Area Per Side [g] (feet)
86	S99CW022	2	Unnamed	Flume	Perennial	0.31		BP, NO, PEM		400
86.5	S99CW023	3	Unnamed	Open Cut	Intermittent	0.48		DF, MO, PEM	10 DF	200
86.7	S99CW025	3	Unnamed	Open Cut	Intermittent	0.40		BP, DF, PEM	48 DF	200
86.8	S99CW026	3	Unnamed	Flume	Perennial	0.39		BP, DF, PEM	65 DF	400

[a] Stream ID numbers beginning in S99 and S38 are for areas with no field access and are based on aerial photography and Pacific Northwest Hydrography Network database. Duplicate stream ID and milepost numbers may occur as a result of rounding of mileposts to the nearest tenth of a mile.

[b] Widths in feet are stream ordinary high water mark.

[c] Waterbody includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies.

[d] Construction methods for crossing waterbodies are flume, HDD (horizontal directional drilling), or open-cut.

[e] ODFW habitat types:

BP = Buildings and developed land
CF = Coniferous forest
DF = Deciduous forest
NO = Agricultural land
PEM = Palustrine emergent wetland
PFO = Palustrine Forest
PSS = Palustrine scrub/shrub wetland
ST = Stream

[f] Riparian area = DF4, 3, 2; CF4, 3, 2; PFO; PSS.

[g] Riparian area widths are for side of stream with maximum width.

APPENDIX G6

LANDSLIDE AND DEBRIS FLOW RISK NEAR WATERBODY CROSSINGS

Landslide and Debris Flow: Relative Risk Assessment for the Bidirectional Project Pipeline

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DATE: November 15, 2013

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Introduction

The purpose of this technical memorandum is to evaluate landslide and erosion hazards near 13 stream crossings selected along the proposed liquefied natural gas (LNG) pipeline (Pipeline) for the Bidirectional Project (Project). Two types of landslide hazards were evaluated: rotational slides and debris flows. Thirteen stream crossings along approximately 87 miles of the Pipeline between the Terminal near Warrenton, Oregon, and the interconnect with the existing Northwest Pipeline LLC (Northwest) pipeline near Woodland, Washington, were identified for this evaluation based on the following criteria: (1) salmon habitat protected under the endangered species act (ESA) has been identified in the stream to be crossed, and (2) the proposed Pipeline construction method consists of traditional cut-and-cover in conjunction with fluming of the stream at the crossing.

Other ESA-listed streams will be crossed using horizontal directional drilling (HDD) or other trenchless installation techniques. Trenchless installation methods have less impact in the immediate vicinity of stream crossings because the primary work areas at the entry and exit locations are typically at least 700 feet away from the stream and very little disturbance occurs between these work areas. In addition, the Pipeline will be installed at much greater depths below the stream when installed using HDD or other trenchless methods. ESA stream crossings where trenchless installation methods are proposed therefore are not discussed in this memorandum.

The relative risk of two types of landslides hazards, rotational slides and debris flows/rapid erosion, were assessed for the stream crossings evaluated using a set of risk factors. The primary risk factor evaluated relates to the presence of landslide hazards that are shown on published geologic hazard mapping and on landslide inventory mapping developed for the Project. Where mapped landslides or debris flow/rapid erosion hazards are identified on landslide mapping, the type and location of hazard is summarized for each of the selected stream crossings. Additional risk factors are evaluated for each crossing location to determine a relative hazard score for each of the 13 stream crossings evaluated. The risk factors used in the assessment consisted of the following:

- Slope Steepness
- Landform
- Geology
- Land Use
- Scour Potential
- Channel Migration

Table 1 lists the 13 stream crossings evaluated for landslide potential and the location, by milepost (MP), along the alignment. All 13 stream crossings evaluated are located in Oregon. The first 3 stream crossings listed are in Clatsop County and the remaining 10 are in Columbia County.

TABLE 1
Stream Crossing Summary

Waterbody	Stream ID	Milepost (approximate)
Barrett Slough	S5BCL064	4.4
Heckard Creek	S1BCL001	7.9
Alder Creek	S2BCL008B	31.4
North Fork Wolf Creek	S6BCO002	47.6
Clear Creek	S3BCO012	50.5
Cedar Creek	S3BCO107	55.7
Clatskanie River	S99CO020	70.7
Little Clatskanie River	S5BCO001	71.8
Milton Creek	S3BCO010	73.0
Milton Creek	S6BCO001	74.9
Merrill Creek	S3BCO017	76.4
Tributary of Merrill Creek	S3BCO122	78.4
Deer Island Slough	S99CO011	81.6

Note: Milepost refers to the approximate milepost along the Pipeline for the Oregon Pipeline Project.

ID = identification

This memorandum is organized into the following sections: Landslide Risk Factors, Stream Crossings, Summary of Landslide Risk Assessment, Limitations, and References.

Landslide Risk Factors

Landslides can have multiple causes. This section examines the physical, geological, and human-made causes of landslides and the risk factors that contribute to landslide potential. The following risk factors are addressed: mapped landslide hazard, slope steepness, landform, geology, land use, scour potential, and channel migration. A scoring system for each risk factor was developed in order to determine the relative landslide hazard for each of the 13 stream crossings.

Mapped Landslide Hazard

The most critical risk factor affecting the potential for future landslides is judged to be the presence of existing landslide features in the immediate vicinity of the stream crossings evaluated. The presence of mapped landslide features is critical because hill slope areas that have failed in the past often remain in a weakened state, and may tend to fail repeatedly over time. Additionally, large landslide complexes may have moved several times over thousands of years, with long periods of stability punctuated by episodes of movement. Thus, previously failed areas are particularly important to identify because they may be susceptible to future instability.

Two general types of landslide mapping were evaluated: published geologic mapping and landslide hazard inventory mapping developed specifically for the Project.

Published Hazard Mapping

In addition to using the landslide hazard inventory mapping developed for the Project, the potential for landslide hazards to be present in the vicinity of each of the 13 stream crossings has been evaluated by reviewing published geologic and landslide hazard reports. Some of these reports focus on identifying

documented historical landslides, others focus on identifying landslide topography, and a third group focus on identifying potential landslide areas. The following four primary sources of landslide hazard information, published by the Department of Geology and Mineral Industries (DOGAMI), have been used to identify the potential hazards for slope instability at each stream crossing:

- Statewide Landslide Information Database for Oregon (SLIDO-2)
- Slope Failures in Oregon: GIS Inventory for Three 1996/97 Storm Events; Oregon Department of Geology and Mineral Industries, Special Paper 34 (Hofmeister, 2000)
- "Potential Rapidly Moving Landslide Hazards in Western Oregon" (IMS-22) (Hofmeister, 2002)

Numerous additional geologic and hazard maps produced by DOGAMI were reviewed to identify potential landslide hazards at the stream crossings. These maps typically identify the locations of active landslides, inactive landslides, and landslide debris.

The following maps from DOGAMI Bulletin 79, *Environmental Geology of Inland Tillamook and Clatsop Counties, Oregon*, were included in this review:

- Hazard Map of the Birkenfeld Quadrangle (Beaulieu, 1972a)
- Hazard Map of the Saddle Mountain Quadrangle (Beaulieu, 1972b)

Project-Specific Landslide Hazard Inventory Mapping

A landslide deposit inventory map has been developed for the Project. Landslide inventory maps typically show the locations of identified historic and prehistoric landslide deposits for an area along with the characteristics of each landslide. Landslide inventory maps provide basic information for identifying areas of higher and lower hazards, and landslide susceptibility, which is the first step in risk reduction.

Although areas with mapped landslide deposits are likely to be at higher risk than other areas, these areas will not automatically experience problems in the future. However, hill slope areas that have failed in the past often remain in a weakened state, and may tend to fail repeatedly over time. Large landslide complexes may have moved several times over thousands of years, with long periods of stability punctuated by episodes of movement. Thus, previously failed areas are particularly important to identify because they may be susceptible to future instability.

Landslide and mass-movement topography, recent landslides, and areas that appear to be susceptible to gullying or rapid erosion were mapped on 1:24,000-scale, color stereo-pairs of aerial photographs. For the portion of the Project between MP 0.0 and approximately MP 47.5, the aerial photographs utilized were taken in June 2007 by i-TEN Associates of Portland, Oregon, and the mapping developed in 2009 (CH2M HILL, 2009). These aerial photographs provide coverage within Clatsop and Tillamook counties, Oregon. In Columbia County, Oregon, and Cowlitz County, Washington, from approximately MP 47.5 to the end of the Pipeline near MP 87.8, mapping was conducted using 1:13,560 scale aerial photographs taken in September 2011 by Continental Mapping Consultants, Inc., and the mapping developed in 2011 (CH2M HILL, 2011). Figures 1 through 18 in the Attachment to this memorandum show the combined 2009 and 2011 landslide inventory and geologic hazard maps developed for the Project.

In addition, light detection and ranging (LIDAR) data of the alignment are available to assist in delineating landslide areas in Columbia County. These data provide a detailed image of the ground surface and allow the identification of the topographic features associated with landslides. According to Burns and Madin (2009), the use of LIDAR data resulted in identification of 3 to 200 times the number of landslide found with other data sets, and the accuracy of the spatial extent of the landslides identified was greatly improved with LIDAR data.

Large areas of mass movement terrain were identified by the following features:

- Steep, arcuate, curved headscarps (pull-away zone) that form bowl-shaped areas

- Irregular, hummocky topography; disrupted or poorly developed drainage patterns and high drainage density; closed depressions and ponds within the slide mass; transverse ridges, and raised toes and lobes
- Deep gullies eroded into the weak, disturbed soils and rock
- Concave, nonplanar hillsides with steep upper slopes and flatter irregular lower slopes
- Drainages blocked by slide toes and lobes that often result in low-gradient streams that have areas of alluvium "ponded" behind them

The general direction of landslide movement is shown by an arrow. Obvious younger headscarps and smaller scarps within the slide mass are delineated on the landslide inventory mapping. Scarps in thick trees are more difficult to identify, but often have semi-circular logging roads following them around heads of drainages and are distinguished from "V" shaped drainage heads. Large areas of "mass movement terrain" are delineated by a triangular stippled pattern (similar to mass movement terrain shown on previous published mapping by Beaulieu, 1973). The landslide masses are typically downslope from the arcuate headscarps, which are outlined on the maps.

As landslides age and are subjected to erosion and weathering, the topographic features become more subdued and difficult to identify. Outlines of older landslides with a lower confidence of identification are shown by dashed outlines. The landslide inventory mapping also shows features such as rock quarries and areas of ponded stream alluvium. Generally, features such as hummocky topography, steep headscarps, gullies, ridges, and closed depressions were more easily observed in clearcut areas on the aerial photographs.

Areas that appear to be more susceptible to rapid erosion and gullying were also delineated on the aerial photographs. These areas are where the proposed alignment crosses side slopes that exhibit debris flows and steep-sided, deep erosional channels in weak soils. These areas are shown by an arrow. Often, in landslide areas, the erosional channels do not follow the "fall-line" towing to diversion by the irregular slide mass (deviation from the expected drainage patterns). Steep-sided gullies could be observed in the landslide mass, where the weakened, disturbed slide mass is more easily eroded.

Slope angles are often considered in landslide susceptibility and general landslide hazard, particularly for the hazard of potentially rapid-moving landslides. However, in the Project vicinity, the presence of large areas of landslide topography appears to be related more to lithology and areas of weak, interbedded sedimentary rocks rather than steeper slope angles. For example, stronger rocks such as basalt flows, intrusive basalts, and sandstones form steeper, more stable slopes that are not as susceptible to sliding. The steepest slopes along the Project are found in areas underlain by these types of rocks, and they actually exhibit fewer landslides despite being steeper. For example, between approximately MP 40 and 44, slopes are steep but fewer landslides were mapped because much of this area is underlain by sandstones (Sunset Highway member). In fact, Beaulieu (1973) notes that "slopes within the slide mass are gentler than those of the surrounding intact terrain." Steep slopes thus do not necessarily equate to greater landslide hazard. Steep slopes are often underlain by harder rock, and are actually more stable. For example, in the Birkenfeld Quadrangle, many large areas of landslides form *flatter* terrain, especially where very old slide masses are highly eroded and exhibit subdued topography and low slope angles.

Limitations of the Data and Landslide Inventory Mapping. Landslide inventory mapping is based on available aerial photographs and LIDAR data. Mapping is subject to interpretation or misinterpretation of the data, and landslides can be missed or overlooked. No field checking or verification of the mapping was conducted for Columbia County. Limited field checks were conducted for Clatsop County. Field checking tends to be time consuming and expensive and detailed geologic mapping is generally not completed as part of the Federal energy Regulatory Commission (FERC) permitting process. Limitations of the landslide inventory mapping include the following:

- At this level of inventory mapping, landslides were not classified by type (i.e., slump/earthflow versus debris flow).
- Features of older landslide deposits are more difficult to identify because of erosion and the tendency to be covered with younger deposits.
- The ages of landslides were not estimated, and landslides were not assigned to historic and pre-historic categories (i.e., younger and older than 150 years). However, landslides with less-recognizable features are generally interpreted to be older, and are delineated by dashed lines.
- Landslides were not classified as “deep” or “shallow” and the depths of landslides were not estimated. However, where a larger, deeper slide mass was recognizable, the mass was shown by a triangular stippled pattern.
- Landslide inventory/deposit mapping is NOT a map or complete inventory of locations of all past landslides.
- Very small landslide deposits cannot always be identified because of the resolution of LIDAR data, scale of aerial photos, and forest cover. Also, some areas of landslide terrain extend over several square miles and extend beyond the mapping corridor.
- The aerial photographs and LIDAR data are “snapshot” views of the existing landscape at the time of the photographs or generation of terrain model. New landslides may occur as the result of increased precipitation or changes in land use in the vicinity.

Table 2 presents the scoring system used for the risk related to a mapped landslide hazard. Because the presence of mapped landslide hazard is judged to be the single most important factor in predicting the possibility of future landslide events, the scoring range for this criterion is set between zero and 10, where other factors have a range between 0 and six. The system was developed based on the relative distance of each stream crossing to the mapped hazard. A score of 0 represents the lowest relative hazard for a mapped landslide area and a score of 9 represents the highest relative hazard.

TABLE 2
Mapped Landslide Hazard Scoring System

Mapped Landslide Hazard	Score
No documented or mapped landslide hazard in the vicinity of the stream crossing	0
Mapped areas of low landslide hazard	2
Mapped areas of landslide topography or areas of moderate landslide hazard	5
Areas meeting one of the following conditions: 1. Steam crossing is in the immediate vicinity of potential Gullying/Rapid Erosion/or Debris Flow 2. Within mapped area of inferred landslide 3. Area shown as high landslide hazard	8
Adjacent to recent documented landslide or within mapped landslide area	10

Slope Steepness

An important risk factor affecting the potential for landslides is slope steepness in the general vicinity of each of the 13 stream crossings evaluated. For this evaluation, slope refers to the steepness of the ground, or the height the slope rises in a given distance. For example, if the elevation difference between the toe of a slope and the crest of a slope is 50 feet and the horizontal distance between the toe and crest of the slope is 100 feet, an average slope geometry of 50 percent exists. As a general rule, the steeper the slope, the more susceptible it will be to landslides. This theory has been corroborated by a number of studies, including one study by the Oregon Department of Forestry (ODF), which found that all debris flows in the

study areas were initiated on slopes greater than 40 percent steepness and most landslides (86 percent) were initiated where slope steepness was measured to be over 70 percent (Robison et al., 1999).

Various land survey studies have been performed in the past for each of the 13 stream crossings evaluated. These studies provided contour information that CH2M HILL used to determine the character of any slopes located at or near each crossing. As a result, the scoring system for slope steepness presented in Table 3 was developed based on the general characteristics of the slopes at each crossing and previous experience regarding the stability of various slopes comprising materials native to the region. A score of 0 represents the lowest relative hazard regarding slope steepness and a score of 6 represents the highest relative hazard.

TABLE 3
Slope Steepness Scoring System

Slope Steepness (Percent)	Score
Less than 10	0
10 to 20	2
20 to 30	3
30 to 40	4
40 to 50	5
Greater than 50	6

Landform

The shape of slopes, referred to as landform, has an impact on the potential for landslides and debris flows. Sharply convergent (concave) slopes tend to develop thicker soil deposits and are locations where drainage is concentrated (Dietrich and Dunne, 1978). Many studies report that convergent slope locations have higher landslide hazard than straight (planar) and divergent (convex) landforms (Tsukamoto et al., 1982; Reneau and Dietrich, 1987; Benda and Cundy, 1990; May, 1998; Millard, 1999). While landslides and debris flows do occur on slopes with no apparent distinctive landform, convergent landforms tend to have a higher landslide occurrence in western North America (Hofmeister, 2002). Table 4 presents the scoring system used for landform. The system was developed based on the general shape of slopes at the location of each stream crossing. A score of 1 represents the lowest relative hazard regarding geology and a score of 5 represents the highest relative hazard.

TABLE 4
Landform Scoring System

Landform	Score*
Divergent (convex) shape of slopes at stream crossing	1
Straight (planar) shape of slopes at stream crossing	3
Convergent (concave) shape of slopes at stream crossing	5

*A score of zero (0) will be applied when there are no slopes or slopes of less than 10 percent steepness in the vicinity of the steam crossing.

Geology

The geology of Oregon is complex and varies widely across the state. Much of this variation can be attributed to the offshore Cascadia Subduction Zone, which is where the Juan de Fuca Plate is being actively subducted beneath the western margin of the North American Plate. The ongoing subduction has created accretionary wedges, fore-arc sediment basins, uplift of the Oregon Coast Range, and a seismically active

area with numerous faults, volcanoes, mountains, and valleys (Orr et al., 1992). The geology exclusive to each stream crossing site can have a large impact on the landslide and debris flow hazard. The following sources were used to identify the mapped geology for each of the 13 stream crossings evaluated:

- Oil and Gas Investigation of the Astoria Basin, Clatsop and Northwest Tillamook Counties, Northwest Oregon (Niem and Niem, 1985)
- Oregon Geologic Data Compilation (OGDC) Release 5. OGDC-5. (DOGAMI, 2009).

Table 5 presents the scoring system used for geology. The system was developed based on the established characteristics of geologic formations mapped at each stream crossing. A score of 1 represents the lowest relative hazard regarding geology and a score of 5 represents the highest relative hazard.

TABLE 5
Geology Scoring System

Geology	Score
Geology mapped at stream crossing known to not be susceptible to landsliding hazard (i.e., intact rock)	1
Geology mapped at stream crossing unknown or inconclusive regarding susceptibility to landsliding hazard	3
Geology mapped at stream crossing known to be susceptible to landsliding hazard	5

Land Use

Impacts from human activity can have an adverse effect on the stability of slopes. For this landslide risk assessment, the primary land use activity that could potentially affect the stability of slopes at the 13 stream crossing evaluated is logging and the removal of vegetation at or near each location. Most evidence suggests that the more vegetation present at a site, the lower its susceptibility to landslides. Both vegetative type and cover can significantly impact the potential for landslides (Hofmeister, 2002). Therefore, aerial photographs were studied in order to identify the stream crossings that are located in areas in proximity to timber harvesting and clearcutting activities. Table 6 presents the scoring system used for land use. A score of 1 represents the lowest relative hazard regarding land use and a score of 3 represents the highest relative hazard.

TABLE 6
Land Use Scoring Assessment

Land Use	Score
No evidence of timber harvesting or clearcutting activities in vicinity of the stream crossing	1
Evidence of timber harvesting or clearcutting activities in vicinity of the stream crossing	3

Scour Potential

Separate analyses were performed to evaluate the potential for scour at the 13 stream crossings. These analyses used characteristics such as stream segment slope, channel confinement, and entrenchment. Stream slope (gradient) at proposed Pipeline crossings were determined from field reconnaissance surveys. Where field reconnaissance surveys were not conducted, channel gradient was determined from 1:24,000 U.S. Geological Survey (USGS) topographic maps by measuring the distance between two contour lines encompassing the Pipeline crossing or by using Oregon 10-meter Digital Elevation Model elevations. Channel confinement was determined by measuring the valley width or floodplain (distance between contour lines on either side of the channel based on 1:24,000 USGS topographic map) and comparing it to the channel width (bankfull width).

After determining channel gradient, channel confinement, and valley width at the Pipeline crossing, streams were grouped into categories based on their similarities and channel characteristics. Streams with specific similarities are expected to have similar responses to disturbance or are predisposed to specific conditions. These responses or conditions are based in part on the Washington Department of Natural Resources (WDNR) Watershed Assessment Methodology (1994) Channel Response Matrix. In addition, the Rosgen channel type (Rosgen, 1996) collected during field reconnaissance surveys was used to verify and support WDNR Channel Response Matrix characteristics. Table 7 presents a summary of the categories the stream crossings were grouped into and the associated scoring system used for scour potential. A score of 1 represents the lowest relative hazard regarding scour potential and a score of 5 represents the highest relative hazard.

TABLE 7
Scour Potential Scoring System

Scour Potential	Score
None or Slight	1
Moderate	2
Moderate/Severe	3
Severe	4
Severe (Mass-Wasting Dominated)	5

Channel Migration

Channel migration can have an adverse effect on stability of slopes if the stream channel erodes into the toe or base of a slope. As with scour potential, separate analyses were performed to determine the potential for channel migration at the proposed stream crossings. The analyses considered the valley width, channel width, and the gradient of each stream in order to determine the potential for channel migration. Table 8 presents a summary of the scoring system used for channel migration as it relates to landslide hazard. A score of 0 represents the lowest relative hazard regarding channel migration and a score of 3 represents the highest relative hazard.

TABLE 8
Channel Migration Scoring Assessment

Channel Migration	Score
Minimal bank erosion or channel migration potential	0
Bank erosion and channel migration	3

Summary

A total of seven risk factors that have varying levels of influence on landslide hazard were evaluated for each stream crossing. As shown by the scoring systems presented in Tables 2 through 8, mapped landslide hazard has been determined to be the most critical of the seven risk factors. However, each risk factor does impact the landslide hazard at each of the 13 stream crossings. Landslides often have several causes, some of which are listed above, but only one trigger (Varnes, 1978). A trigger is an external stimulus such as intense rainfall or a seismic event, and the hazard associated with these triggers is considered to be relatively equal across all of the proposed stream crossings.

Stream Crossings

This section summarizes the evaluation of the landslide hazard at each of the 13 stream crossings. A score for each landslide hazard risk factor is presented with a justification for that score. A sum of each risk factor

score for a stream crossing is presented as the total score in order to quantify the relative landslide hazard at that specific stream crossing.

Barrett Slough (S5BCL064)

The Barrett Slough (stream ID S5BCL064) crossing is located at MP 4.4 along the Pipeline alignment in an alluvial valley created by the Lewis and Clark River approximately 2 miles south of the confluence of the Lewis and Clark River and Youngs Bay.

The width and depth of the slough channel at the crossing are approximately 12 and less than 3 feet, respectively. Table 9 presents a score value and justification for each risk factor evaluated for this crossing. Stream crossing Figure 6A-5 presents an aerial view and cross-section of the crossing.

TABLE 9
Scoring Assessment—Barrett Slough (S5BCL064)

Risk Factor	Score	Justification
Mapped Landslide Hazard	0	No documented or mapped landslide hazard in vicinity of crossing.
Slope Steepness	0	Stream located in alluvial valley where topography is primarily flat. Slope geometry approximately equal to 0.
Landform	0	No slopes adjacent to stream crossing.
Geology	3	Geology at crossing mapped to be quaternary alluvium (Qal) consisting of unconsolidated flood plain deposits of clay, silt, sand, and basalt gravel (Niem and Niem, 1985).
Land Use	1	Land use primarily consists of agriculture. Stream setting is an alluvial valley with sporadic trees. No timber harvesting in general vicinity due to stream location.
Scour Potential	1	Analysis results show none or slight scour potential.
Channel Migration	3	Analysis results show bank erosion and channel migration potential.
Total Score	**8**	

Heckard Creek (S1BCL001)

The Heckard Creek (stream ID S1BCL001) crossing is located at MP 7.9 for the main Pipeline alignment in the foothills along the western flank of the Oregon Coast Range in a forested setting.

The width and depth of the creek channel at the crossing are approximately 10 and 3 feet, respectively. Table 10 presents a score value and justification for each risk factor evaluated for this crossing. Figure 6A-8 presents an aerial view and cross-section of the stream crossing.

TABLE 10
Scoring Assessment—Tributary of Heckard Creek (S1BCL001)

Risk Factor	Score	Justification
Mapped Landslide Hazard	5	Landslide topography mapped at crossing location (SLIDO-2).
Slope Steepness	2	Stream crossing located in foothills along western flank of Coast Range. Average slope geometry of slope located south of crossing approximately equal to 15 to 20 percent.
Landform	3	General shape of slopes located at crossing is planar.
Geology	1	Geology at crossing mapped to be Smuggler Cove Formation (Tsc_2), which consists primarily of thick-bedded bioturbated tuffaceous claystone and siltstone (Niem and Niem, 1985).
Land Use	3	Evident that predominant land use activity in the general vicinity of the crossing is timber harvesting.
Scour Potential	1	Analysis results show a slight potential for scour.
Channel Migration	3	Analysis results show bank erosion and channel migration potential.

TABLE 10
Scoring Assessment—Tributary of Heckard Creek (S1BCL001)

Risk Factor	Score	Justification
Total Score	18	

Alder Creek (S2BCL008B)

The Alder Creek (stream ID S2BCL008B) crossing is located at MP 31.4 of the Pipeline alignment in the Oregon Coast Range in a forested setting approximate 1 mile east-northeast from Camp 18 and US Highway 26.

The width and depth of the creek channel at the crossing are approximately 13 and 4 feet, respectively. Table 11 presents a score value and justification for each risk factor evaluated for this crossing. Figure 6A-10 presents an aerial view and cross-section of the stream crossing.

TABLE 11
Scoring Assessment—Alder Creek (S2BCL008B)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Stream is near potential gullying/rapid erosion location. Crossing location is also in area mapped to have mass movement topography (Beaulieu, 1972b).
Slope Steepness	4	Stream crossing located in Oregon Coast Range. Average slope geometry of slope located south of crossing approximately equal to 30 to 40 percent.
Landform	1	General shape of steeper slopes at stream crossing is divergent.
Geology	1	Geology at crossing mapped to be either Sager Creek Formation (Tg) or Keasey Formation (Tkj). Sager Creek Formation primarily consists of well-laminated micaceous and carbonaceous mudstone. Keasey Formation primarily consists of thin-bedded to laminated tuffaceous to glauconitic mudstone (Niem and Niem, 1985).
Land Use	3	Evident that predominant land use activity in the general vicinity of the crossing is timber harvesting. Clearcut located adjacent to stream crossing.
Scour Potential	3	Analysis results show a moderately severe potential for scour.
Channel Migration	0	Analysis results show no or minimal potential for bank erosion or channel migration.
Total Score	**20**	

North Fork Wolf Creek (S6BCO002)

The North Fork Wolf Creek (stream ID S6BCO002) crossing is located at MP 47.6 along the Pipeline in the Oregon Coast Range in a forested setting approximately 1,200 feet north of US Highway 26 about three-quarters of a mile west of the intersection with North Fork Wolf Creek Road.

The width and depth of the creek channel at the crossing are approximately 35 and 5 feet, respectively. Table 12 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-14 presents an aerial view and cross-section of the stream crossing.

TABLE 12
Scoring Assessment—North Fork Wolf Creek (S6BCO002)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Stream is near potential gullying/rapid erosion location. Crossing location is also adjacent to area mapped as landslide topography (CH2M HILL, 2013), potential rapidly moving landslide (Hofmeister, 2002).
Slope Steepness	5	Stream crossing located in Oregon Coast Range. Geometry of slopes adjacent to crossing ranges from 40 to 50 percent on south side of creek and between 20 and 30 percent on north side of creek.
Landform	3	General shape of slopes located at crossing is planar.
Geology	5	Geology consists of marine sedimentary rock. Deep landslides are uncommon in this geology, but shallow landslides are known to occur.
Land Use	3	Evidence of clearcutting activities northeast of the stream crossing.
Scour Potential	2	Analysis results show a slight to moderate potential for scour at the stream crossing.
Channel Migration	0	Minimal bank erosion or channel migration potential.
Total Score	**26**	

Clear Creek (S3BCO012)

The Clear Creek (stream ID S3BCO012) crossing is located at MP 50.5 along the Pipeline alignment in the Oregon Coast Range in a forested setting approximately 2 miles north of US Highway 26 about 2 miles west of Timber Road. The width of the creek channel at the crossing is approximately 30 feet and the depth of the creek is unknown. Table 13 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-15 presents an aerial view and cross-section of the stream crossing.

TABLE 13
Scoring Assessment—Clear Creek (S3BCO012)

Risk Factor	Score	Justification
Mapped Landslide Hazard	2	No documented or mapped landslide hazard at crossing, but Potential Rapidly Moving Landslide located northeast of crossing locations (Hofmeister, 2002).
Slope Steepness	3	Slope ranges between 20 and 30 percent with steeper slopes located northeast of stream crossing.
Landform	1	Slopes on either side of stream crossing are slightly divergent.
Geology	3	Geology at crossing mapped to Marine Sedimentary Rock consisting of sandstone – specifically Cowlitz Formation, Clark and Wilson Sandstone Member (Tccw) (DOGAMI, 2009).
Land Use	3	Evidence of clearcutting activities east of the stream crossing.
Scour Potential	3	Analysis results show a moderate to severe potential for scour.
Channel Migration	0	Analysis results show minimal potential for bank erosion and channel migration.
Total Score	**15**	

Cedar Creek (S3BCO107)

The Cedar Creek (stream ID S3BCO107) crossing is located at MP 55.7 of the Pipeline alignment in the Oregon Coast Range in a forested setting approximately 1 mile west of the Vernonia Airfield and approximately 0.15 mile southwest of Koster Road.

The width and depth of the creek channel at the crossing are approximately 20 and 5 feet, respectively. Table 14 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-16 presents an aerial view and cross-section of the stream crossing.

TABLE 14
Scoring Assessment—Cedar Creek (S3BCO107)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Mapped landslide located south of stream crossing with small areas of rapid erosion and gullying potential (CH2M HILL, 2013).
Slope Steepness	4	Creek is deeply incised with slopes immediately adjacent to the creek crossing ranging in steepness between 30 and 40percent. Slopes further from incised creek are flatter with typical slopes less than 10 percent.
Landform	3	General shape of slopes located at crossing is planar.
Geology	3	Geology at crossing mapped to be Keasey Formation (Tk), which primarily consists of tuffaceous sedimentary rocks (DOGAMI, 2009).
Land Use	3	Evidence of clearcutting activities north of the stream crossing.
Scour Potential	2	Analysis results show slight to moderate scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	**23**	

Clatskanie River (S99CO020)

The Clatskanie River (stream ID S99CO020) crossing is located at MP 70.7 of the main Pipeline alignment on the east side of the Oregon Coast Range. The crossing is in a forested area approximate 0.1 mile west of Schaffer Road, 2 miles north of its intersection with Pittsburg Road, and about 10 miles west of the Columbia River.

The width of the creek channel is estimated to be approximately 20 and the depth of the creek is expected to range between 2 feet and 7 feet for the majority of the year. Table 15 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-19 presents an aerial view and cross-section of the stream crossing.

TABLE 15
Scoring Assessment—Clatskanie River (S39CLI001)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Mapped landslide located immediately west of stream crossing with small areas of rapid erosion and gullying potential (CH2M HILL, 2013).
Slope Steepness	4	Geometry of slopes adjacent to crossing generally range from 25 to 35 percent.
Landform	3	General shape of slopes located at crossing is planar.
Geology	5	Geology at crossing mapped Scappoose Formation (Ts) consisting of sandstone (DOGAMI, 2009). However, it is believe that shallow deposits of recent quaternary alluvium (Qal) overly the sandstone at this crossing location (CH2M HILL, 2013).
Land Use	3	The stream crossing is immediately east of a clearcut.
Scour Potential	1	Analysis results show none to slight scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	24	

Little Clatskanie River (S5BCO001)

The Little Clatskanie River (stream ID S5BCO001) crossing is located at MP 71.8 of the Pipeline alignment in the Oregon Coast Range, approximately 0.2 miles east of Janshaw Road.

The width and depth of the creek channel at the time of a site visit were less than 10 and less than 2 feet, respectively. Table 16 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-20 presents an aerial view and cross-section of the stream crossing.

TABLE 16
Scoring Assessment—Little Clatskanie River (S5BCO001)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Mapped landslide located west of stream crossing with potential for rapid erosion and/or gullying at stream crossing (CH2M HILL, 2013).
Slope Steepness	2	Geometry of slopes adjacent to crossing ranges from 10 to 20 percent.
Landform	3	General shape of slopes located at crossing is planar.
Geology	1	Geology at crossing mapped Columbia River Basalt Group (Tcr) consisting of basalt rock (DOGAMI, 2009). However, it is believe that shallow deposits of recent quaternary alluvium (Qal) overly the basalt at this crossing location (CH2M HILL, 2013).
Land Use	3	The stream crossing is immediately west of a clearcut.
Scour Potential	3	Analysis results show moderate to severe scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	20	

Milton Creek (S3BCO010)

The Milton Creek (stream ID S3BCO010) crossing is located at MP 73.0 of the Pipeline alignment in the Oregon Coast Range approximately 0.1 mile east of S Canaan Road.

At the time of the field visit to evaluate the stream characteristics, the width and depth of the creek channel at the crossing were approximately 10 and less than 2 feet, respectively. Table 17 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-21 presents an aerial view and cross-section of the stream crossing.

TABLE 17
Scoring Assessment—Milton Creek (S3BCO010)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Mapped potential for rapid erosion and/or gullying at stream crossing (CH2M HILL, 2013).
Slope Steepness	4	Geometry of slopes adjacent to crossing generally range from 25 to 35 percent.
Landform	1	Slopes on either side of stream crossing are slightly divergent.
Geology	1	Geology at crossing mapped Columbia River Basalt Group (Tcr) consisting of basalt rock (DOGAMI, 2009). However, it is believe that shallow deposits of recent quaternary alluvium (Qal) overly the basalt at this crossing location (CH2M HILL, 2013).
Land Use	1	No evidence of timber harvesting or clearcutting activities in vicinity of the stream crossing.
Scour Potential	3	Analysis results show moderate to severe scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	**18**	

Milton Creek (S6BCO001)

The Milton Creek (stream ID S6BCO001) crossing is located at MP 74.9 of the Pipeline alignment in the Oregon Coast Range. The crossing is approximately 0.2 mile south of Pinkney Road.

At the time of the field visit to evaluate the stream characteristics, the width of the creek channel at the crossing was approximately 20 feet. No information was obtained relative to the depth of the creek channel. Table 18 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-22 presents an aerial view and cross-section of the stream crossing.

TABLE 18
Scoring Assessment—Milton Creek (S6BCO001)

Risk Factor	Score	Justification
Mapped Landslide Hazard	5	Mapped landslide hazards both north and south of crossing location with potential for gullying and/or rapid erosion upstream and downstream of crossing, but not directly at crossing location.
Slope Steepness	5	Geometry of slopes adjacent to crossing generally range from 40 to 50 percent east of the stream crossing and less than 20 percent west of the stream crossing.
Landform	1	Slopes on either side of stream crossing are divergent.
Geology	5	Geology at crossing mapped to be Scappoose Formation, Oligocene Sediment (Tos) which primarily consists of sandstone (DOGAMI, 2009). However, it is believe that shallow deposits of recent quaternary alluvium (Qal) overly the sandstone at this crossing location (CH2M HILL, 2013).
Land Use	3	The stream crossing is west of a clearcut area.
Scour Potential	3	No data are available for the relative scour potential at the crossing. Therefore, a medium score of 3 is used.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	**22**	

Merrill Creek (S3BCO017)

The Merrill Creek (stream ID S3BCO017) crossing is located at MP 76.4 of the Pipeline alignment in the foothills of the Oregon Coast Range, approximately 1.1 miles due south of the intersection of Hawks Run Lane and Canaan Road.

At the time of the field visit to evaluate the stream characteristics, the full width of the stream channel was noted at 35 feet but no information was recorded on the width or depth of the stream. Table 19 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-23 presents an aerial view and cross-section of the stream crossing.

TABLE 19
Scoring Assessment—Merrill Creek (S3BCO017)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Mapped landslide hazards in the vicinity, but not directly at the crossing location. Potential for gullying and/or rapid erosion in the vicinity of the crossing location.
Slope Steepness	3	Geometry of slopes adjacent to crossing generally range from 20 to 30 percent east of the stream crossing and less than 20 percent west of the stream crossing.
Landform	5	Slope to the east of the crossing is divergent and the slope to the west of the crossing is convergent.
Geology	1	Geology at crossing mapped Columbia River Basalt Group (Tcr) consisting of basalt rock (DOGAMI, 2009).
Land Use	1	No evidence of recent timber harvesting or clearcutting in the vicinity of the stream crossing.
Scour Potential	2	Analysis results show slight to moderate scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	**20**	

Tributary of Merrill Creek (S3BCO122)

The Tributary of Merrill Creek (stream ID S3BCO122) crossing is located at MP 78.4 of the Pipeline alignment in the foothills of the Oregon Coast Range, approximately 0.8 mile south of the terminus of Hills Haven Avenue.

At the time of the field visit to evaluate the stream characteristics, the width of the creek channel at the crossing was approximately 10 feet. No information was obtained relative to the depth of the stream. Table 20 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-24 presents an aerial view and cross-section of the stream crossing.

TABLE 20
Scoring Assessment—Tributary of Merrill Creek (S3BCO122)

Risk Factor	Score	Justification
Mapped Landslide Hazard	8	Both sides of stream crossing are shows as landslide topography. Multiple small areas where there is a potential for gullying and/or rapid erosion are located in the vicinity of the crossing location.
Slope Steepness	4	Geometry of slopes adjacent to crossing ranges from 30 to 40 percent.
Landform	3	Slope to the east of the crossing is divergent and the slope to the west of the crossing is planar.
Geology	5	Geology at crossing mapped Scappoose Formation (Ts) consisting of sandstone (DOGAMI, 2009). However, it is believe that shallow deposits of recent quaternary alluvium (Qal) overly the sandstone at this crossing location (CH2M HILL, 2013).
Land Use	1	No evidence of recent timber harvesting or clearcutting in the vicinity of the stream crossing.
Scour Potential	2	Analysis results show slight to moderate scour potential.
Channel Migration	0	Minimal potential for bank erosion and channel migration potential.
Total Score	**23**	

Deer Island Slough (S99CO011)

The Deer Island Slough (stream ID S99CO011) crossing is located at MP 81.6 of the Pipeline alignment at the edge of the Coast Range in the Willamette Valley ecoregion. The crossing is immediately adjacent to the Columbia River and is bordered on both sides by open areas.

The proposed Pipeline alignment is along a flood control levee that also serves as an access road, called Dike Road, to Deer Island. The slough flows under Dike Road via culverts. The planned location for the Pipeline would be along the toe of the existing levee, above the culverts that carry water of the Deer Island Slough. Therefore, the proposed location of the Pipeline would not have any impacts to the landslide potential at this crossing. However, an assessment of the potential hazard is included to evaluate the potential hazard at the crossing in the unlikely event that the location of the Pipeline is modified.

At the time of the field visit to evaluate the stream characteristics, the width of the creek channel at the crossing was approximately 38 feet. No information was obtained relative to the depth of the stream. Table 21 presents a score value and justification for each risk factor evaluated for the crossing. Figure 6A-25 presents an aerial view and cross-section of the stream crossing.

TABLE 21
Scoring Assessment—Deer Island Slough (S99CO011)

Risk Factor	Score	Justification
Mapped Landslide Hazard	0	No documented or mapped landslide hazard in vicinity of crossing.
Slope Steepness	0	Stream located in alluvial valley where topography is primarily flat. Slope geometry approximately equal to 0.
Landform	0	Slopes adjacent to stream crossing are less than 10 percent.
Geology	5	Geology at crossing mapped to be artificial fill (af), which makes up the Dike Road. The material around the dike road is mapped as Alluvium (Qa) (DOGAMI, 2009).
Land Use	1	No timber harvesting in general vicinity because of stream location.
Scour Potential	3	Analysis results show moderate to severe scour potential.
Channel Migration	3	Analysis results show bank erosion and channel migration potential.
Total Score	**12**	

Summary of Landslide Risk Assessment

The systematic assessment methodology described in this technical memorandum resulted in the quantification of relative landslide hazard at each of the 13 selected Pipeline stream crossings. Table 22 presents the range of total score values relative to the landslide hazard.

TABLE 22
Relative Landslide Hazard

Total Score	Relative Landslide Hazard
10 or less	Very Low
11 to 15	Low
16 to 20	Moderate
21 to 25	High
25 and greater	Very High

Table 23 presents a summary of the scores for each risk factor applied to each of the 13 selected stream crossings, as well as the total score and corresponding relative landslide hazard.

TABLE 23
Landslide Risk Assessment Summary

Waterbody	Stream ID	Mapped Landslide Hazard	Slope Steepness	Landform	Geology	Land Use	Scour Potential	Channel Migration	Total Score	Relative Landslide Hazard
Barrett Slough	S5BCL064	0	0	3	0	1	1	3	8	Very Low
Heckard Creek	S1BCL001	5	2	3	1	3	1	3	18	Moderate
Alder Creek	S2BCL008B	8	4	1	1	3	3	0	20	Moderate
North Fork Wolf Creek	S6BCO002	8	5	3	5	3	2	0	26	Very High
Clear Creek	S3BCO012	2	3	1	3	3	3	0	15	Low
Cedar Creek	S3BCO107	8	4	3	3	3	2	0	23	High
Clatskanie River	S99CO020	8	4	3	5	3	1	0	24	High
Little Clatskanie River	S5BCO001	8	2	3	1	3	3	0	20	Moderate
Milton Creek	S3BCO010	8	4	1	1	1	3	0	18	Moderate
Milton Creek	S3BCO001	5	5	1	5	3	3	0	22	High
Merrill Creek	S3BCO017	8	3	5	1	1	2	0	20	Moderate
Tributary of Merrill Creek	S3BCO122	8	4	3	5	1	2	0	23	High
Deer Island Slough	S99CO011	0	0	0	5	1	3	3	12	Low

ID = identification.

Limitations

This memorandum has been prepared for the exclusive use of LNG Development Company, LLC, and the Oregon Pipeline Company, LLC, and CH2M HILL, for application to the specific stream crossings described along the Oregon Pipeline Project in Clatsop and Columbia counties, Oregon. It has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The geologic information contained in this memorandum is from published geology and geologic hazard maps. Data related to ground surface topography are from various sources that include in order of decreasing accuracy and detail, field surveys, aerial photography, and 1:24,000 USGS topographic maps. Information on land use is based on aerial photographs available at the time of this assessment and observations made during field reconnaissance of sites where access to stream crossings could be obtained. The interpretations and recommendations contained in this memorandum are based on limited data and should be considered preliminary. Site-specific information for each Pipeline stream crossing should be collected. CH2M HILL is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or for reuse of subsurface data, without CH2M HILL's express written authorization.

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Attachment
Landslide Inventory and Geologic Hazard Maps

This attachment has been removed. The full memo containing the maps was filed as appendix 6B to the Oregon LNG Applicant-Prepared Draft Biological Assessment and is available on FERC's eLibrary at http://www.ferc.gov/docs-filing/elibrary.asp under Docket No. CP09-6-001, Accession No. 20131230-5208.

APPENDIX H

OTHER SPECIAL STATUS SPECIES FOR OREGON LNG PROJECT

Table H-1

Other Special Status Species for Oregon LNG Project

Species [a]	Status [b]	Habitat	Impacts	Mitigation
Plants				
Bradshaw's desert parsley *Lomatium bradshawii*	F-E OR-E OCS WA-E	Range extends from western Washington south through the Willamette Valley. Historically found in lowland *Deschampsia cespitosa* prairies with heavy clay soils; especially Bashaw soils. Also in wetland depressions, grassy swales, and along seasonally wet waterways and flooded prairie lowlands. Unlikely to occur in project area. Associated plant species include *Deschampsia caespitosa, Juncus tenuis, Carex stipata, Carex uniLateralis, Poa pratensis, Hordeum brachyantherum, Perideridia sp., Juncus sp*.	If present in the right-of-way, these plants would be disturbed and potentially lost to vegetation clearing and ground disturbing activities. However, most of the pipeline would be routed through previously disturbed industrial forest or agricultural areas that likely preclude these plant species.	Following construction, the construction right-of-way would be reseeded with a native seed mix developed in consultation with state resource agencies. Oregon LNG would segregate top soil to preserve seed bank according to its Plan and Procedures. A botanist would be available during construction activities involving vegetation removal and soil disturbance to ensure no rare plants are lost.
Wayside aster *Eucephalus vialis*	OR-T OCS	Many of the 100 known populations occur in disturbed areas (ODFW, 2006). Found in second growth and old-growth Douglas fir forests, mixed coniferous/hardwood forest openings, along shaded roadsides, in residential areas, and on prairie balds.		
White rock larkspur *Delphinium leucophaeum*	OR-E OCS WA-E	Only 17 known occurrences in Oregon (OSU, 2008). Historically occurred in upland prairies. Due to habitat loss, species is found in remnant habitat patches, along dry roadsides, dry roadside ditches, open fields, dry hillsides, meadow and grassland. Also, some occurrences on the edge of oak woodlands.		
Invertebrates				
Haddock's rhyacophilan caddisfly *Rhyacophila haddocki*	F-SOC OCS	Requires cool, clear streams with coarse sediment and little silt.	Waterbody crossings would temporary disturb substrate and cause turbidity that could inhibit the growth and survival of aquatic insects. Following construction, stream substrate is expected to return to preconstruction conditions.	Oregon LNG would use HDD to cross certain waterbodies, which would avoid disturbance to aquatic insects. Compliance with Oregon LNG's Plan and Procedures would limit turbidity during open cut waterbody crossings.
Roth's blind ground beetle *Pterostichus rothi*	F-SOC OCS	Requires cool, moist, closed-canopy conifer forests with deep, well-drained soils. Lives within soil but requires coarse woody debris for refugia.	Pipeline construction in conifer forests may result in the loss of ground dwelling insects.	Oregon LNG selected a pipeline route to avoid intact forest habitats to the extent possible. Cleared areas would be replanted to prevent non-native colonization. Where possible, downed woody debris would be left when clearing right-of-way.
Willamette floater (freshwater mussel) *Anodonta wahlametensis*	OCS WA-SC	Occurs in lakes, slow-moving rivers, streams and sloughs. Substrate is either mud or sand. Uses waters with low gradient, especially waterways in coastal areas. As with most mussels, this species requires specific species of native fish to fulfill portions of its larval life history.	In-water excavation and dewatering associated with waterbody crossings could result in the loss of freshwater mussels if they are present in the substrate. Following construction, stream substrate is expected to return to preconstruction conditions.	Oregon LNG would use HDD to cross certain waterbodies, which would avoid impact on freshwater mussels. At open cut crossings, Oregon LNG would salvage aquatic species present in dewatered area, which includes freshwater mussels.

Table H-1

Other Special Status Species for Oregon LNG Project

Species [a]	Status [b]	Habitat	Impacts	Mitigation
Fish				
Pacific lamprey *Entosphenus tridentatus*	F-SOC OR-SV OCS	Feed and grow in the ocean, then return to freshwater rivers for spawning and early development. Requires fine gravel beds for spawning and cool clean water for development within river systems.	In-water excavation and dewatering associated with waterbody crossings could result in the loss of lamprey if they are present in the substrate. Following construction stream substrate is expected to return to preconstruction conditions.	Oregon LNG would use HDD to cross certain waterbodies, which would also benefit lamprey. At open cut crossings, Oregon LNG would salvage aquatic species present in dewatered area, which includes lamprey – to the extent feasible. Compensatory mitigation for the Youngs Bay estuarine enhancements and fish barrier removal would benefit Pacific lamprey.
River lamprey *Lampetra ayresii*	F-SOC WA-C	Riffle and side channel habitats are important for spawning and for ammocoete rearing. Lamprey ammocoetes colonize areas with soft substrate and good water quality. Adults feed in nearshore marine and estuarine habitat.	Waterbody crossings in Cowlitz County may support river lamprey. In-water excavation and dewatering associated with waterbody crossings could result in the loss of ammocoetes buried in the sediment. Following construction stream substrate is expected to return to preconstruction conditions.	At open cut crossings, Oregon LNG would salvage aquatic species present in dewatered area, which includes lamprey – to the extent feasible.
Coastal cutthroat *Oncorhynchus clarki clarki*	F-SOC OR-SV	Utilize a wide variety of habitat types during their complex life cycle. Spawn in small tributary streams and utilize slow flowing backwater areas, low velocity pools, and side channels for rearing of young. Large woody debris, instream structures and vegetation are important for protection while in freshwater. Clean gravel is needed for spawning and rearing.	Coastal cutthroat are documented as occurring in 10 streams to be crossed by the project, although their presence is assumed in all other fish bearing streams that would be crossed. Waterbody crossings would temporarily displace cutthroat due to inwater work and increased turbidity. Direct mortality may occur if fish are trapped in the dewatered area at open cut crossings.	Oregon LNG would cross certain waterbodies using HDD which would avoid impacts on coastal cutthroat. At open cut crossings, Oregon LNG would salvage fish present in dewatered area. Compensatory mitigation for the Youngs Bay estuarine enhancements and fish barrier removal would benefit Coastal cutthroat. Erosion control measures would minimize turbidity during construction.
Amphibians and Reptiles				
Western toad *Bufo boreas*	WA-C	Found in a variety of habitats, including slow moving rivers and streams; wetlands; near ponds and lakes; and in woodlands, grasslands and forests. Elevation range extends from sea level to above the tree-line. Main factor for selecting habitat is proximity to water for breeding. Requires sun exposed shallows with little to no vegetation for egg laying and tadpole rearing habitat. Unlikely to occur in project area.	Waterbody and wetland crossings could temporarily displace or result in the mortality of toads and frogs. Following construction stream and riparian habitat is expected to return to preconstruction conditions.	The pipeline route would avoid waterbodies and wetlands to the extent possible. In particular, the route would avoid wetlands with standing water preferred by amphibians. Oregon LNG would cross certain waterbodies using HDD which would avoid impacts on amphibians. At open cut crossings, Oregon LNG would salvage aquatic species, including amphibians, from the dewater area. Whenever possible, downed logs would be
Coastal tailed frog *Ascaphus truei*	OR-SV OCS	Limited to cold, clear, fast-flowing streams that contain water year round; typically in conifer forests, but some populations have been found in non-forested streams. Adults require small boulders in the stream channel for egg laying. Larvae require moss free rocks, which they attach themselves to in well-oxygenated stream sections.		

Table H-1

Other Special Status Species for Oregon LNG Project

Species [a]	Status [b]	Habitat	Impacts	Mitigation
Red-legged frog *Rana aurora*	OCS OR-SV	Undisturbed, continuously watered streams with shallow pools and emergent vegetation. Also found in marshes, wet meadows and occasionally ponds and ephemeral pools. Selects sites that provide access to forested areas.		left or moved to the corridor/forest edge. Erosion control measures would minimize turbidity during construction.
Foothill yellow-legged frog *Rana boylii*	F-SOC OCS OR-SC OR-SV	Found in permanently watered, slow-flowing streams and backwaters and in coniferous and deciduous forests and woodlands. Streams typically have rocky substrate, sloping banks and vegetation on the stream bank.		
Columbia torrent salamander *Rhyacotriton kezeri*	OR-SV OCS	Range extends from the Chehalis River in Grays Harbor County, Washington, south to the Little Nestucca River, in Tillamook County, Oregon. Both adults and larvae live beneath or close to moss-covered rocks. Found in streams that are perennial, have loose gravel, and are located in steep, mountainous areas within coniferous forests where the banks are heavily vegetated and shaded. Headwater streams, springs, and seeps are often used.	Construction in or near waterbodies and wetlands could result in the temporary displacement or loss of salamanders. Following construction, stream and riparian habitat is expected to return to preconstruction conditions.	Oregon LNG would cross certain waterbodies using HDD which would avoid impacts on amphibians. At open cut crossings, Oregon LNG would salvage aquatic species, including amphibians, from the dewatered area. Whenever possible, downed logs would be left or moved to the corridor/forest edge. Erosion control measures would minimize turbidity during construction.
Clouded salamander *Aneides farreus*	OR-SV OCS	Found in forested habitats. Inhabits moist areas within conifer forests in the Coastal Range. Often found beneath downed logs and vegetation. Also commonly found in recently burned and cleared areas, as long as large logs are left behind. Strongly associated with Douglas-fir logs.		
Southern torrent salamander *Rhyacotriton variegatus*	F-SOC OR-SV OCS	Range extends from the Little Nestucca River in Tillamook County, Oregon, south to Mendocino County, California. Occurs in permanently flowing, steep, mountainous streams in moist, conifer forests. Utilizes shallow sections of streams, including splash zones and riffles. Requires loose gravel substrate, as larvae rear in cobble and gravel beds that receive stream flow.		
Western painted turtle *Chrysemys picta bellii*	OR-SC OCS	Inhabits marshy ponds, small lakes and backwaters of rivers and slowing moving streams. Often selects waterways with mud substrate and emergent vegetation. Requires logs, large rocks, or vegetation mats for basking, and bare patches of ground close to water to lay eggs. Possibly occurs in project area.	Oregon LNG would generally avoid ponds, lakes, or large wetlands with standing water. Therefore, the potential for impacts on turtles is low. However, turtles could be temporary displaced or lost if they are present at waterbody or wetlands crossings.	Oregon LNG would cross certain waterbodies using HDD which would avoid impacts on reptiles. At open-cut crossings, Oregon LNG would salvage aquatic species, including reptiles, from the dewater area. Whenever possible, downed logs would be left or moved to the corridor/forest edge
Birds				
American bald eagle *Haliaeetus leucocephalus*	F-SOC OCS OR-SV WA-S	Associated with large waterbodies that support fish populations including rivers, lakes, and the ocean. Area must have large trees that provide nesting structure. They also require variable wintering habitats that support a varied food web.	Eagles forage along the Columbia River and Youngs Bay near the terminal, but the terminal site does not contain suitable habitat structure for eagles. There are four known eagle nests within 0.5 miles of the pipeline. Construction noise may disturb eagles.	Oregon LNG would protect active roost trees during construction and minimize activities within 0.5 miles of nests during breeding season. Oregon LNG would install three artificial nest platforms for every nest or nest platform that must be relocated.

Table H-1

Other Special Status Species for Oregon LNG Project

Species [a]	Status [b]	Habitat	Impacts	Mitigation
Little willow flycatcher *Empidonax traillii brewsteri*	F-SOC OR-SV OCS	Inhabits scrub-shrub patches of vegetation adjacent to water for nesting and foraging.	Wetland crossings may temporarily disturb scrub shrub wetland habitat, but vegetation is expected to recover following construction.	Oregon LNG's wetland mitigation would benefit passerine birds that use wetlands.
Mammals				
California myotis *Myotis californicus*	OR-SV OCS	Inhabits a mixture of forest types using large snags for day roosts. Often found night roosting under bridges.	The pipeline would avoid caves, cliffs, and bridges that could be used by bats as roosting sites. The pipeline would also avoid late successional confer forest by crossing industrial forest or agricultural lands to the extent possible. Timber clearing within the right-of-way could reduce available roosting sites for bats.	Where possible, snags would be left in the construction right-of-way. Oregon LNG's off-site mitigation, such as the protection of large tracts of coastal forest would benefit tree roosting bats.
Fringed myotis *Myotis thysanodes*	F-SOC OR-SV OCS	Inhabits a mixture of forest types using large snags for day roosts. Requires large snags and rock features for day, night, and maternity roosts (occasionally uses bridges). Caves and old mines are often used for hibernacula.		
Hoary bat *Lasiurus cinereus*	OR-SV OCS	Inhabits a mixture of forest habitats but is often associated with late successional forests for roosting.		
Long legged myotis *Myotis volans*	F-SOC OR-SV OCS	Often associated with late successional conifer forests or other forested habitat with late successional components. Uses large snags and hollows of trees primarily in riparian zones for day, night, and maternity roosts. Occasionally found in caves and old mines. Forages in forest riparian and forest edge areas.		
Silver haired bat *Lasionycteris noctivagans*	F-SOC OR-SV OCS	Inhabits late-successional conifer forests where it uses large snags and hollows in trees for day, night, and maternity roosting. Is migratory in nature.		
Townsend's big-eared bat *Corynorhinus townsendii*	F-SOC WA-SC OR-SC OCS	Inhabits caves, mines, and old buildings for day, night, and maternity roosts or hibernacula. Occasionally uses hollows in trees or bridges for day and night roosting. Primarily feeds on moths.		
American marten *Martes americana*	OR-SV OCS	Inhabits forest habitats with high density of snags and fallen logs for den sites and foraging. Often associated with late-successional mixed conifer habitats with multi-layer stands.	Timber clearing would reduce the quantity and quality of forest habitat. Small mammals may be temporarily or permanently displaced due to the loss of habitat. However, the pipeline would not cross large tracts of old forest that is preferred by American marten and red tree vole, so there would be low likelihood of encountering these species.	The pipeline route would avoid high value conifer forests (i.e., ODFW Class I) and instead be routed through industrial forests and agricultural areas. This would minimize potential effects on small mammals that depend on late successional conifer forest. Where possible, Oregon LNG would avoid removing riparian trees and snags within the construction right-of-way. Oregon LNG's off-site mitigation, such as the protection of large tracts of coastal forest would benefit American marten and red tree vole.
Red tree vole *Arborimus longicaudus*	F-C OR-SV OCS	Found in dense, moist conifer forests. Prefers large stand size. Has a highly specialized diet of Douglas-fir needles. Nest at least 50 feet above ground level in highly developed conifers.		

[a] Special status species that are also federally listed are addressed in section 4.1.8; OCS species that are not likely to occur in the project area are excluded.

[b] OCS = Oregon Conservation Strategy species; OR-SV = ODFW Sensitive Vulnerable; OR-SC = ODFW Sensitive Critical; WA-E = Washington Endangered; WA-C = Washington Candidate; WA-S = Washington Sensitive; F-E = Federal Endangered Species; F-C = Federal Candidate Species; F-SOC = Federal Species of Concern

APPENDIX I

WEP FACILITY MAPS, DRAWINGS, AND TABLES

Appendix I1:	WEP Facility Location Maps
Appendix I2:	Pipeline Construction Right-of-way Cross Sections and Configuration Table
Appendix I3:	Pipeline Route Minor Variations
Appendix I4:	Additional Temporary Workspace for the Pipeline Route
Appendix I5:	Table of Access Roads
Appendix I6:	Site-specific Residential Construction Plans; Table of Residences within 50 Feet of WEP Construction Right-of-way and ATWS; Site-specific School Construction Plans
Appendix I7:	Utilities Crossed
Appendix I8:	Major Roads and Railroads Crossed

APPENDIX I1

WEP FACILITY LOCATION MAPS

REFERENCE DRAWINGS	
DRAWING NO.	TITLE

WASHINGTON EXPANSION PROJECT

Pipe Yard Locations
CLARK COUNTY
T3N, R2E, Sec. 5

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
01	5/15/2013	MC				

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APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 1 OF 4

REFERENCE DRAWINGS	
DRAWING NO.	TITLE

WASHINGTON EXPANSION PROJECT

Pipe Yard Locations
PIERCE COUNTY
T19N, R3E, Sec 36

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
01	5/15/2013	MC				

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REFERENCE DRAWINGS	
DRAWING NO.	TITLE

WASHINGTON EXPANSION PROJECT

Pipe Yard Locations
KING COUNTY
T25N, R6E, Sec. 22

REVISIONS						
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REFERENCE DRAWINGS	
DRAWING NO.	TITLE

WASHINGTON EXPANSION PROJECT

Pipe Yard Locations
WHATCOM COUNTY
T41N, R4E, Sec. 34

REVISIONS						
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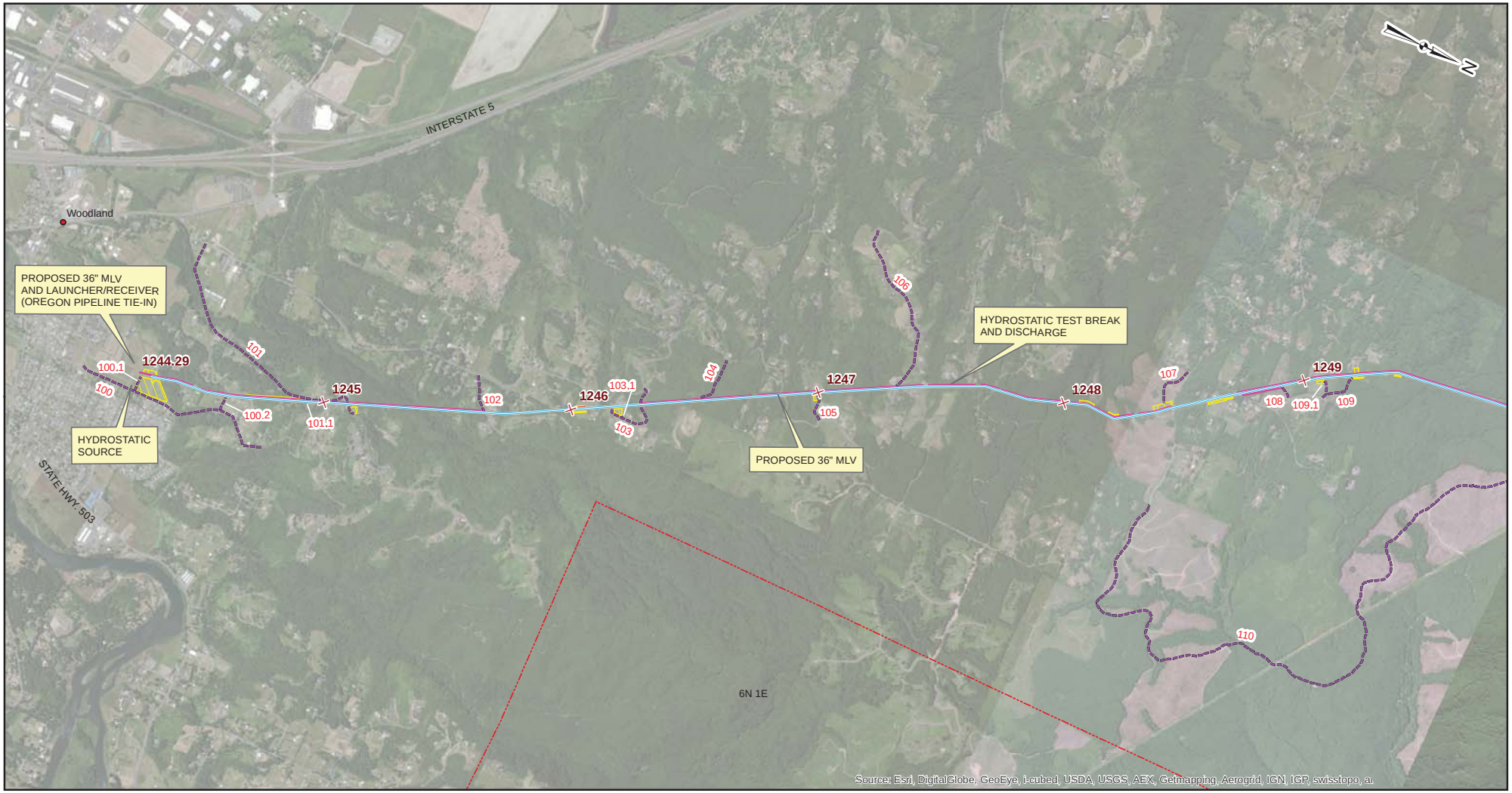

Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

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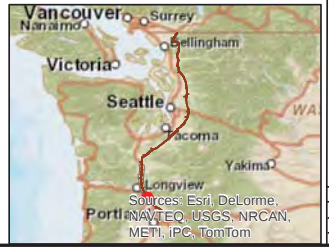

WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
WOODLAND MP 1244.29 TO 1289.54
COWLITZ AND LEWIS
COUNTIES, WASHINGTON

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Legend

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- Cities

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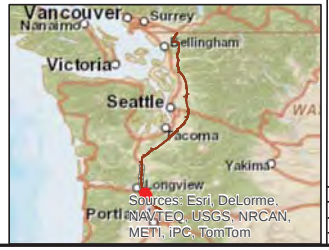

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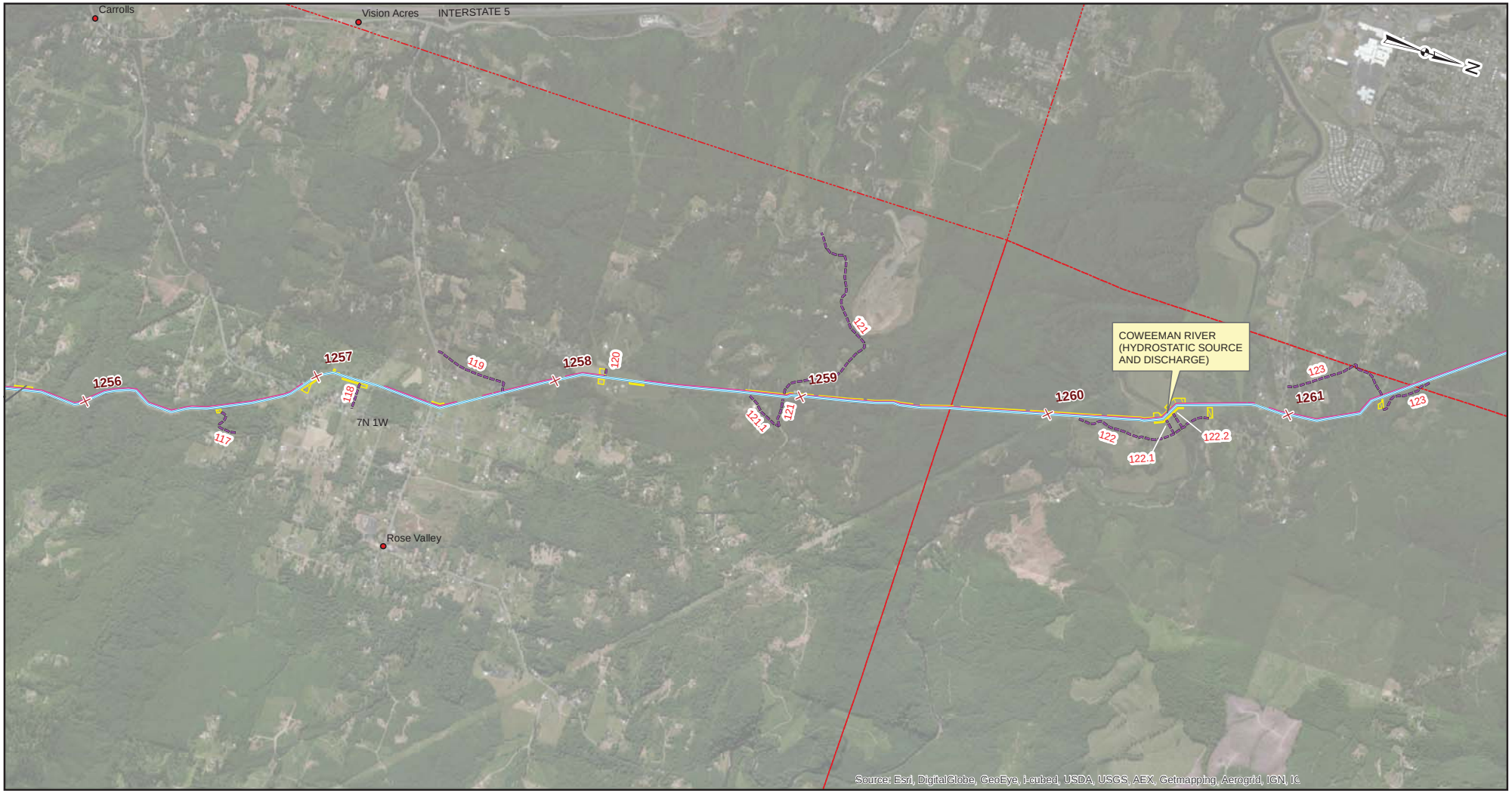

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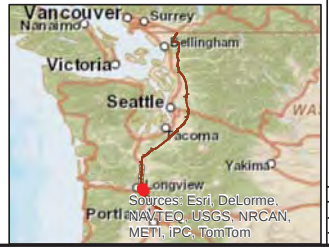

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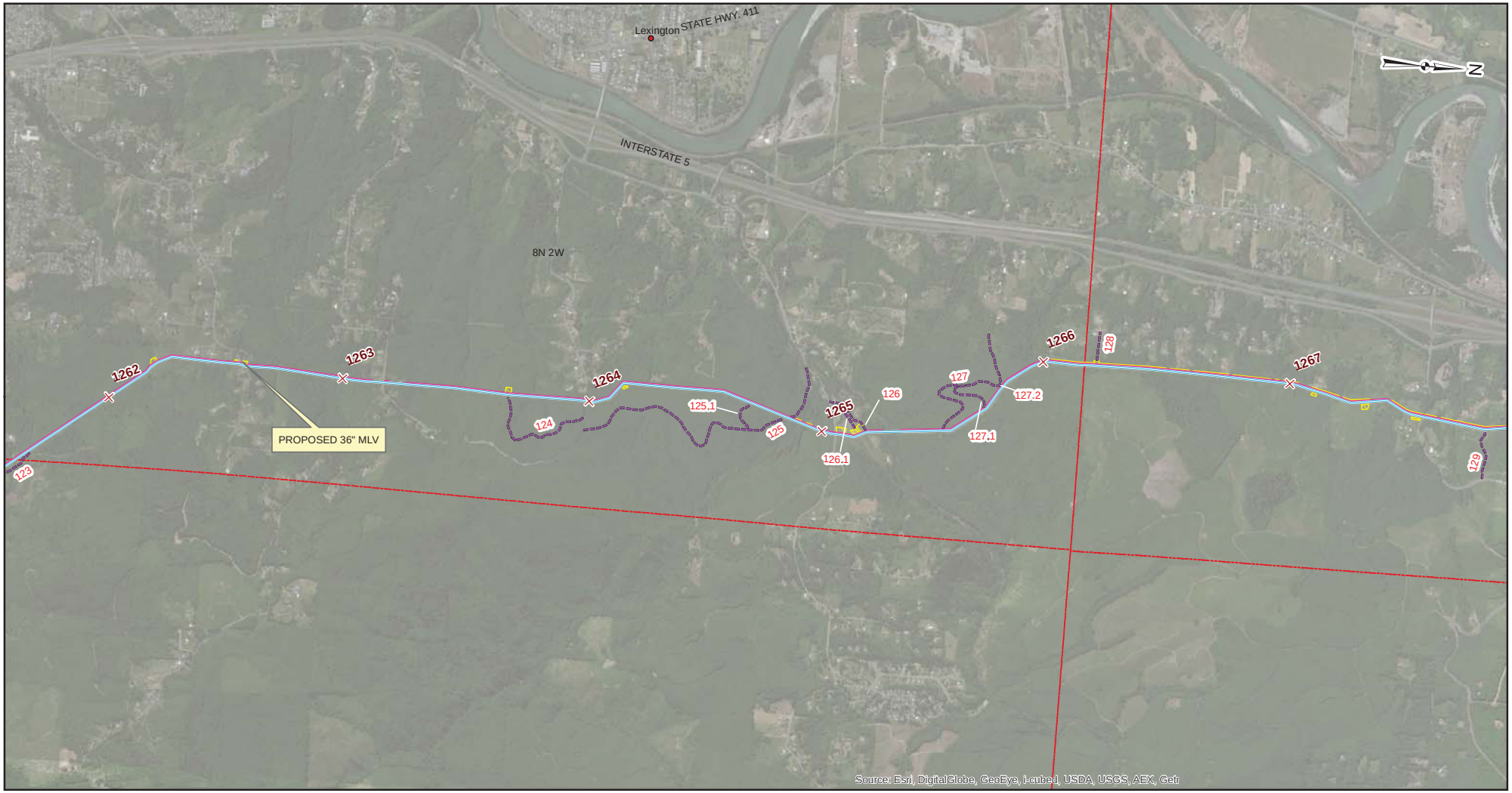

Legend

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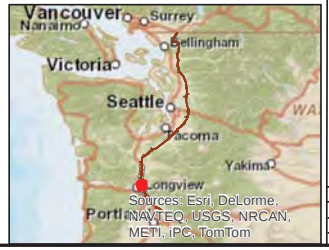

WASHINGTON EXPANSION
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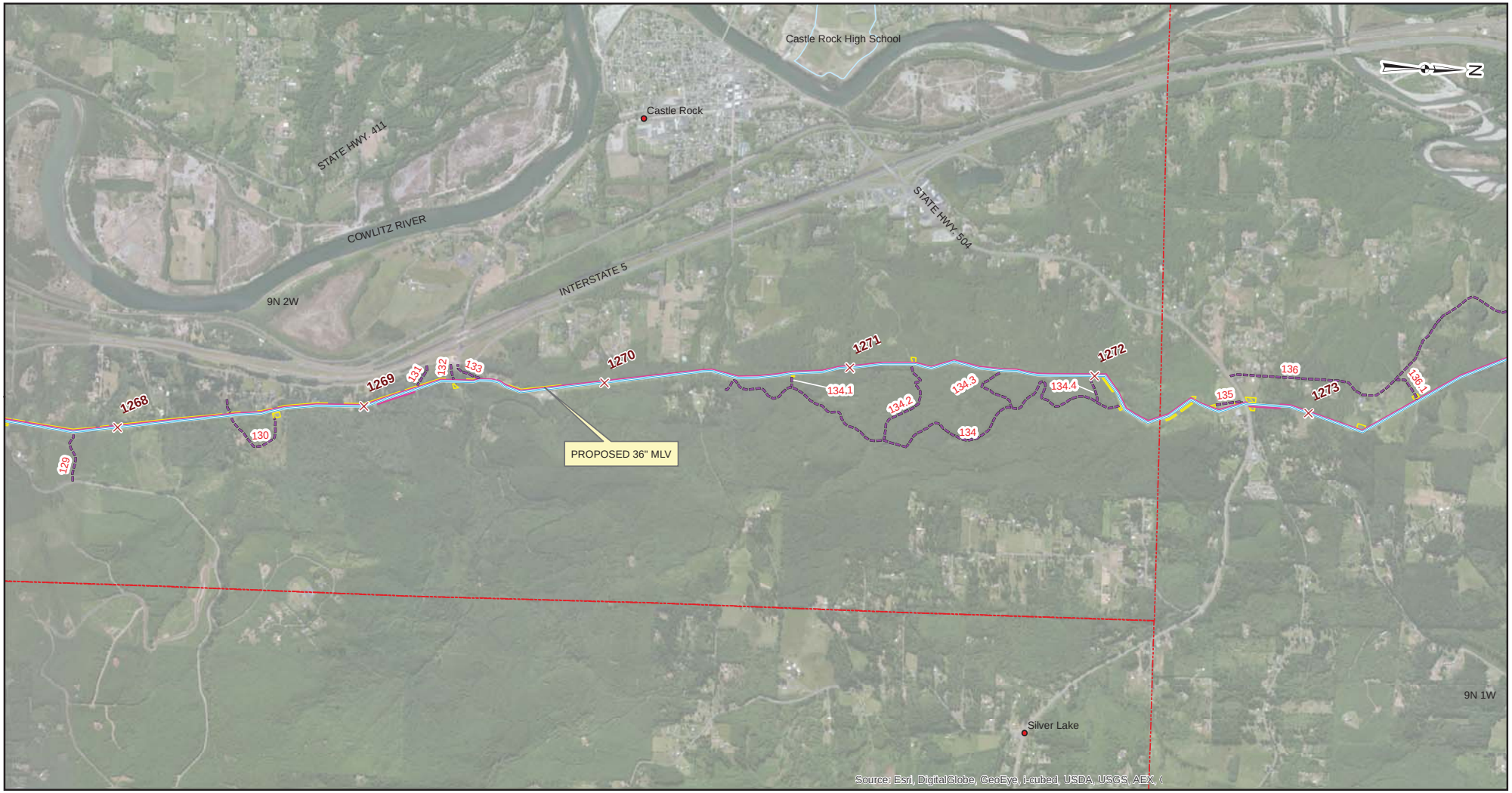

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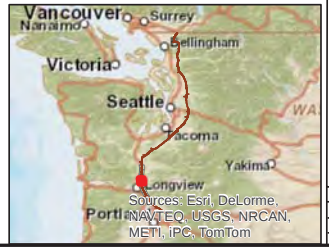

WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
WOODLAND MP 1244.29 TO 1289.54
COWLITZ AND LEWIS
COUNTIES, WASHINGTON

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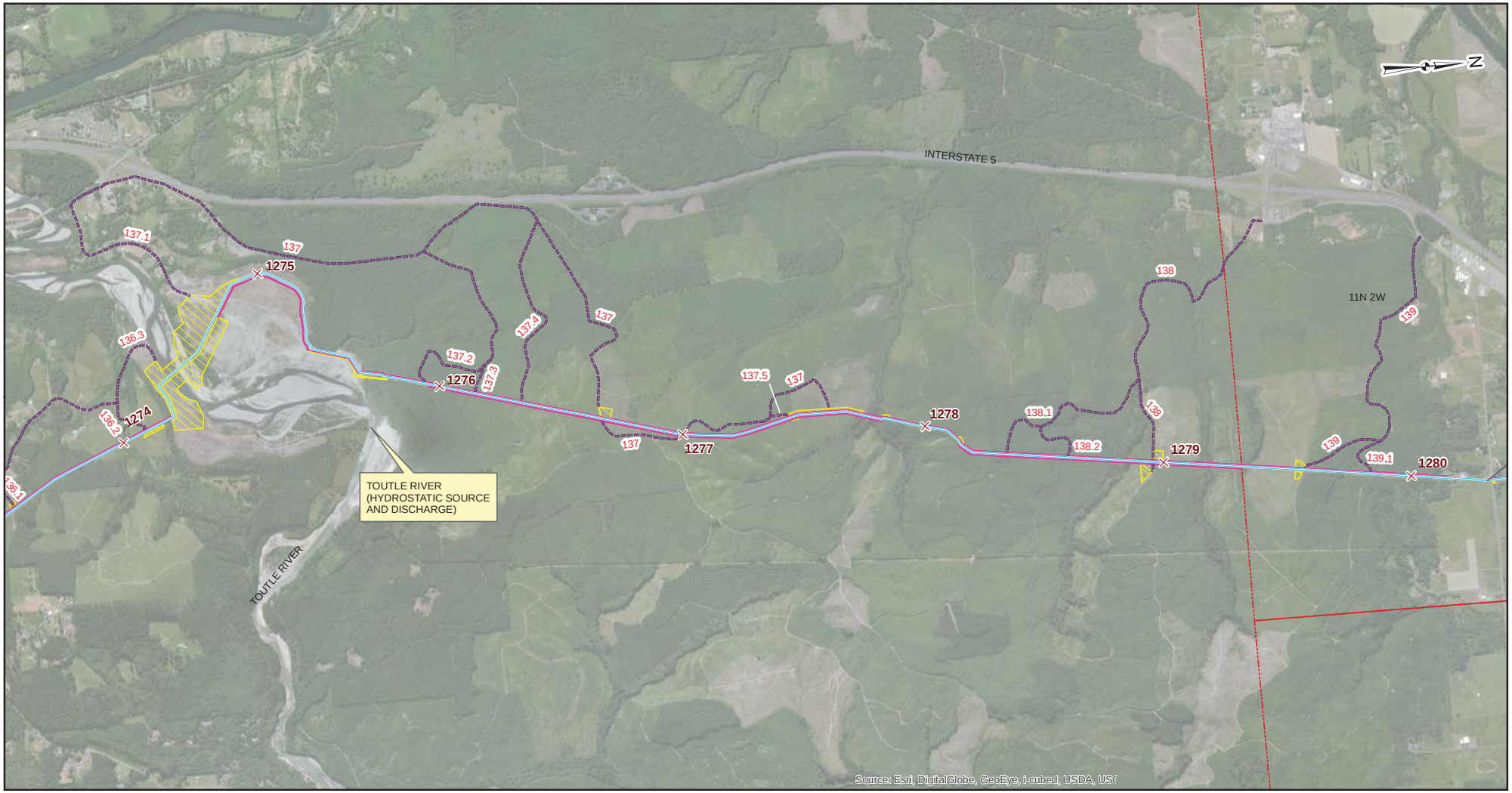

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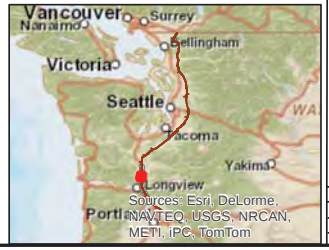

WASHINGTON EXPANSION
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WOODLAND MP 1244.29 TO 1289.54
COWLITZ AND LEWIS
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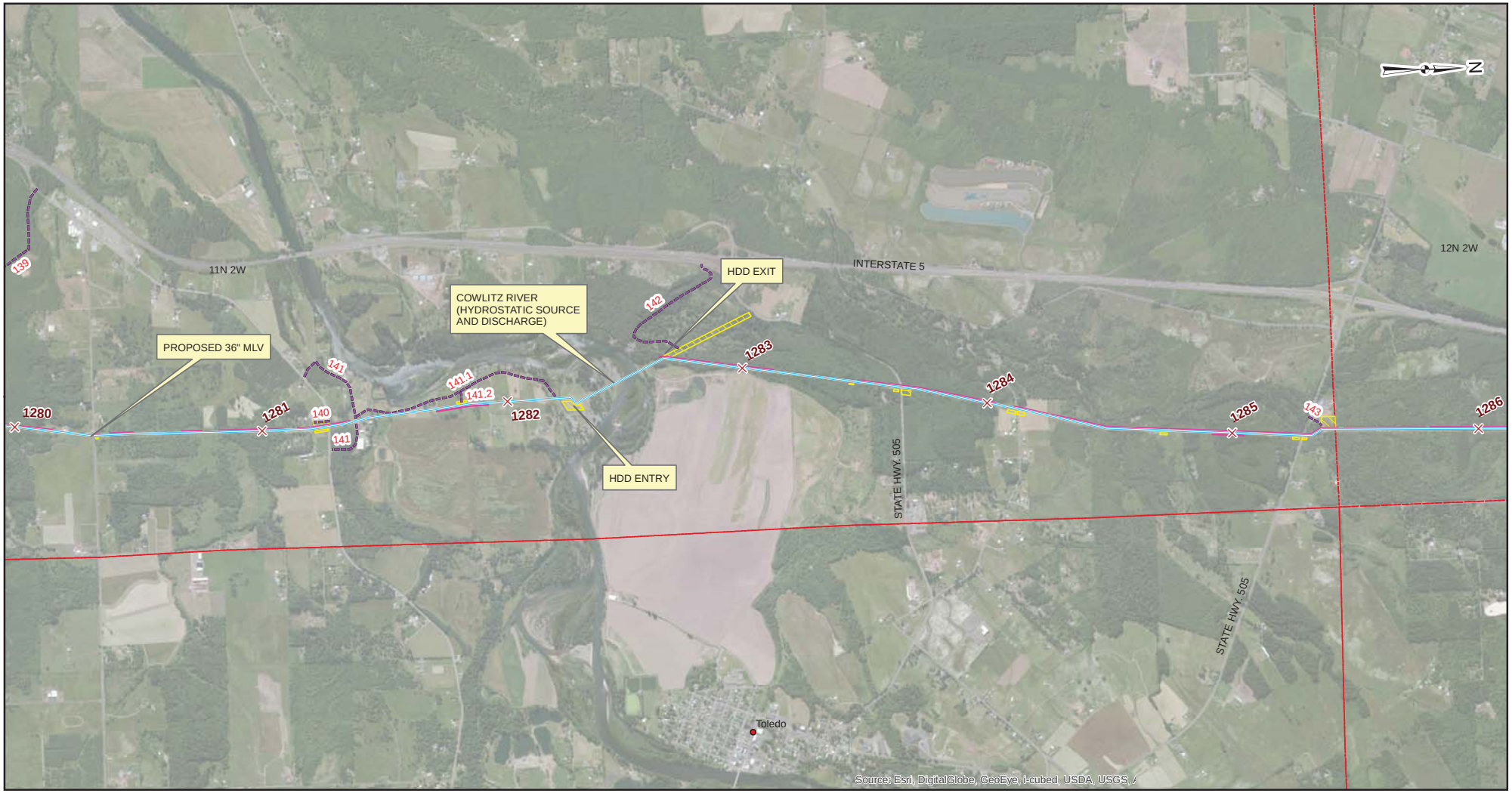

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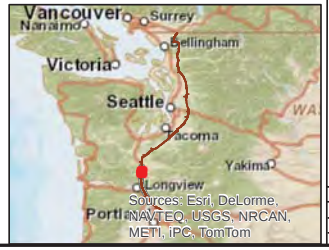

WASHINGTON EXPANSION
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WOODLAND MP 1244.29 TO 1289.54
COWLITZ AND LEWIS
COUNTIES, WASHINGTON

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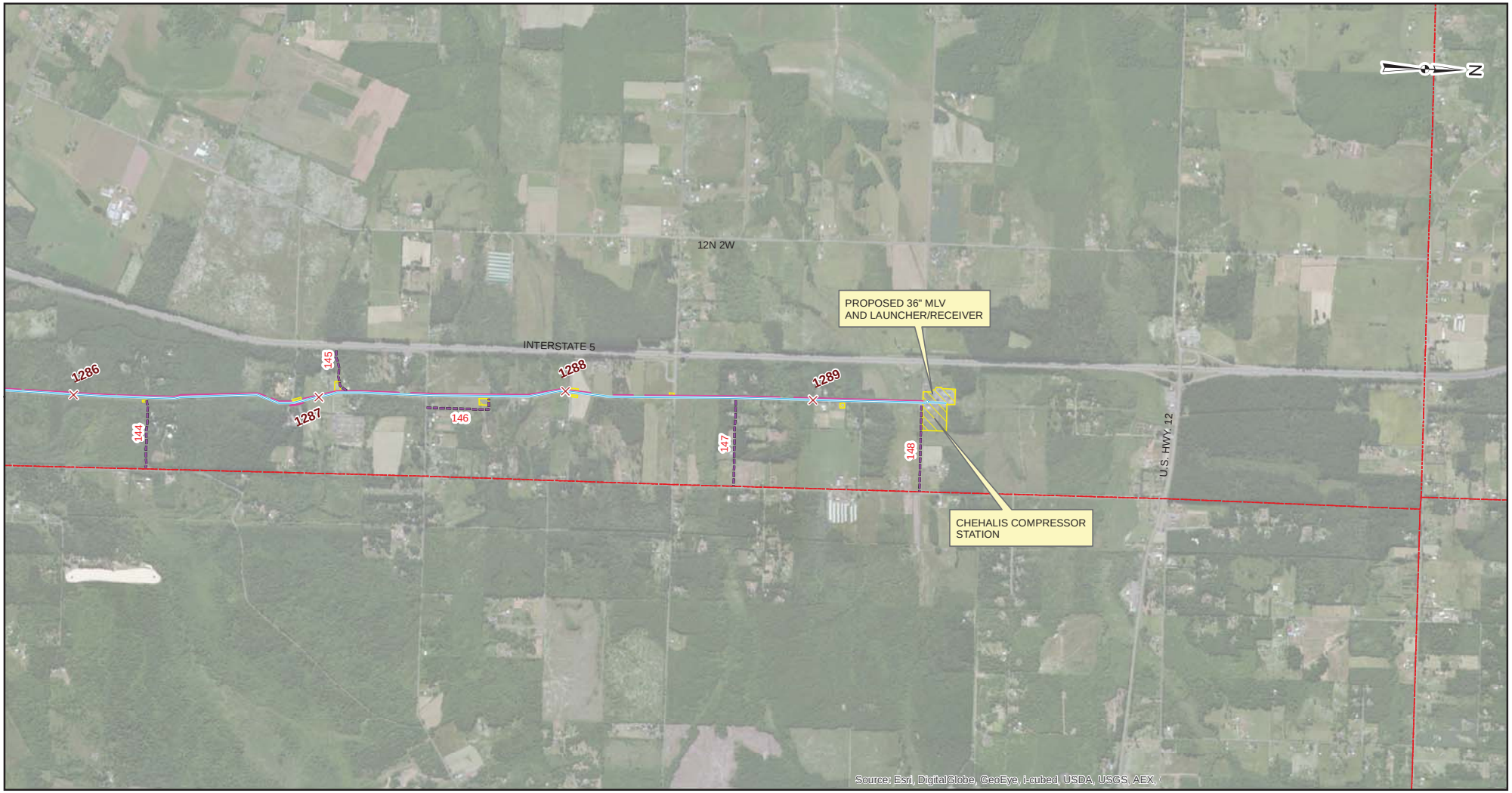

Legend

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- Cities

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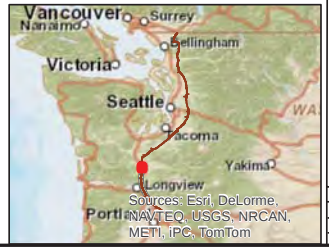

WASHINGTON EXPANSION
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WOODLAND MP 1244.29 TO 1289.54
COWLITZ AND LEWIS
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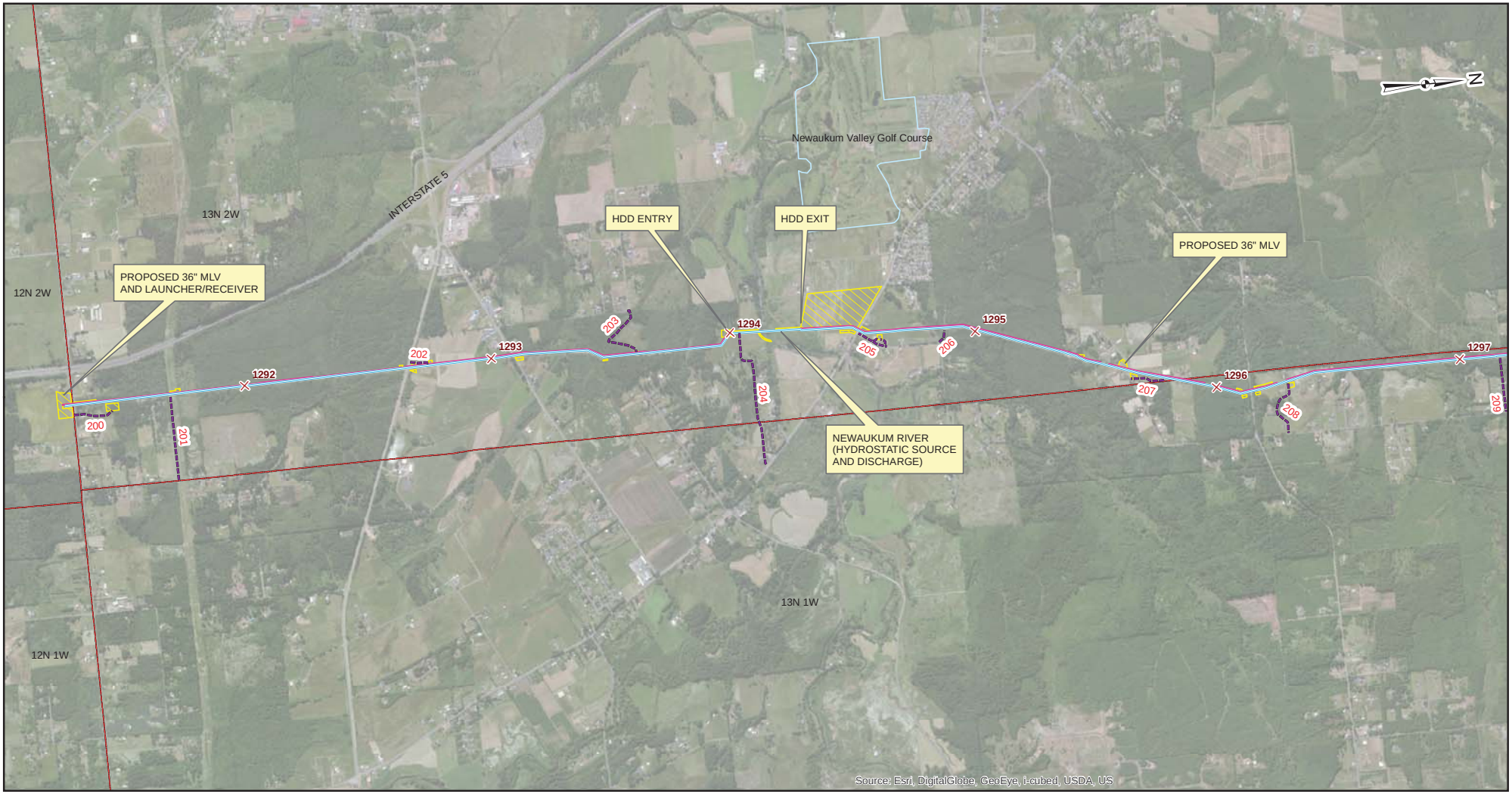

Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

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WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
CHEHALIS MP 1291.27 TO 1315.62
LEWIS COUNTY, WASHINGTON

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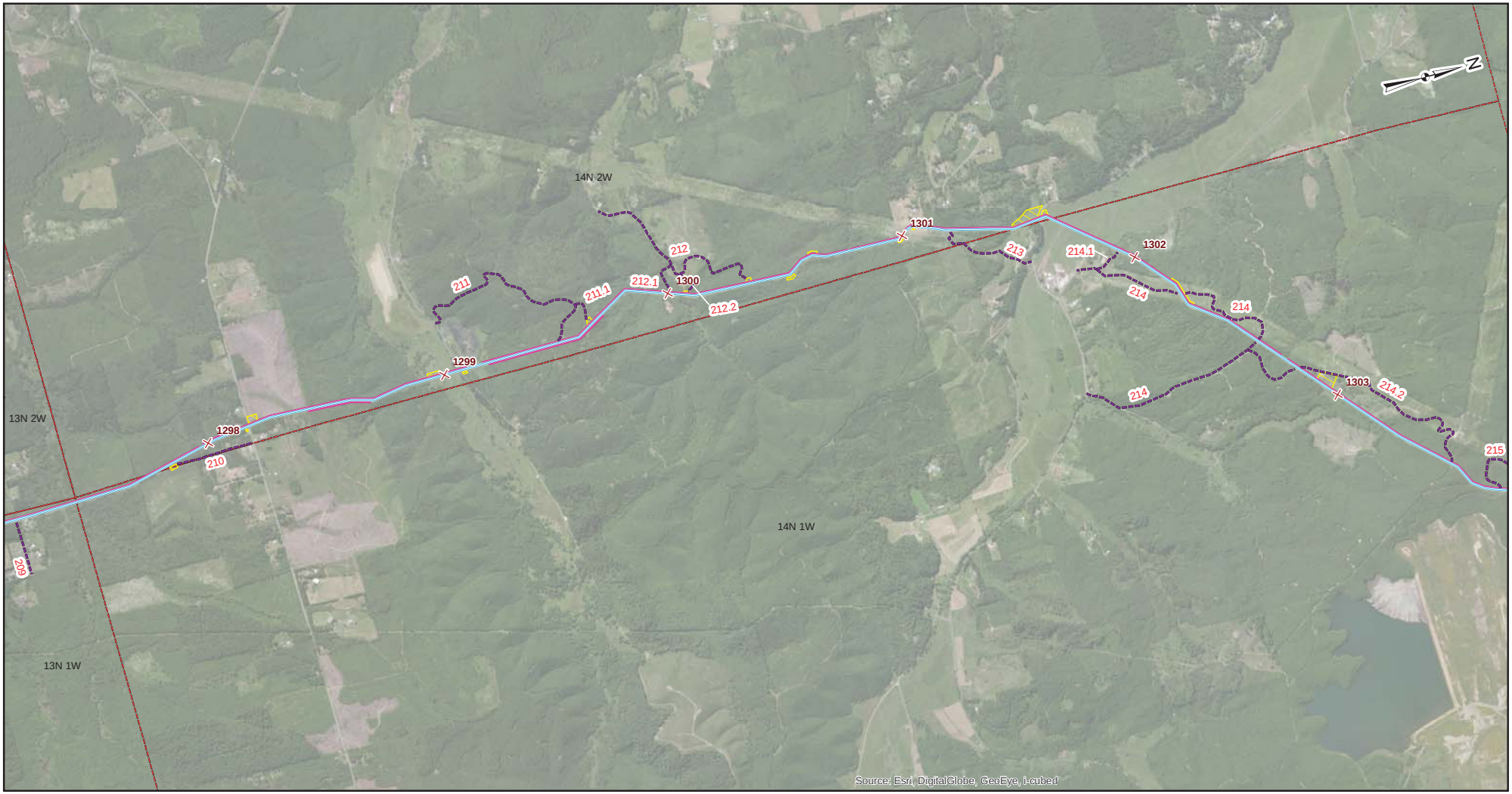

Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

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WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
CHEHALIS MP 1291.27 TO 1315.62
LEWIS COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
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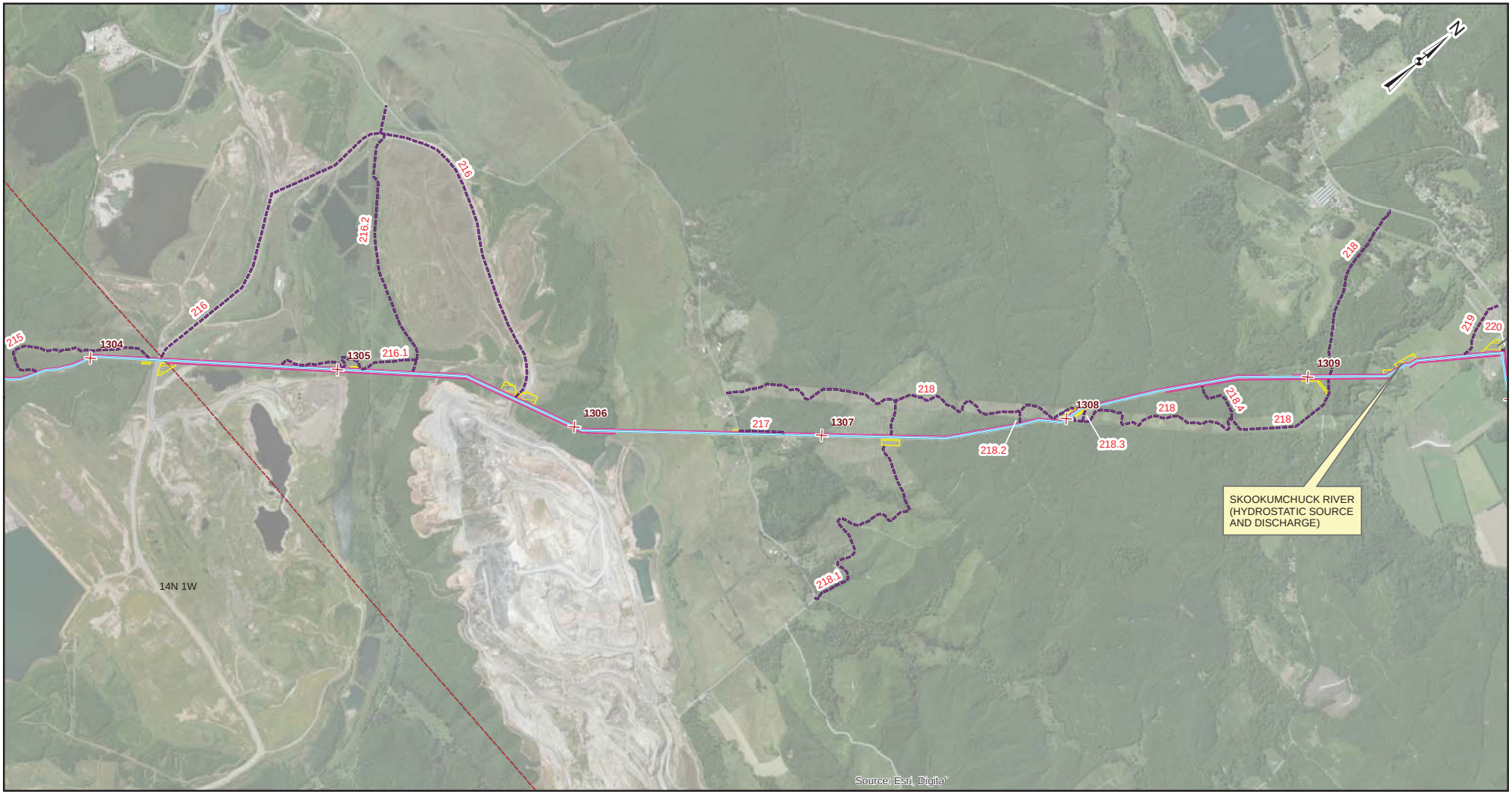

Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

0 1,000 2,000 4,000 Feet

WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
CHEHALIS MP 1291.27 TO 1315.62
LEWIS COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
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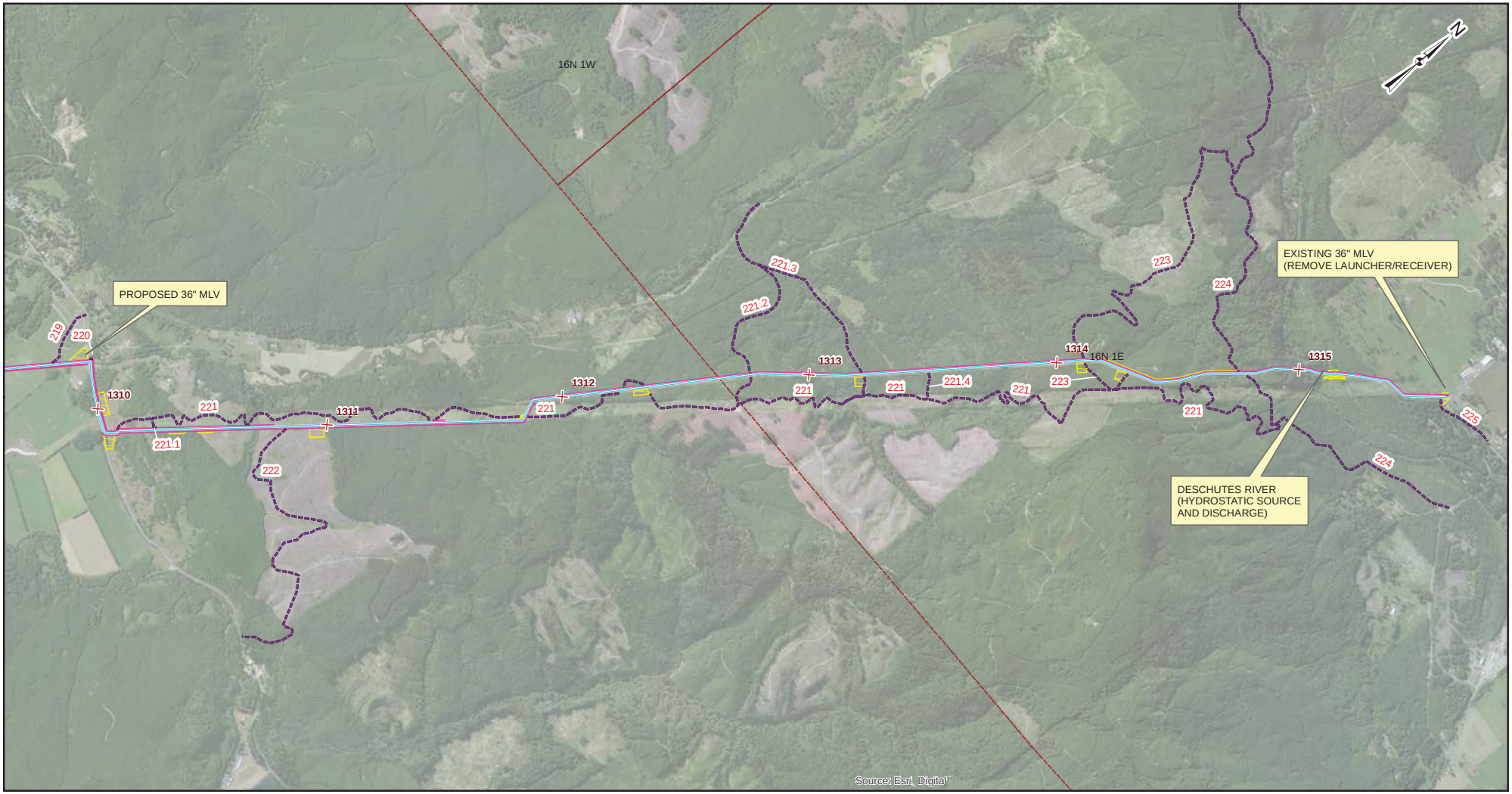
APPROVED BY:		DRAWING NUMBER: 1A - 11	SHEET 3 OF 4

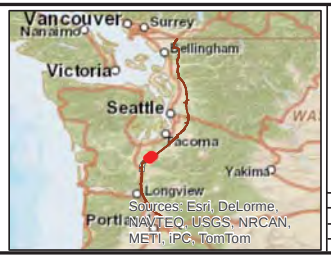


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
CHEHALIS MP 1291.27 TO 1315.62
LEWIS COUNTY, WASHINGTON

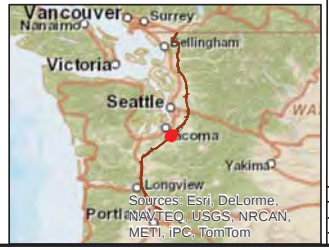
DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 12	SHEET 4 OF 4

Legend

- New Pipeline Segement
- Mileposts
- Exitsting Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

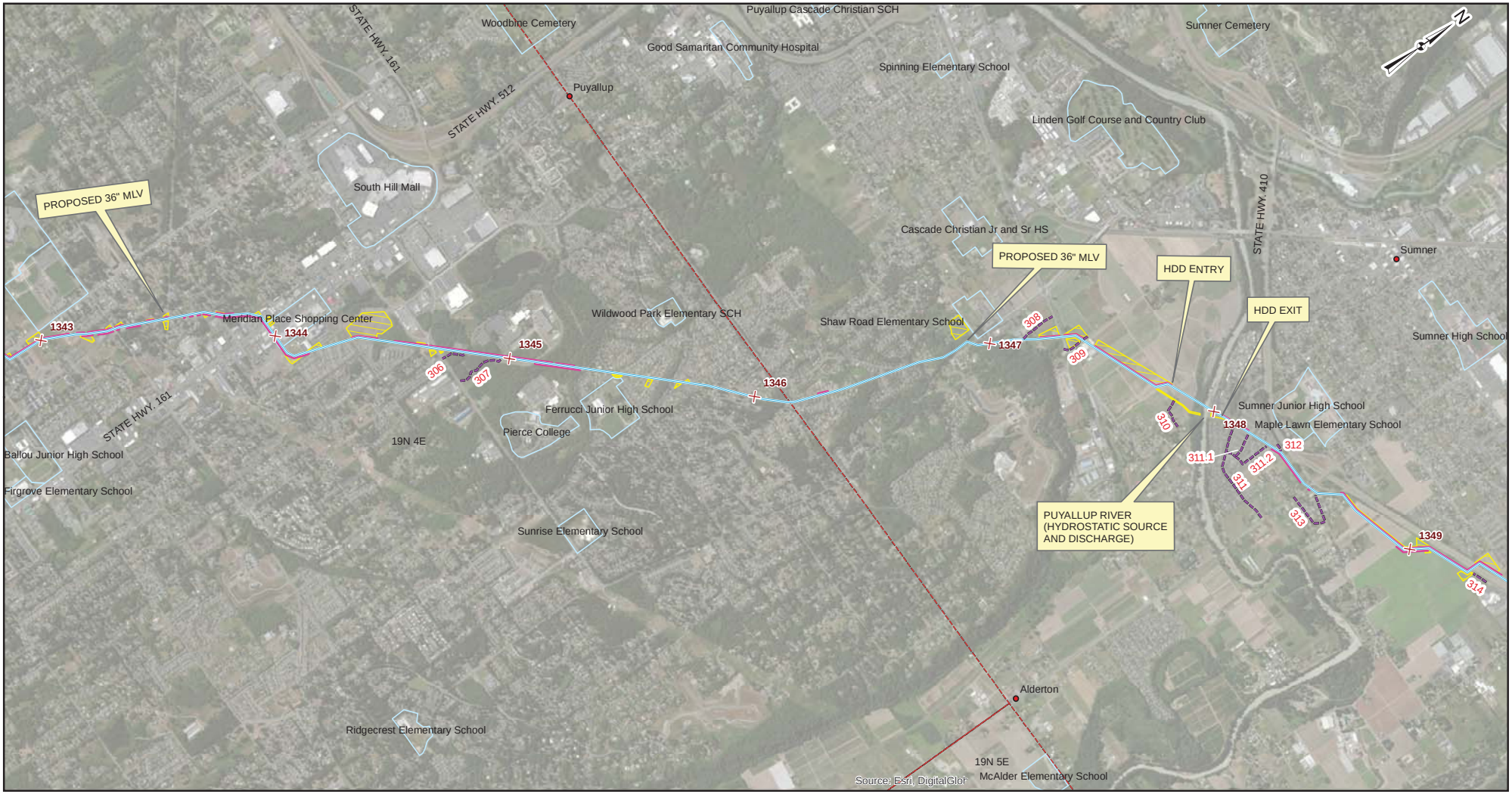
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT
SITE LOCATION MAPS
SUMNER SOUTH MP 1338.00 TO
1351.82 PIERCE COUNTY,
WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 13	SHEET 1 OF 3

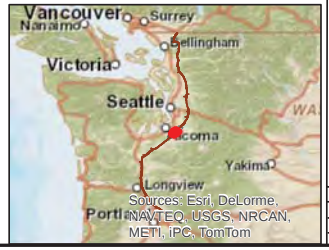


Legend

- New Pipeline Segement
- Mileposts
- Exitsting Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT
SITE LOCATION MAPS
SUMNER SOUTH MP 1338.00 TO
1351.82 PIERCE COUNTY,
WASHINGTON

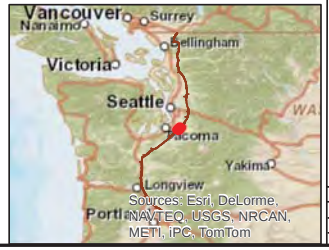
DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 14	SHEET 2 OF 3

Legend

- New Pipeline Segement
- Mileposts
- Exitsting Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Township & Range Line
- Cities

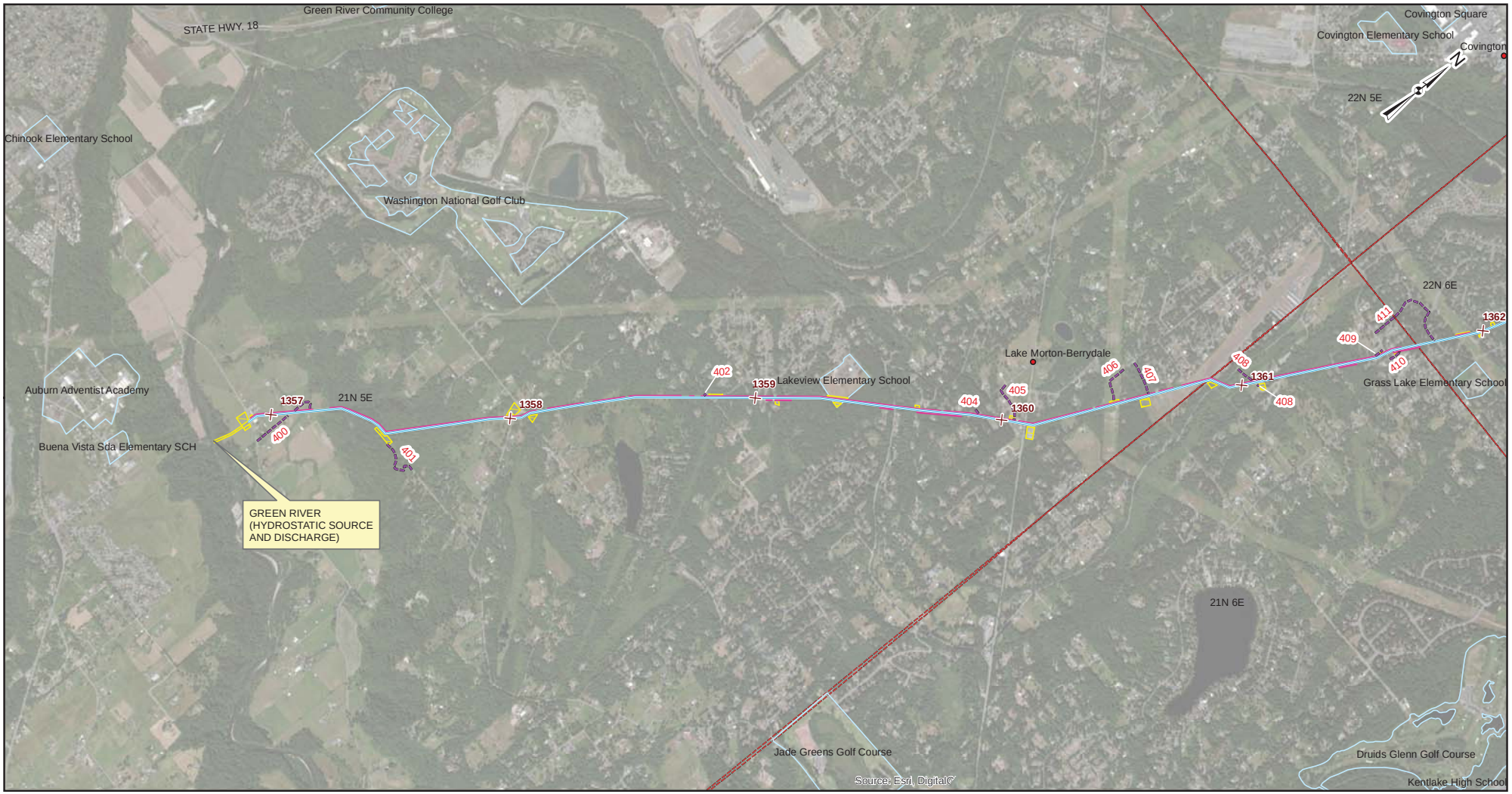
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT
SITE LOCATION MAPS
SUMNER SOUTH MP 1338.00 TO
1351.82 PIERCE COUNTY,
WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 15	SHEET 3 OF 3

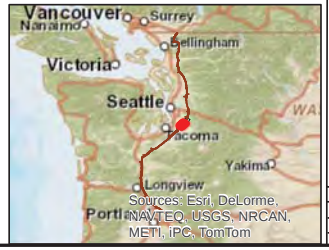


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Township & Range Line
- Cities

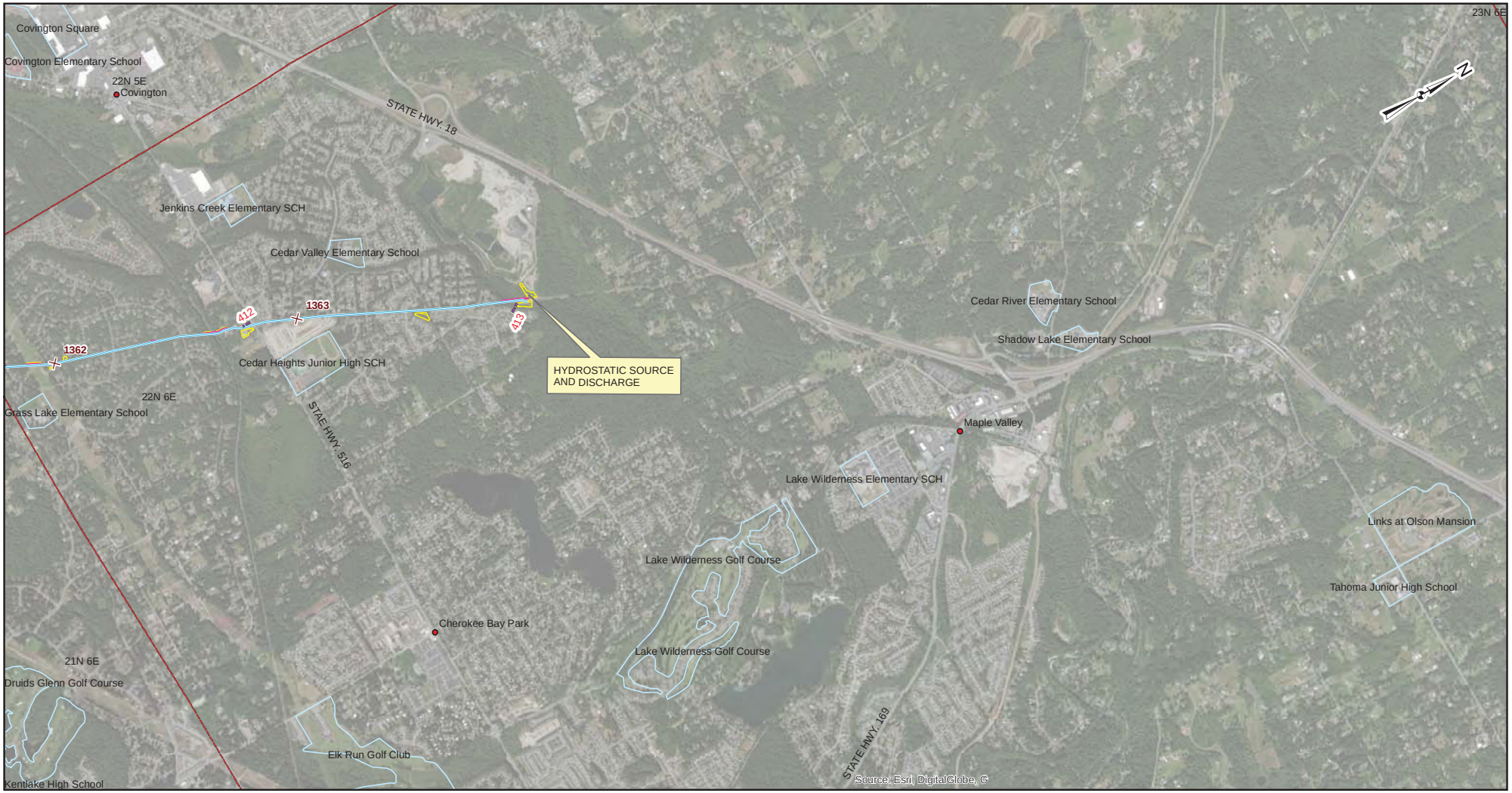
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE
LOCATION MAPS
SUMNER NORTH "A" MP 1356.90 TO 1363.93
KING COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 16	SHEET 1 OF 2

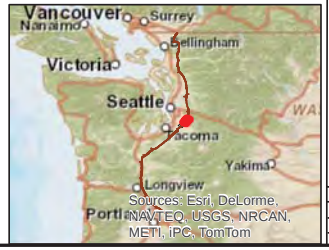


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Township & Range Line
- Cities

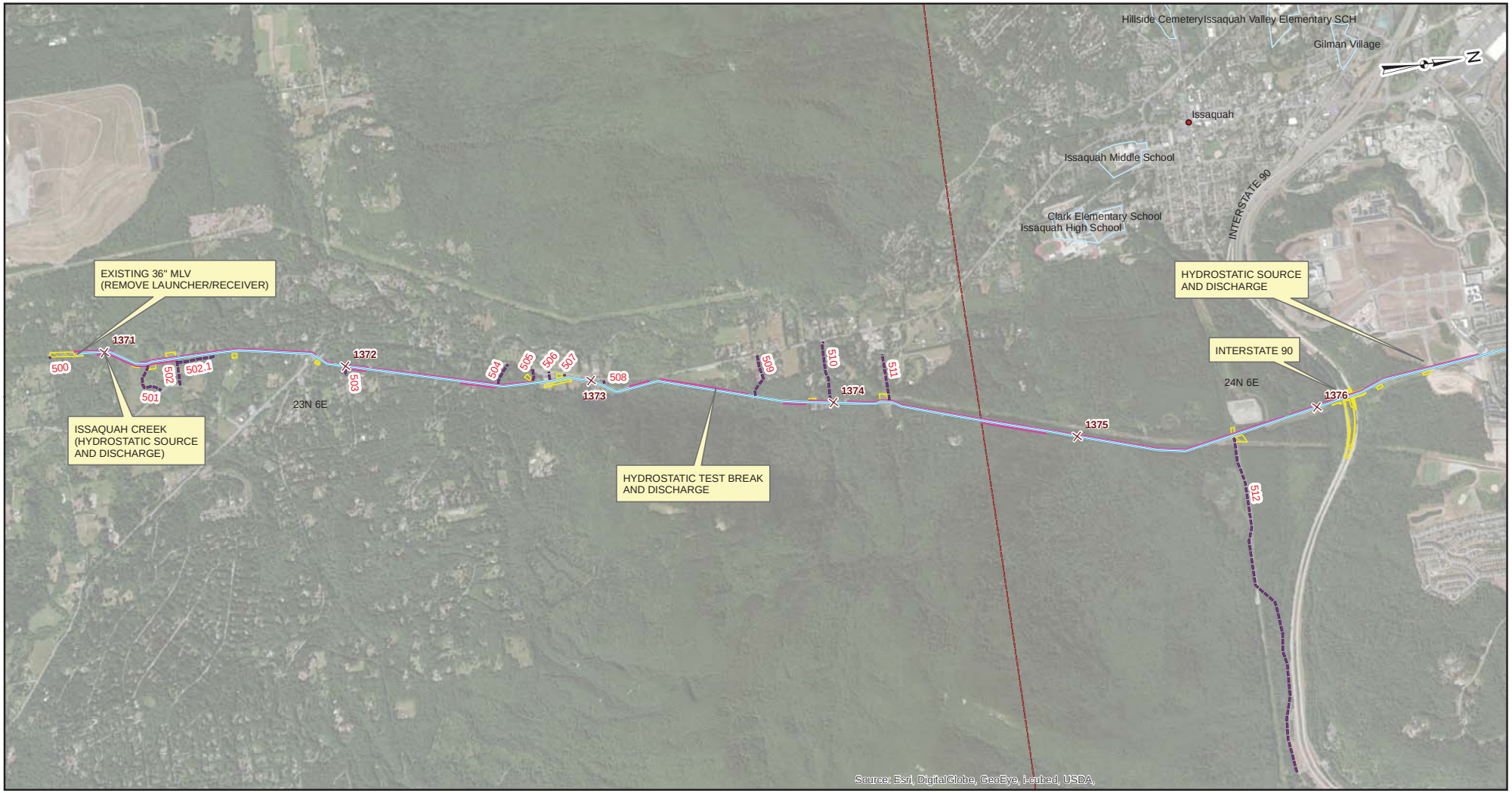
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE
LOCATION MAPS
SUMNER NORTH "A" MP 1356.90 TO
1363.93 KING COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A -17	SHEET 2 OF 2

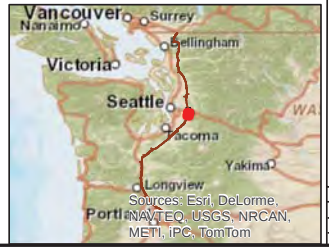


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Cities

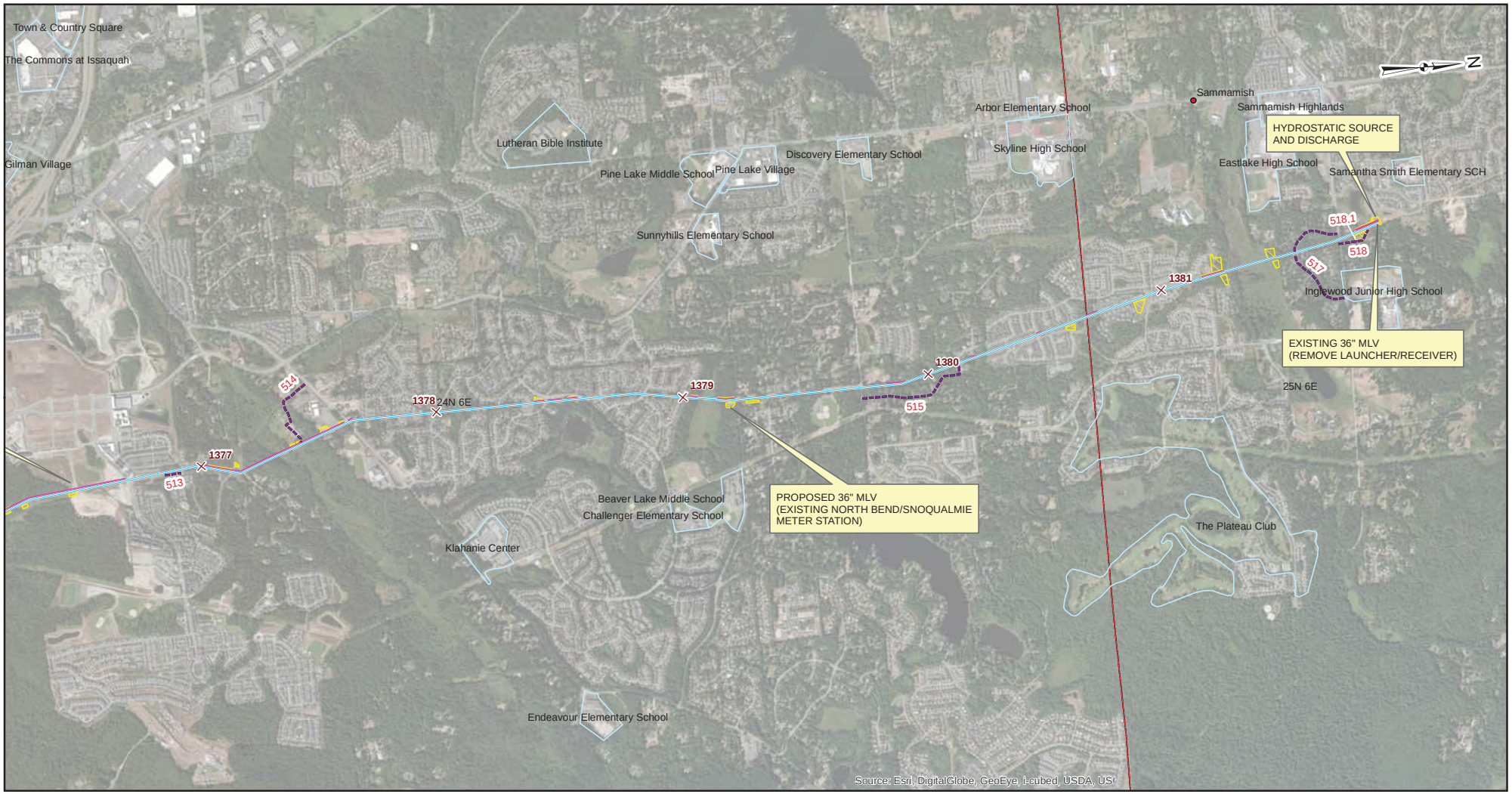
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE
LOCATION MAPS
SUMNER NORTH "B" MP 1370.89 TO
1381.92 KING COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 18	SHEET 1 OF 2

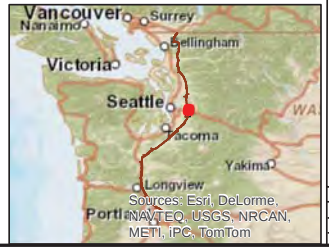


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Space
- Cities

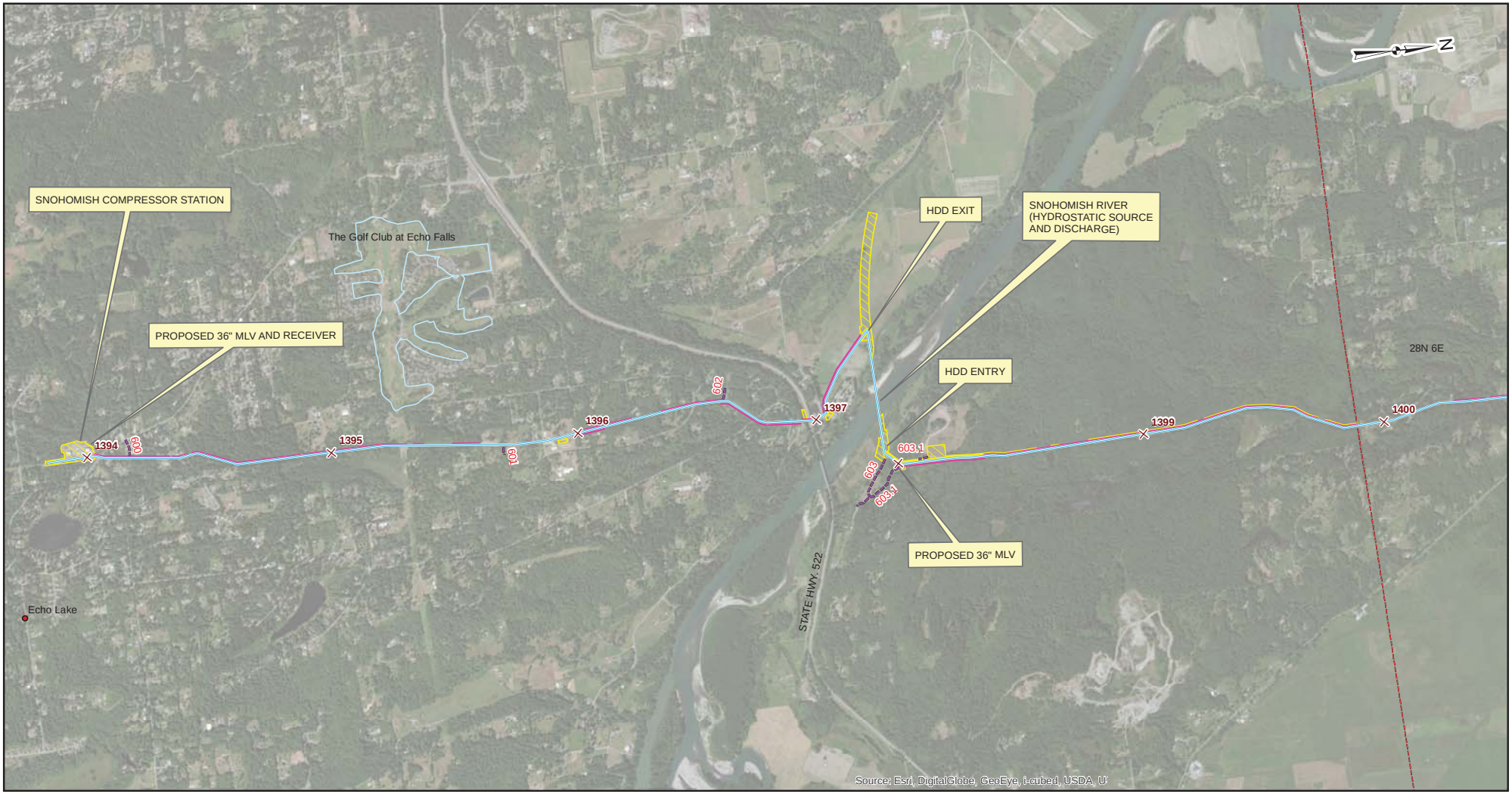
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE
LOCATION MAPS
SUMNER NORTH "B" MP 1370.89 TO
1381.92 KING COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 19	SHEET 2 OF 2

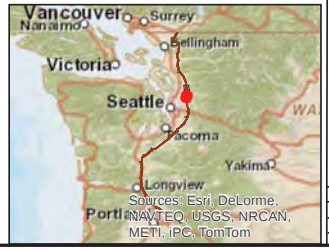


Legend

- New Pipeline Segement
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Cities

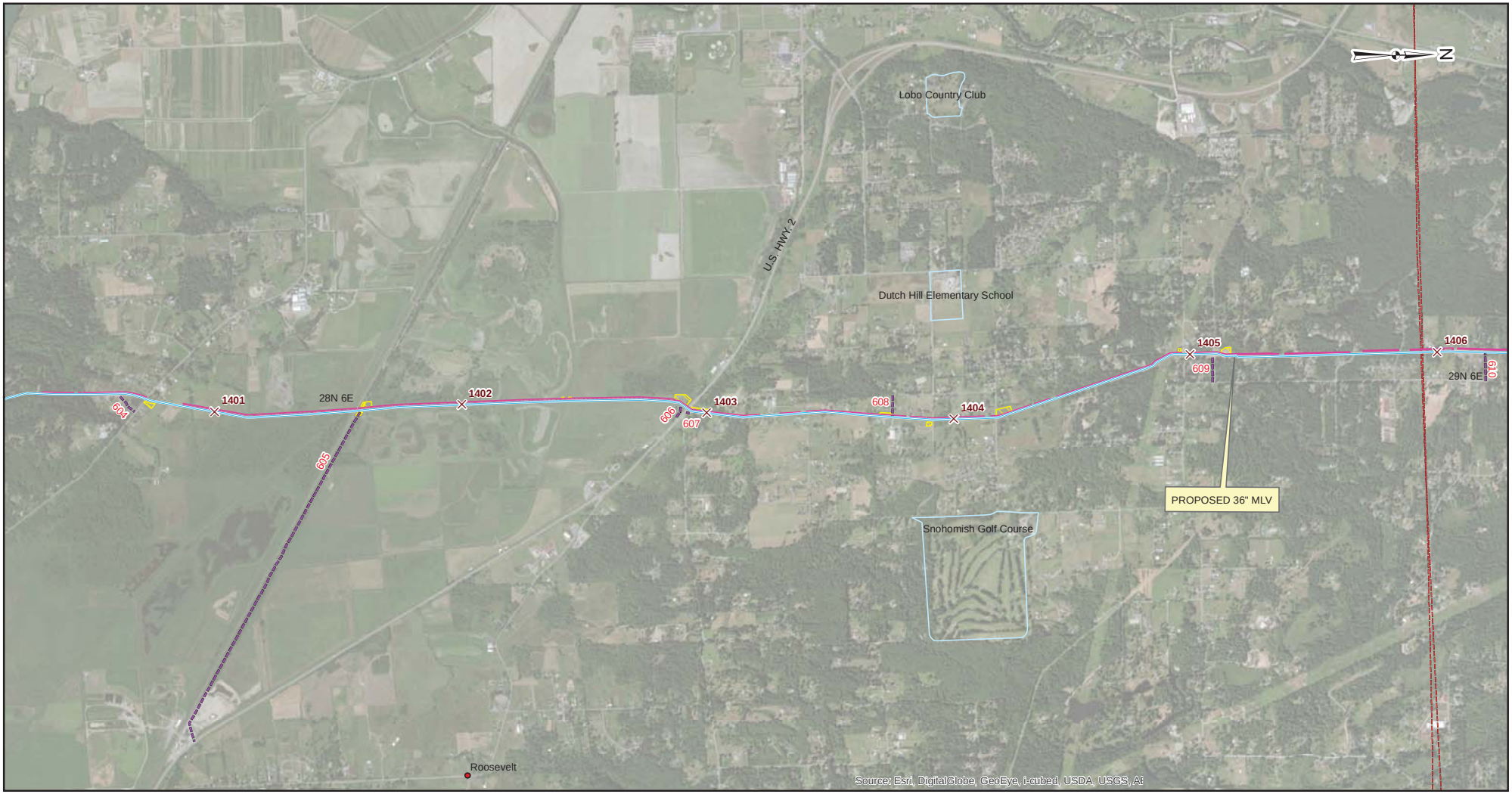
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
SNOHOMISH MP 1393.84 TO 1409.39
SNOHOMISH COUNTY,
WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 20	SHEET 1 OF 3

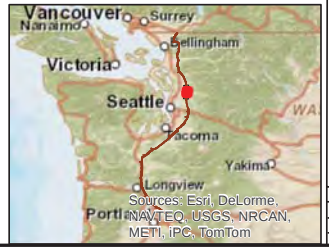


Legend

- New Pipeline Segement
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Cities

NOTES:

0 1,000 2,000 4,000 Feet



EXPANSION PROJECT SITE LOCATION MAPS
SNOHOMISH MP 1393.84 TO 1409.39
SNOHOMISH COUNTY, WASHINGTON

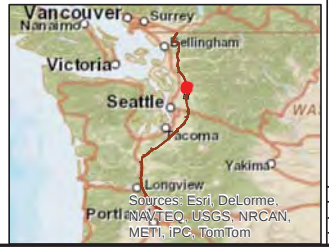
DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 21	SHEET 2 OF 3

Legend

- New Pipeline Segement
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Cities

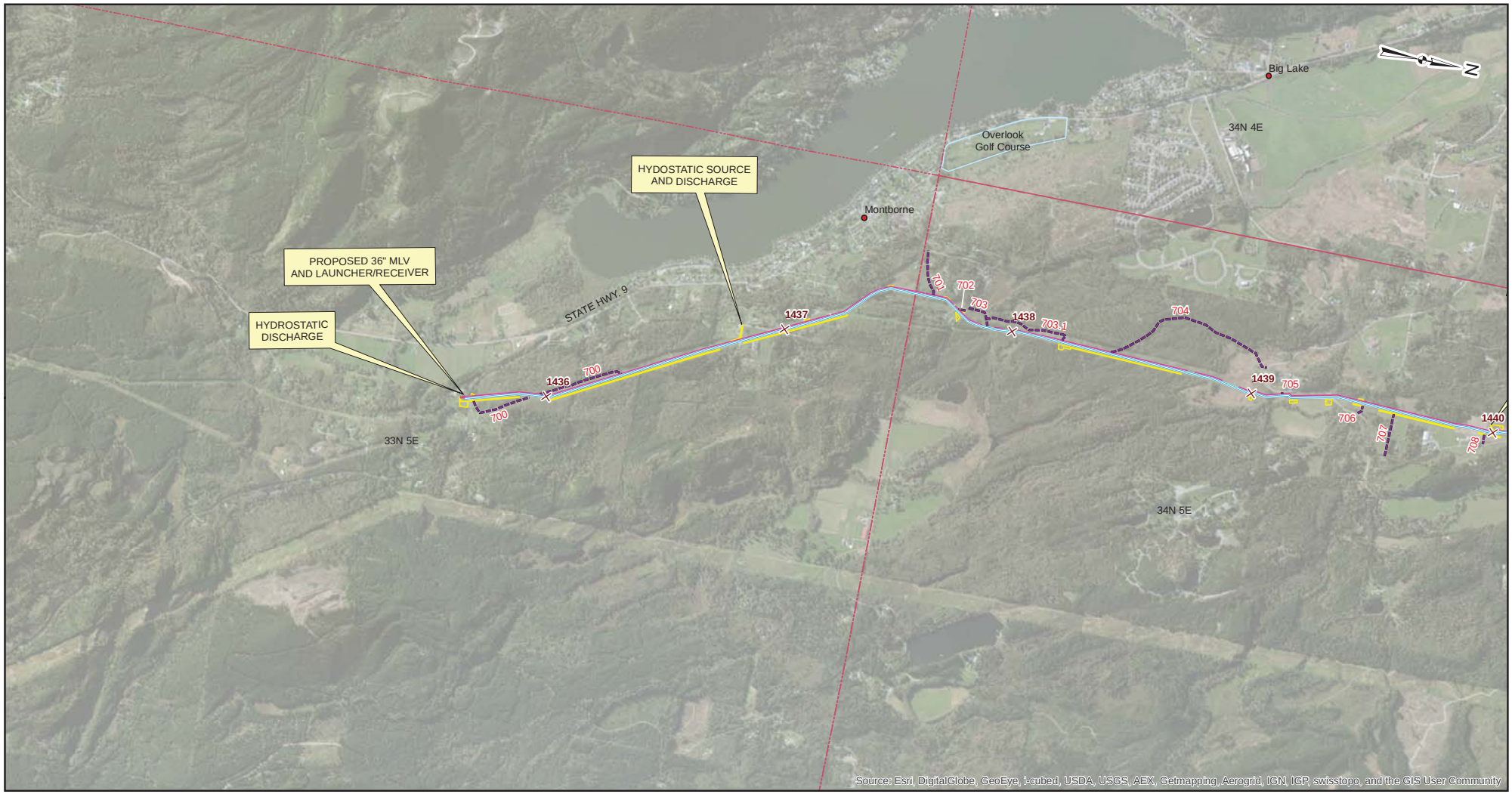
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
SNOHOMISH MP 1393.84 TO 1409.39
SNOHOMISH COUNTY,
WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 22	SHEET 3 OF 3

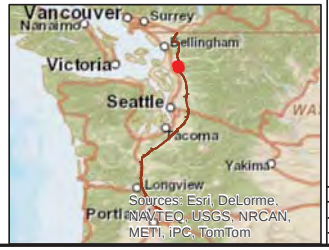


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction
- ROW Temporary Extra Work
- Area Township & Range Line
- Cities

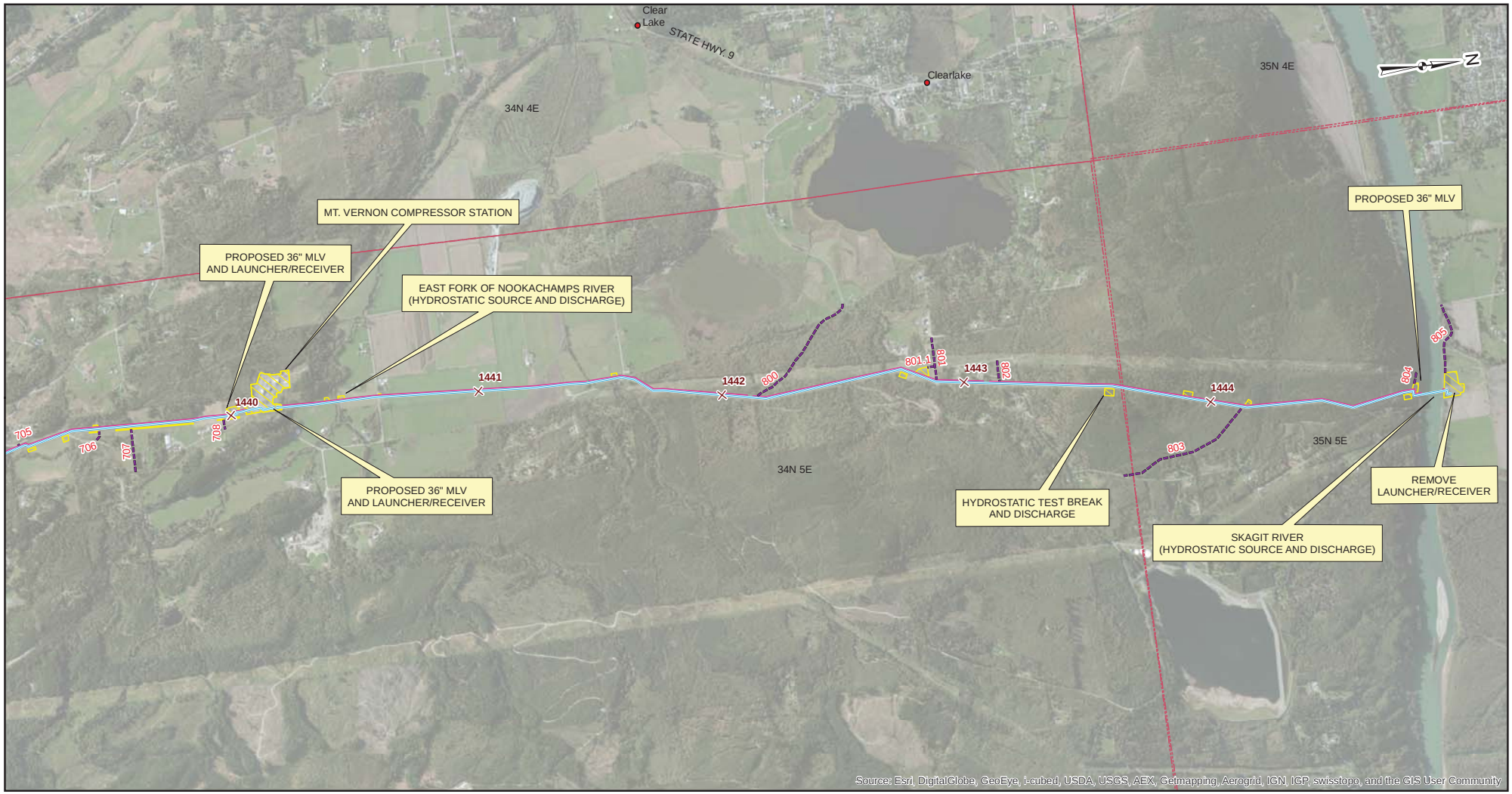
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE
LOCATION MAPS
Mt. VERNON SOUTH MP 1435.67 TO
1440.18 AND Mt. VERNON NORTH "A"
MP 1440.18 TO 1445.02
SKAGIT COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 23	SHEET 1 OF 2

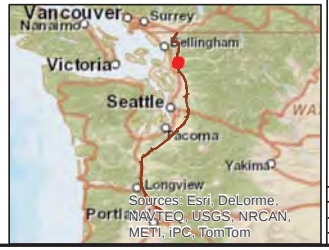


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction
- ROW Temporary Extra Work
- Area Township & Range Line
- Cities

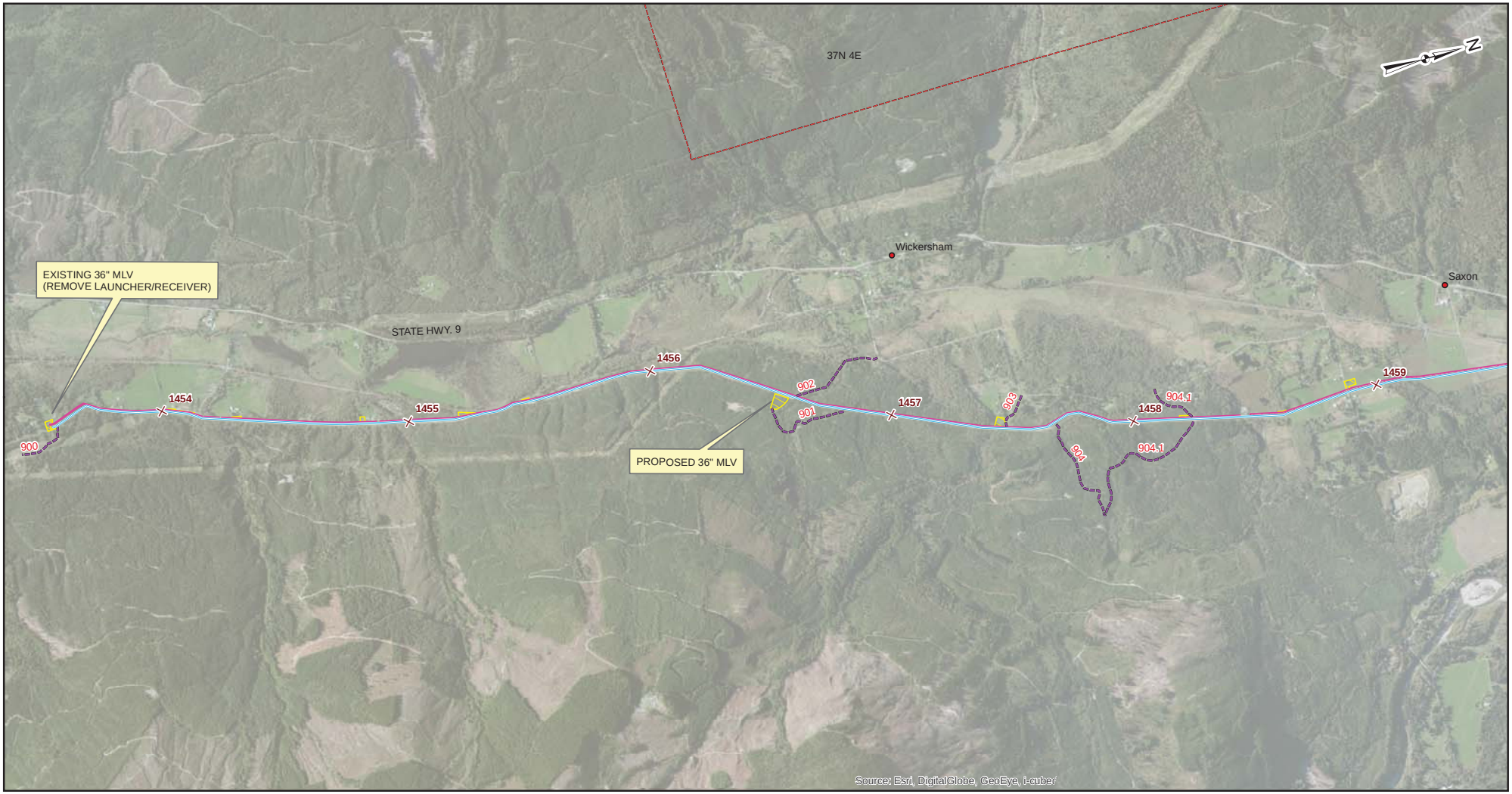
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT SITE LOCATION MAPS
Mt. VERNON SOUTH MP 1435.67 TO 1440.18 AND Mt. VERNON NORTH "A" MP 1440.18 TO 1445.02
SKAGIT COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 24	SHEET 2 OF 2



Legend

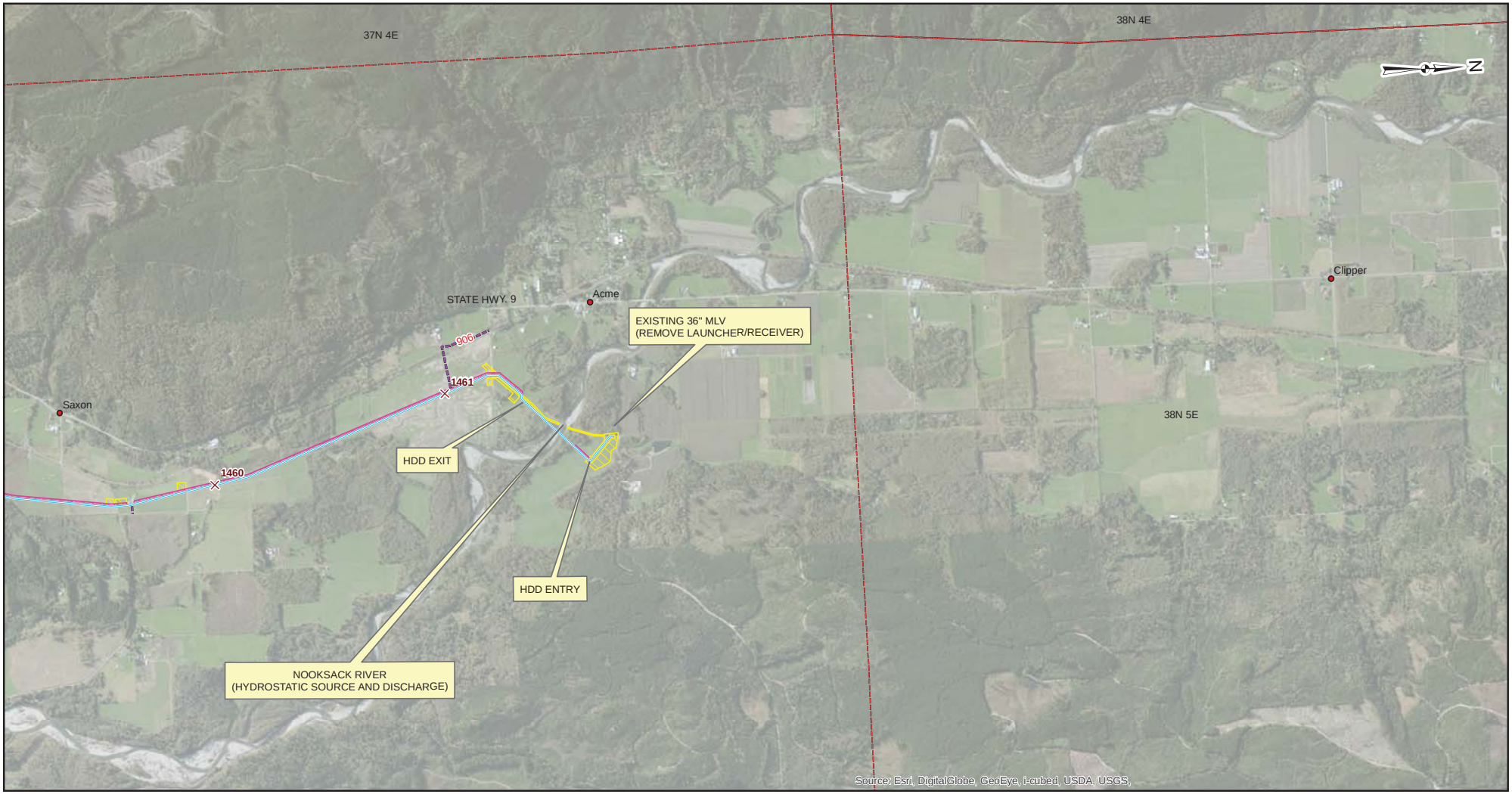
- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Township & Range Line
- Cities

NOTES:

0 1,000 2,000 4,000 Feet

WASHINGTON EXPANSION PROJECT
SITE LOCATION MAPS
Mt. VERNON NORTH "B" MP 1453.53 TO 1461.88
SKAGIT & WHATCOM COUNTIES, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 25	SHEET 1 OF 2

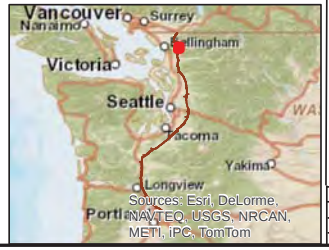


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Township & Range Line
- Cities

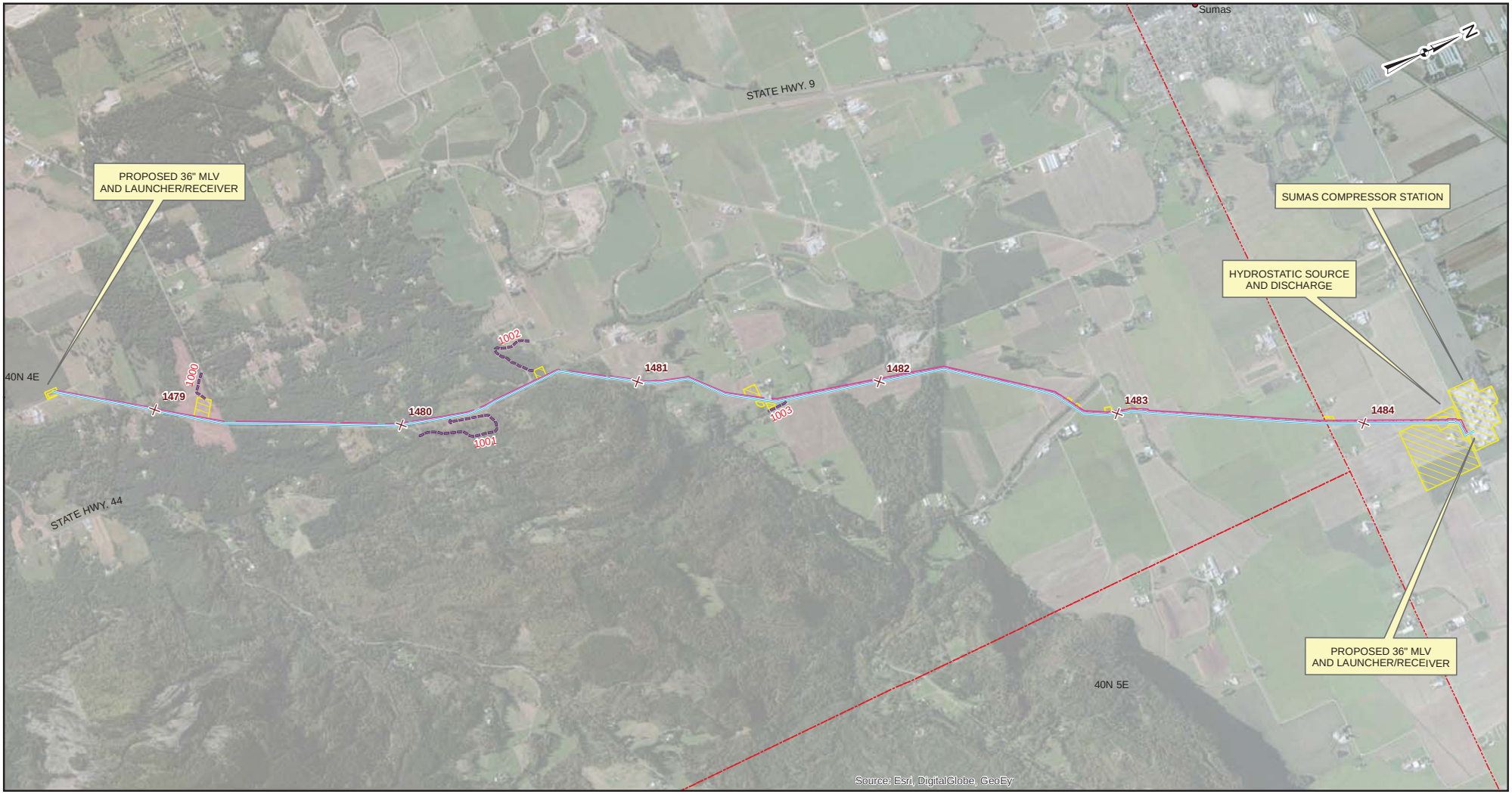
NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION PROJECT
SITE LOCATION MAPS
Mt. VERNON NORTH "B" MP 1453.53 TO 1461.88
SKAGIT & WHATCOM COUNTIES, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 26	SHEET 2 OF 2

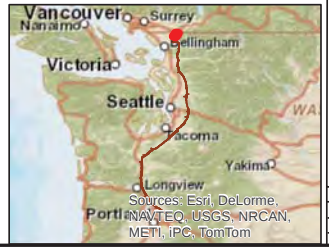


Legend

- New Pipeline Segment
- Mileposts
- Existing Access Road
- Temporary Construction ROW
- Temporary Extra Work Area
- Township & Range Line
- Cities

NOTES:

0 1,000 2,000 4,000 Feet



WASHINGTON EXPANSION
PROJECT SITE LOCATION MAPS
SUMAS MP 1478.58 TO 1484.48
WHATCOM COUNTY, WASHINGTON

DRAWN BY: MC	DATE: 5/6/2014	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: MD	DATE	ISSUED FOR CONSTRUCTION:	
APPROVED BY:		DRAWING NUMBER: 1A - 27	SHEET 1 OF 1

APPENDIX I2

PIPELINE CONSTRUCTION RIGHT-OF-WAY CROSS SECTIONS AND CONFIGURATION TABLE

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
Woodland Loop		
1244.29	1244.46	1
1244.46	1244.48	2
1244.48	1244.50	Nontypical
1244.50	1244.50	2
1244.50	1244.95	1
1244.95	1244.96	Nontypical
1244.96	1245.01	2
1245.0	1245.64	1
1245.64	1246.02	2
1246.02	1246.06	1
1246.06	1246.22	2
1246.22	1246.22	Nontypical
1246.22	1246.28	2
1246.28	1246.73	1
1246.73	1246.76	2
1246.76	1247.42	1
1247.42	1247.45	2
1247.45	1247.63	1
1247.63	1247.66	2
1247.66	1247.73	1
1247.73	1247.74	2
1247.74	1248.30	1
1248.30	1248.32	2
1248.32	1248.45	1
1248.45	1248.73	2
1248.73	1248.75	1
1248.75	1248.90	Nontypical
1248.90	1248.97	1
1248.97	1248.97	2
1248.97	1251.32	1
1251.32	1251.38	2
1251.38	1253.44	1
1253.44	1253.50	2
1253.50	1253.52	1
1253.52	1253.53	2
1253.53	1255.30	1
1255.30	1255.32	2
1255.32	1255.74	1
1255.74	1255.75	Nontypical
1255.75	1256.41	1
1256.41	1256.42	2
1256.42	1256.90	1
1256.90	1256.91	2
1256.91	1256.93	1
1256.93	1256.94	2
1256.94	1256.95	Nontypical
1256.95	1257.28	2
1257.28	1257.47	1
1257.47	1257.48	2
1257.48	1257.52	1
1257.52	1257.53	Nontypical
1257.53	1257.59	1
1257.59	1257.70	2
1257.70	1257.74	1

Milepost Start	Milepost End	ROW Typical [a]
1257.74	1257.75	Nontypical
1257.75	1257.75	2
1257.75	1257.77	1
1257.77	1257.79	2
1257.79	1258.02	1
1258.02	1258.03	2
1258.03	1258.05	Nontypical
1258.05	1258.20	1
1258.20	1258.37	2
1258.37	1258.97	1
1258.97	1259.00	2
1259.00	1260.82	1
1260.82	1260.83	2
1260.83	1260.86	1
1260.86	1260.88	2
1260.88	1260.89	Nontypical
1260.89	1260.92	2
1260.92	1261.20	1
1261.20	1261.21	2
1261.21	1262.20	1
1262.20	1262.59	Nontypical
1262.59	1262.61	2
1262.61	1263.12	1
1263.12	1263.17	2
1263.17	1263.19	1
1263.19	1263.24	2
1263.24	1263.25	Nontypical
1263.25	1263.26	2
1263.26	1265.25	1
1265.25	1265.32	2
1265.32	1269.06	1
1269.06	1269.21	Nontypical
1269.21	1269.54	1
1269.54	1269.55	2
1269.55	1274.00	1
1274.00	1274.02	2
1274.02	1274.22	1
1274.22	1274.74	2
1274.74	1275.67	1
1275.67	1275.68	2
1275.68	1275.77	1
1275.77	1277.82	Nontypical
1277.82	1278.16	1
1278.16	1279.32	Nontypical
1279.32	1279.71	1
1279.71	1279.72	2
1279.72	1280.15	1
1280.15	1280.20	2
1280.20	1280.21	Nontypical
1280.21	1280.32	2
1280.32	1280.34	1
1280.34	1280.38	2
1280.38	1280.48	1
1280.48	1280.67	2
1280.67	1280.76	1

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1280.76	1280.82	2
1280.82	1281.09	1
1281.09	1281.13	2
1281.13	1281.14	Nontypical
1281.14	1281.14	2
1281.14	1281.20	1
1281.20	1281.20	2
1281.20	1281.92	Nontypical
1281.92	1282.03	2
1282.03	1282.68	Nontypical
1282.68	1282.87	1
1282.87	1282.89	2
1282.89	1282.92	1
1282.92	1282.95	2
1282.95	1283.12	1
1283.12	1283.47	2
1283.47	1284.03	1
1284.03	1284.11	2
1284.11	1284.25	1
1284.25	1284.26	2
1284.26	1284.74	1
1284.74	1284.75	2
1284.75	1284.92	1
1284.92	1285.05	Nontypical
1285.05	1285.43	1
1285.43	1285.46	2
1285.46	1285.79	1
1285.79	1285.80	2
1285.80	1286.17	1
1286.17	1286.18	2
1286.18	1286.77	1
1286.77	1286.80	2
1286.80	1286.88	1
1286.88	1286.94	Nontypical
1286.94	1287.33	1
1287.33	1287.37	2
1287.37	1287.72	1
1287.72	1287.73	2
1287.73	1288.10	1
1288.10	1288.19	2
1288.19	1288.27	1
1288.27	1288.32	2
1288.32	1288.87	1
1288.87	1288.92	2
1288.92	1289.03	1
1289.03	1289.04	Nontypical
1289.04	1289.54	1
Chehalis Loop		
1291.27	1291.40	1
1291.40	1291.56	5
1291.56	1291.59	Nontypical
1291.59	1292.06	5
1292.06	1292.28	1
1292.28	1292.65	5
1292.65	1293.14	1
1293.14	1293.40	5

Milepost Start	Milepost End	ROW Typical [a]
1293.40	1293.63	1
1293.63	1293.89	5
1293.89	1294.00	1
1294.00	1294.30	Nontypical
1294.30	1295.52	1
1295.52	1295.56	2
1295.56	1295.61	1
1295.61	1295.61	Nontypical
1295.61	1295.95	1
1295.95	1295.98	2
1295.98	1296.26	1
1296.26	1296.30	2
1296.30	1297.20	1
1297.20	1297.21	Nontypical
1297.21	1297.96	1
1297.96	1297.98	2
1297.98	1298.07	1
1298.07	1298.15	2
1298.15	1298.53	1
1298.53	1298.68	Nontypical
1298.68	1299.10	1
1299.10	1299.17	2
1299.17	1299.19	1
1299.19	1299.70	Nontypical
1299.70	1300.77	1
1300.77	1300.78	2
1300.78	1302.72	1
1302.72	1302.75	2
1302.75	1304.31	1
1304.31	1306.17	Nontypical
1306.17	1308.42	1
1308.42	1309.80	Nontypical
1309.80	1310.10	1
1310.10	1311.88	Nontypical
1311.88	1315.62	1
Sumner South Loop		
1338.00	1338.21	1
1338.21	1338.33	2
1338.33	1338.40	1
1338.40	1338.46	2
1338.46	1338.48	Nontypical
1338.48	1338.51	2
1338.51	1338.54	Nontypical
1338.54	1338.56	2
1338.56	1338.58	Nontypical
1338.58	1338.60	2
1338.60	1338.63	Nontypical
1338.63	1338.66	2
1338.66	1339.12	1
1339.12	1339.24	Nontypical
1339.24	1339.38	1
1339.38	1339.38	Nontypical
1339.38	1340.17	1
1340.17	1340.46	2
1340.46	1340.47	Nontypical
1340.47	1340.59	2

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1340.59	1340.64	1
1340.64	1340.66	2
1340.66	1340.67	Nontypical
1340.67	1340.78	2
1340.78	1340.79	Nontypical
1340.79	1340.80	2
1340.80	1340.80	Nontypical
1340.80	1340.82	2
1340.82	1340.82	Nontypical
1340.82	1340.86	2
1340.86	1340.86	Nontypical
1340.86	1340.90	2
1340.90	1340.90	Nontypical
1340.90	1341.10	2
1341.10	1341.13	1
1341.13	1341.17	Nontypical
1341.17	1341.19	2
1341.19	1341.19	Nontypical
1341.19	1341.21	1
1341.21	1341.22	Nontypical
1341.22	1341.38	2
1341.38	1341.45	1
1341.45	1341.46	Nontypical
1341.46	1341.47	3
1341.47	1341.48	Nontypical
1341.48	1341.60	3
1341.60	1341.60	Nontypical
1341.60	1341.61	3
1341.61	1341.62	Nontypical
1341.62	1341.68	3
1341.68	1341.69	Nontypical
1341.69	1341.70	3
1341.70	1341.71	Nontypical
1341.71	1341.75	3
1341.75	1341.77	Nontypical
1341.77	1341.79	3
1341.79	1341.84	Nontypical
1341.84	1341.86	3
1341.86	1341.86	2
1341.86	1341.95	1
1341.95	1342.06	2
1342.06	1342.11	1
1342.11	1342.13	Nontypical
1342.13	1342.32	1
1342.32	1342.35	2
1342.35	1342.46	1
1342.46	1342.47	2
1342.47	1342.50	1
1342.50	1342.50	Nontypical
1342.50	1342.56	2
1342.56	1342.56	Nontypical
1342.56	1342.59	2
1342.59	1342.83	1
1342.83	1343.02	Nontypical
1343.02	1343.12	1
1343.12	1343.12	2

Milepost Start	Milepost End	ROW Typical [a]
1343.12	1343.13	Nontypical
1343.13	1343.14	2
1343.14	1343.17	1
1343.17	1343.21	Nontypical
1343.21	1343.23	1
1343.23	1343.26	Nontypical
1343.26	1343.26	1
1343.26	1343.29	Nontypical
1343.29	1343.30	2
1343.30	1343.31	1
1343.31	1343.35	Nontypical
1343.35	1343.35	3
1343.35	1343.44	Nontypical
1343.44	1343.46	1
1343.46	1343.51	2
1343.51	1343.52	1
1343.52	1343.58	2
1343.58	1343.59	Nontypical
1343.59	1343.60	3
1343.60	1343.62	Nontypical
1343.62	1343.64	3
1343.64	1343.65	Nontypical
1343.65	1343.66	3
1343.66	1343.70	Nontypical
1343.70	1343.72	3
1343.72	1343.79	Nontypical
1343.79	1343.79	1
1343.79	1344.18	Nontypical
1344.18	1344.24	3
1344.24	1344.25	Nontypical
1344.25	1344.35	3
1344.35	1344.36	2
1344.36	1344.37	1
1344.37	1344.38	Nontypical
1344.38	1344.44	1
1344.44	1344.45	Nontypical
1344.45	1344.46	1
1344.46	1344.53	2
1344.53	1344.60	1
1344.60	1344.61	Nontypical
1344.61	1344.66	1
1344.66	1344.67	2
1344.67	1345.10	1
1345.10	1345.29	Nontypical
1345.29	1345.45	3
1345.45	1345.46	Nontypical
1345.46	1345.50	3
1345.50	1345.50	Nontypical
1345.50	1345.57	3
1345.57	1345.57	Nontypical
1345.57	1345.60	3
1345.60	1345.61	Nontypical
1345.61	1345.76	3
1345.76	1345.77	Nontypical
1345.77	1345.93	3
1345.93	1346.05	Nontypical

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1346.05	1346.16	3
1346.16	1346.17	Nontypical
1346.17	1346.26	3
1346.26	1346.30	Nontypical
1346.30	1346.51	3
1346.51	1346.52	Nontypical
1346.52	1346.53	3
1346.53	1346.55	Nontypical
1346.55	1346.56	3
1346.56	1346.60	Nontypical
1346.60	1346.63	3
1346.63	1346.63	Nontypical
1346.63	1346.69	3
1346.69	1346.71	2
1346.71	1346.72	Nontypical
1346.72	1347.13	2
1347.13	1347.13	Nontypical
1347.13	1347.20	2
1347.20	1347.29	1
1347.29	1347.30	2
1347.30	1347.39	1
1347.39	1347.42	Nontypical
1347.42	1347.43	2
1347.43	1347.45	Nontypical
1347.45	1347.78	1
1347.78	1348.10	Nontypical
1348.10	1348.16	1
1348.16	1348.17	2
1348.17	1348.18	Nontypical
1348.18	1348.19	2
1348.19	1348.20	Nontypical
1348.20	1348.22	2
1348.22	1348.24	Nontypical
1348.24	1348.26	2
1348.26	1348.27	Nontypical
1348.27	1348.28	2
1348.28	1348.46	Nontypical
1348.46	1348.48	3
1348.48	1348.49	Nontypical
1348.49	1348.50	2
1348.50	1348.53	Nontypical
1348.53	1348.54	2
1348.54	1348.55	Nontypical
1348.55	1348.61	2
1348.61	1348.62	Nontypical
1348.62	1348.63	2
1348.63	1348.94	1
1348.94	1349.08	Nontypical
1349.08	1349.32	1
1349.32	1349.42	Nontypical
1349.42	1349.46	2
1349.46	1349.47	Nontypical
1349.47	1349.55	2
1349.55	1349.65	Nontypical
1349.65	1349.66	1
1349.66	1349.91	Nontypical

Milepost Start	Milepost End	ROW Typical [a]
1349.91	1349.92	1
1349.92	1349.95	Nontypical
1349.95	1349.96	1
1349.96	1349.97	Nontypical
1349.97	1349.99	2
1349.99	1349.99	Nontypical
1349.99	1351.15	1
1351.15	1351.28	Nontypical
1351.28	1351.35	2
1351.35	1351.36	Nontypical
1351.36	1351.44	2
1351.44	1351.45	Nontypical
1351.45	1351.48	2
1351.48	1351.50	Nontypical
1351.50	1351.57	2
1351.57	1351.58	Nontypical
1351.58	1351.61	2
1351.61	1351.61	Nontypical
1351.61	1351.82	2
Sumner North A Loop		
1356.90	1356.91	2
1356.91	1356.92	1
1356.92	1356.94	Nontypical
1356.94	1357.17	1
1357.17	1357.24	2
1357.24	1358.00	1
1358.00	1358.01	2
1358.01	1358.11	1
1358.11	1358.16	2
1358.16	1358.31	1
1358.31	1358.34	2
1358.34	1358.47	1
1358.47	1358.49	2
1358.49	1358.70	1
1358.70	1358.73	2
1358.73	1358.75	1
1358.75	1358.78	2
1358.78	1359.00	1
1359.00	1359.01	2
1359.01	1359.04	1
1359.04	1359.14	Nontypical
1359.14	1359.50	1
1359.50	1359.56	Nontypical
1359.56	1359.66	1
1359.66	1359.83	Nontypical
1359.83	1360.05	1
1360.05	1360.07	Nontypical
1360.07	1360.37	1
1360.37	1360.39	2
1360.39	1360.51	1
1360.51	1360.52	2
1360.52	1360.63	1
1360.63	1360.64	2
1360.64	1360.65	Nontypical
1360.65	1360.66	2
1360.66	1360.68	1

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1360.68	1360.69	Nontypical
1360.69	1360.71	1
1360.71	1360.75	2
1360.75	1360.86	1
1360.86	1360.91	Nontypical
1360.91	1361.39	1
1361.39	1361.47	Nontypical
1361.47	1361.53	1
1361.53	1361.55	Nontypical
1361.55	1361.60	1
1361.60	1361.74	Nontypical
1361.74	1361.89	2
1361.89	1361.95	1
1361.95	1362.27	2
1362.27	1362.35	1
1362.35	1362.40	2
1362.40	1362.42	1
1362.42	1362.62	2
1362.62	1362.71	1
1362.71	1362.83	2
1362.83	1362.84	3
1362.84	1362.85	Nontypical
1362.85	1362.88	3
1362.88	1363.24	Nontypical
1363.24	1363.31	2
1363.31	1363.34	Nontypical
1363.34	1363.34	2
1363.34	1363.36	Nontypical
1363.36	1363.73	2
1363.73	1363.81	Nontypical
1363.81	1363.83	2
1363.83	1363.93	1
Sumner North B Loop		
1370.89	1370.97	1
1370.97	1371.31	Nontypical
1371.31	1371.32	2
1371.32	1371.87	1
1371.87	1371.89	2
1371.89	1371.90	Nontypical
1371.90	1371.91	2
1371.91	1371.95	1
1371.95	1371.98	2
1371.98	1372.02	1
1372.02	1372.08	Nontypical
1372.08	1372.09	1
1372.09	1372.11	2
1372.11	1372.47	1
1372.47	1372.61	Nontypical
1372.61	1372.76	1
1372.76	1372.78	2
1372.78	1372.78	Nontypical
1372.78	1372.82	2
1372.82	1372.82	Nontypical
1372.82	1372.97	2
1372.97	1373.17	Nontypical
1373.17	1373.25	1

Milepost Start	Milepost End	ROW Typical [a]
1373.25	1373.29	2
1373.29	1373.52	1
1373.52	1373.56	Nontypical
1373.56	1373.65	1
1373.65	1373.69	2
1373.69	1373.71	Nontypical
1373.71	1373.80	2
1373.80	1373.89	Nontypical
1373.89	1373.90	2
1373.90	1373.96	1
1373.96	1373.96	Nontypical
1373.96	1373.99	1
1373.99	1374.06	2
1374.06	1374.61	1
1374.61	1374.87	Nontypical
1374.87	1375.86	1
1375.86	1375.89	2
1375.89	1376.69	1
1376.69	1377.01	2
1377.01	1377.63	1
1377.63	1377.65	2
1377.65	1377.67	1
1377.67	1377.68	Nontypical
1377.68	1377.72	2
1377.72	1377.72	Nontypical
1377.72	1377.77	2
1377.77	1377.79	Nontypical
1377.79	1377.80	2
1377.80	1377.84	Nontypical
1377.84	1377.87	2
1377.87	1377.90	Nontypical
1377.90	1377.93	2
1377.93	1377.95	Nontypical
1377.95	1378.40	2
1378.40	1378.44	1
1378.44	1378.45	2
1378.45	1378.51	1
1378.51	1378.53	2
1378.53	1378.57	1
1378.57	1378.65	2
1378.65	1378.66	Nontypical
1378.66	1378.67	2
1378.67	1378.69	Nontypical
1378.69	1379.03	2
1379.03	1379.06	1
1379.06	1379.14	Nontypical
1379.14	1379.21	1
1379.21	1379.23	2
1379.23	1379.25	Nontypical
1379.25	1379.32	2
1379.32	1379.36	Nontypical
1379.36	1379.83	2
1379.83	1379.91	1
1379.91	1380.19	2
1380.19	1380.21	1
1380.21	1380.47	2

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1380.47	1380.49	1
1380.49	1380.68	2
1380.68	1380.73	1
1380.73	1380.74	2
1380.74	1380.87	Nontypical
1380.87	1381.18	2
1381.18	1381.27	1
1381.27	1381.49	Nontypical
1381.49	1381.75	2
1381.75	1381.92	Nontypical
Snohomish Loop		
1393.84	1394.06	1
1394.06	1394.39	Nontypical
1394.39	1394.41	1
1394.41	1394.43	2
1394.43	1394.47	1
1394.47	1394.48	2
1394.48	1394.87	1
1394.87	1394.89	2
1394.89	1395.30	1
1395.30	1395.33	2
1395.33	1395.37	1
1395.37	1395.49	2
1395.49	1395.60	1
1395.60	1396.11	Nontypical
1396.11	1396.22	1
1396.22	1396.35	2
1396.35	1396.59	1
1396.59	1396.95	Nontypical
1396.95	1396.99	1
1396.99	1397.06	Nontypical
1397.06	1397.39	1
1397.39	1397.43	2
1397.43	1398.35	Nontypical
1398.35	1399.65	1
1399.65	1399.67	Nontypical
1399.67	1399.72	1
1399.72	1399.75	2
1399.75	1399.89	1
1399.89	1399.95	2
1399.95	1399.97	Nontypical
1399.97	1400.03	2
1400.03	1400.04	Nontypical
1400.04	1400.10	2
1400.10	1400.11	Nontypical
1400.11	1400.30	2
1400.30	1400.33	1
1400.33	1400.34	2
1400.34	1400.42	1
1400.42	1400.44	2
1400.44	1400.45	1
1400.45	1400.46	2
1400.46	1400.72	1
1400.72	1400.87	2
1400.87	1401.57	4
1401.57	1401.58	Nontypical

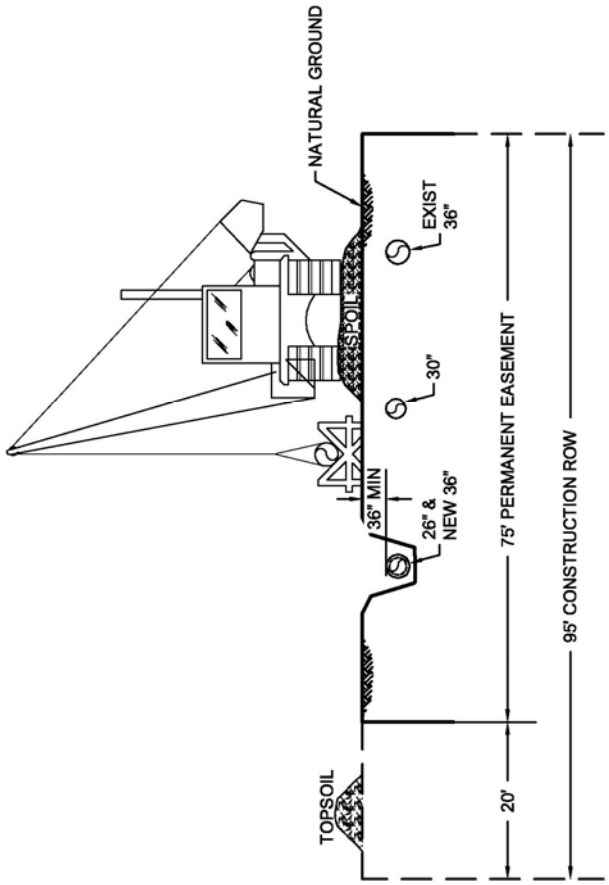
Milepost Start	Milepost End	ROW Typical [a]
1401.58	1402.86	4
1402.86	1403.21	1
1403.21	1403.30	2
1403.30	1403.38	1
1403.38	1403.40	2
1403.40	1403.66	1
1403.66	1403.73	Nontypical
1403.73	1403.80	1
1403.80	1403.82	Nontypical
1403.82	1403.88	1
1403.88	1403.89	Nontypical
1403.89	1404.12	1
1404.12	1404.15	2
1404.15	1404.32	1
1404.32	1404.34	2
1404.34	1404.40	1
1404.40	1404.43	2
1404.43	1404.94	1
1404.94	1404.94	Nontypical
1404.94	1404.97	1
1404.97	1405.01	2
1405.01	1405.36	1
1405.36	1405.39	2
1405.39	1405.48	1
1405.48	1405.49	Nontypical
1405.49	1405.65	1
1405.65	1405.70	2
1405.70	1405.85	1
1405.85	1405.89	2
1405.89	1406.00	1
1406.00	1406.06	Nontypical
1406.06	1406.08	2
1406.08	1406.32	1
1406.32	1406.39	2
1406.39	1406.53	1
1406.53	1406.59	2
1406.59	1406.66	1
1406.66	1406.67	2
1406.67	1406.95	1
1406.95	1407.45	Nontypical
1407.45	1407.53	2
1407.53	1407.63	1
1407.63	1407.64	Nontypical
1407.64	1407.64	2
1407.64	1407.93	1
1407.93	1407.98	2
1407.98	1407.99	Nontypical
1407.99	1408.02	2
1408.02	1408.21	1
1408.21	1408.22	2
1408.22	1408.54	1
1408.54	1408.60	2
1408.60	1408.75	1
1408.75	1408.76	Nontypical
1408.76	1408.95	1
1408.95	1408.96	2

Pipeline Construction Right-of-way Cross Sections and Configuration Table

Milepost Start	Milepost End	ROW Typical [a]
1408.96	1409.4	1
Mt. Vernon South Loop		
1435.67	1437.19	1
1437.19	1437.20	2
1437.20	1437.60	1
1437.60	1437.61	2
1437.61	1437.73	1
1437.73	1437.74	2
1437.74	1437.87	1
1437.87	1437.93	2
1437.93	1437.96	1
1437.96	1438.02	2
1438.02	1438.73	1
1438.73	1438.76	2
1438.76	1438.87	1
1438.87	1438.94	2
1438.94	1439.00	1
1439.00	1439.17	Nontypical
1439.17	1440.07	1
1440.07	1440.18	Nontypical
Mt. Vernon North A Loop		
1440.20	1441.44	1
1441.44	1441.45	2
1441.45	1442.10	1
1442.10	1442.12	2
1442.12	1443.08	1
1443.08	1443.10	2
1443.10	1444.88	1
1444.88	1444.97	River Crossing
1444.97	1444.98	1
1444.98	1445.02	Nontypical
Mt. Vernon North B Loop		
1453.53	1454.17	1
1454.17	1454.18	2
1454.18	1454.24	1
1454.24	1454.24	2
1454.24	1454.87	1
1454.87	1454.88	2
1454.88	1458.43	1
1458.43	1458.45	2
1458.45	1458.47	Nontypical
1458.47	1458.73	4
1458.73	1458.78	Nontypical
1458.78	1458.82	4
1458.82	1458.95	Nontypical
1458.95	1459.03	4
1459.03	1459.39	Nontypical
1459.39	1459.64	4
1459.64	1459.66	Nontypical
1459.66	1460.37	4
1460.37	1460.48	Nontypical
1460.48	1461.37	4
1461.37	1461.74	Nontypical
1461.74	1461.88	2
Sumas Loop		
1478.58	1478.97	1
1478.97	1478.98	Nontypical
1478.98	1479.29	1
1479.29	1479.33	2
1479.33	1479.74	1
1479.74	1479.76	2
1479.76	1479.90	1
1479.90	1479.94	2
1479.94	1479.98	1
1479.98	1479.99	2
1479.99	1480.03	1
1480.03	1480.05	2
1480.05	1480.30	1
1480.30	1480.33	2
1480.33	1480.68	1
1480.68	1480.72	2
1480.72	1480.87	1
1480.87	1480.88	2
1480.88	1481.53	1
1481.53	1481.56	Nontypical
1481.56	1483.05	4
1483.05	1483.13	Nontypical
1483.13	1484.21	4
1484.21	1484.48	Nontypical

[a] The numbers in this column correlate with the typical drawings that follow. Nontypical right-of-way configurations are those areas for which the typicals do not apply. Nontypical configurations occur for 23.0 miles of WEP.

Pipeline Construction Right-of-way Cross Sections and Configuration Table



TYPICAL 1

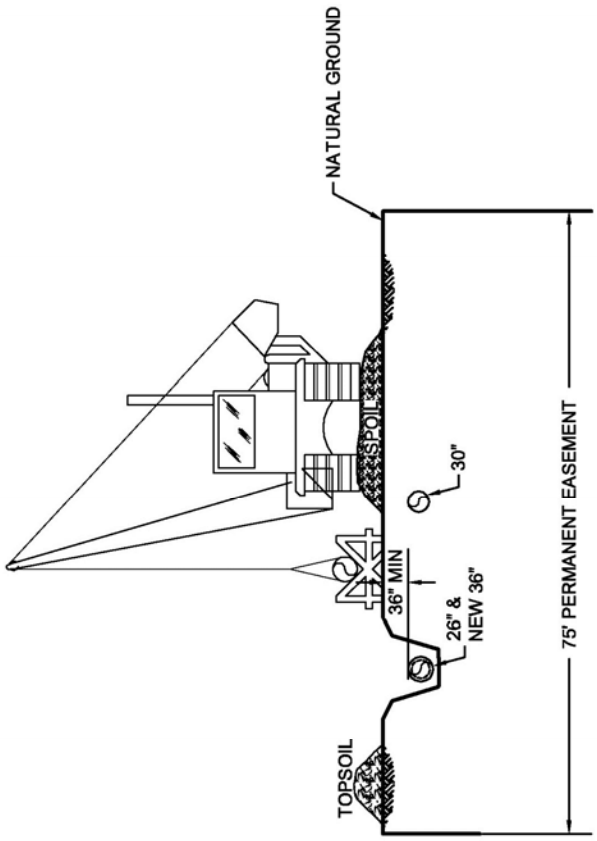
NOTES:

1. Permanent easement may not be width shown in all locations. Where required, temporary construction workspace has been added to the east or west to obtain full construction ROW.
2. Typical spoil placement shown. Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.
3. Existing 36" not installed in all locations.
4. This drawing is intended to show the general configuration and over all width of the construction ROW for the WEP. Site-specific conditions, such as exact and relative locations of existing pipelines may differ, and will be addressed during detailed design and construction.

TYPICAL RIGHT-OF-WAY CROSS SECTION
TYPICAL 1
36" WASHINGTON EXPANSION PROJECT

DRAWN BY: KB	DATE: 1/15/2013	ISSUED FOR FERC: 1/18/2013	SCALE: 1"=20
CHECKED BY: JWD	DATE: 1/15/2013	ISSUED FOR CONSTRUCTION:	
APPROVED BY: DT	DATE: 1/15/2013		

Pipeline Construction Right-of-way Cross Sections and Configuration Table



TYPICAL 2

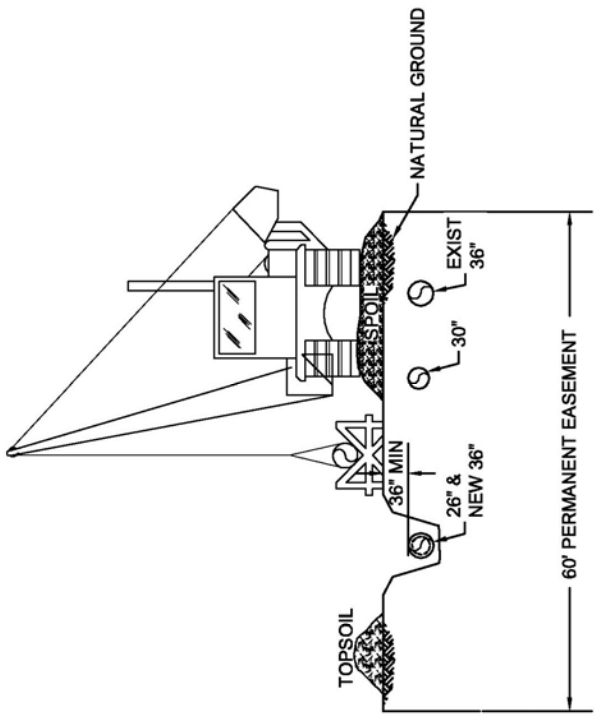
NOTES:

1. Permanent easement may not be width shown in all locations. Where required, temporary construction workspace has been added to the east or west to obtain full construction ROW.
2. Typical spoil placement shown. Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.
3. Existing 36" not installed in all locations.
4. This drawing is intended to show the general configuration and over all width of the construction ROW for the WEP. Site-specific conditions, such as exact and relative locations of existing pipelines may differ, and will be addressed during detailed design and construction.

TYPICAL RIGHT-OF-WAY CROSS SECTION
TYPICAL 2
36" WASHINGTON EXPANSION PROJECT

DRAWN BY: KB	DATE: 1/15/2013	ISSUED FOR FERC: 1/18/2013	SCALE: 1"=20
CHECKED BY: JWD	DATE: 1/15/2013	ISSUED FOR CONSTRUCTION:	
APPROVED BY: DT	DATE: 1/15/2013		

Pipeline Construction Right-of-way Cross Sections and Configuration Table



TYPICAL 3

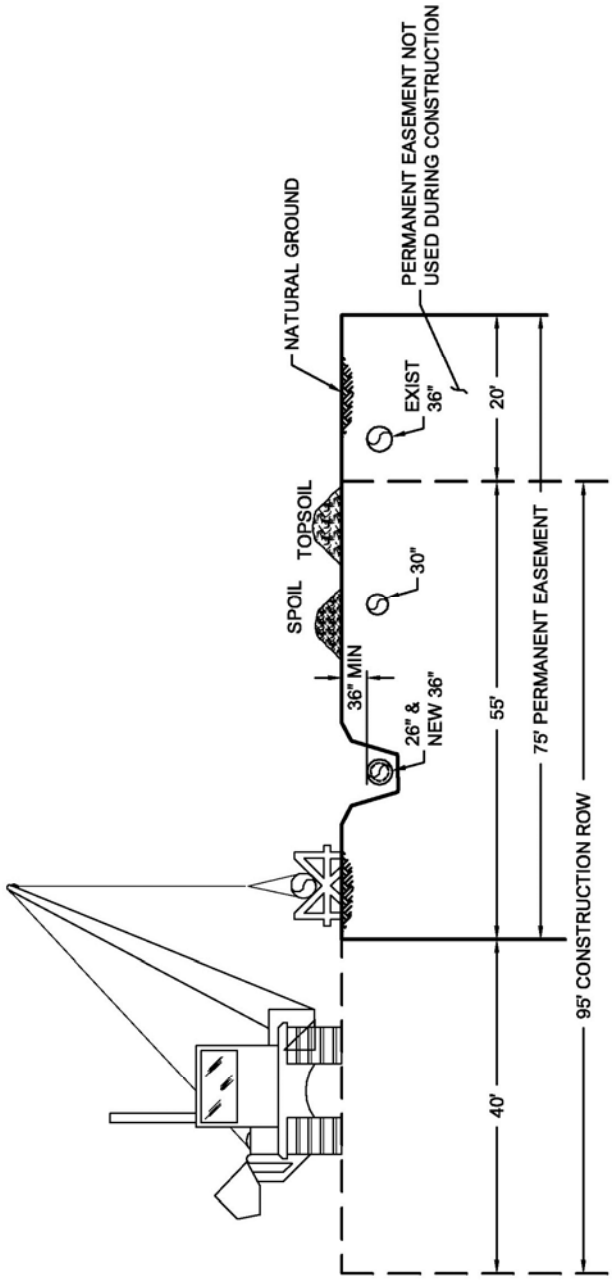
NOTES:

1. Permanent easement may not be width shown in all locations. Where required, temporary construction workspace has been added to the east or west to obtain full construction ROW.
2. Typical spoil placement shown. Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.
3. Existing 36" not installed in all locations.
4. This drawing is intended to show the general configuration and over all width of the construction ROW for the WEP. Site-specific conditions, such as exact and relative locations of existing pipelines may differ, and will be addressed during detailed design and construction.

TYPICAL RIGHT-OF-WAY CROSS SECTION
TYPICAL 3
36" WASHINGTON EXPANSION PROJECT

DRAWN BY: KB	DATE: 1/15/2013	ISSUED FOR FERC: 1/18/2013	SCALE: 1"=20
CHECKED BY: JWD	DATE: 1/15/2013	ISSUED FOR CONSTRUCTION:	
APPROVED BY: DT	DATE: 1/15/2013		

Pipeline Construction Right-of-way Cross Sections and Configuration Table



TYPICAL 4

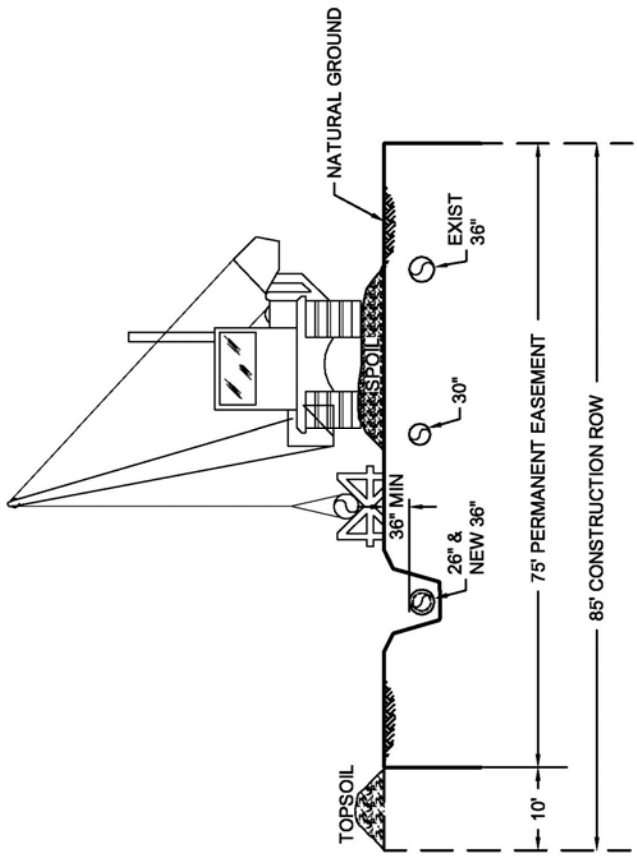
NOTES:

1. Permanent easement may not be width shown in all locations. Where required, temporary construction workspace has been added to the east or west to obtain full construction ROW.
2. Typical spoil placement shown. Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.
3. Existing 36" not installed in all locations.
4. This drawing is intended to show the general configuration and over all width of the construction ROW for the WEP. Site-specific conditions, such as exact and relative locations of existing pipelines may differ, and will be addressed during detailed design and construction.

TYPICAL RIGHT-OF-WAY CROSS SECTION
TYPICAL 4
36" WASHINGTON EXPANSION PROJECT

DRAWN BY: KB	DATE: 1/15/2013	ISSUED FOR FERC: 1/18/2013	SCALE: 1"=20
CHECKED BY: JWD	DATE: 1/15/2013	ISSUED FOR CONSTRUCTION:	
APPROVED BY: DT	DATE: 1/15/2013		

Pipeline Construction Right-of-way Cross Sections and Configuration Table



TYPICAL 5

NOTES:

1. Permanent easement may not be width shown in all locations. Where required, temporary construction workspace has been added to the east or west to obtain full construction ROW.
2. Typical spoil placement shown. Spoil placement may also occur on the working side of the construction right-of-way as determined by site specific conditions.
3. Existing 36" not installed in all locations.
4. This drawing is intended to show the general configuration and over all width of the construction ROW for the WEP. Site-specific conditions, such as exact and relative locations of existing pipelines may differ, and will be addressed during detailed design and construction.

TYPICAL RIGHT-OF-WAY CROSS SECTION
TYPICAL 5
36" WASHINGTON EXPANSION PROJECT

DRAWN BY: KB	DATE: 1/15/2013	ISSUED FOR FERC: 1/18/2013	SCALE: 1"=20
CHECKED BY: JWD	DATE: 1/15/2013	ISSUED FOR CONSTRUCTION:	
APPROVED BY: DT	DATE: 1/15/2013		

APPENDIX I3

PIPELINE ROUTE MINOR VARIATIONS

Appendix I3
Figure 1

Kalama River Crossing

LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Kalama River - Option B

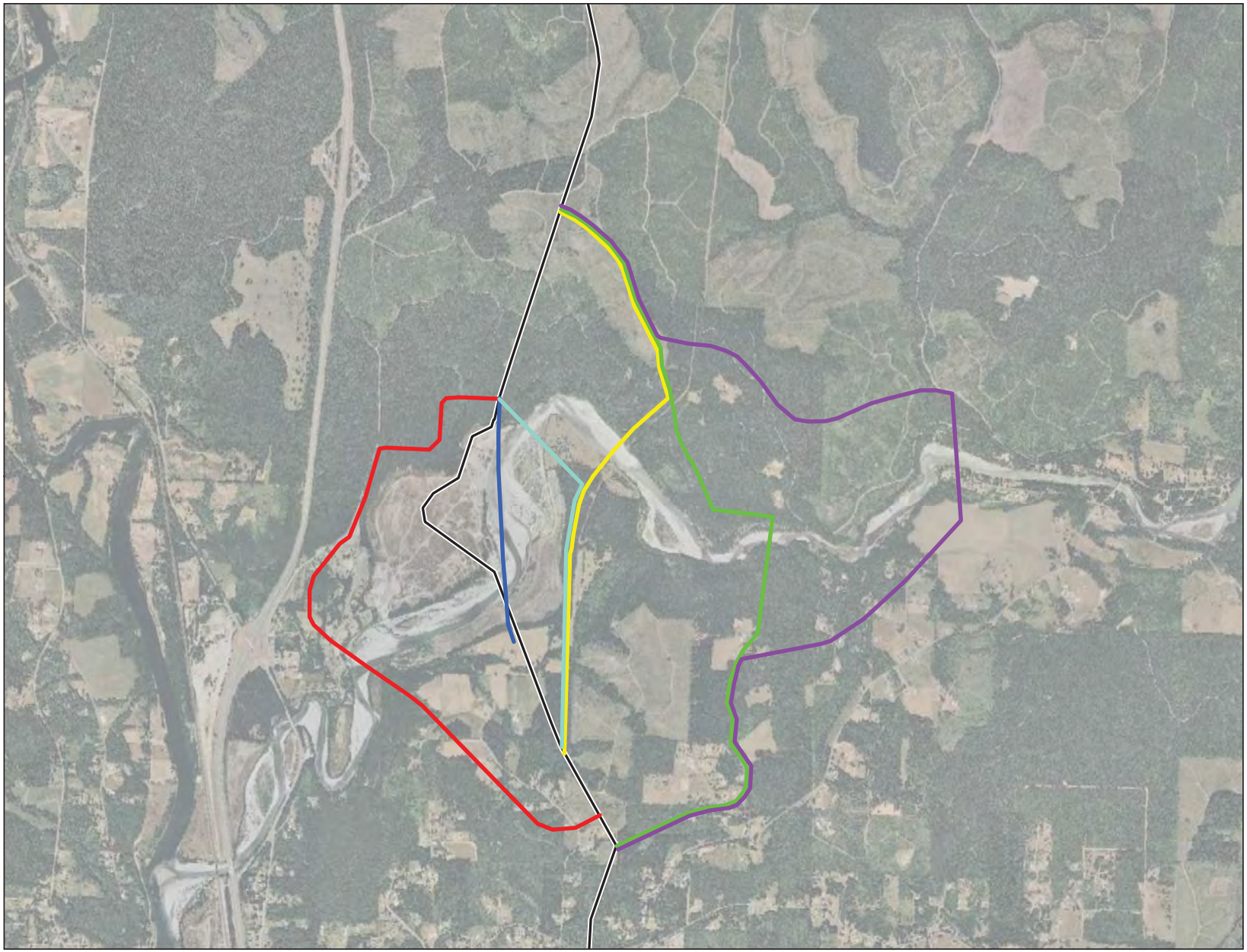
Kalama River Option C is collocated within the WEP route, but utilizes a different crossing method.

*

Area of Interest

N

0 1,000 2,000
Feet



Appendix I3
Figure 2

2007 Toutle River

HDD Evaluation

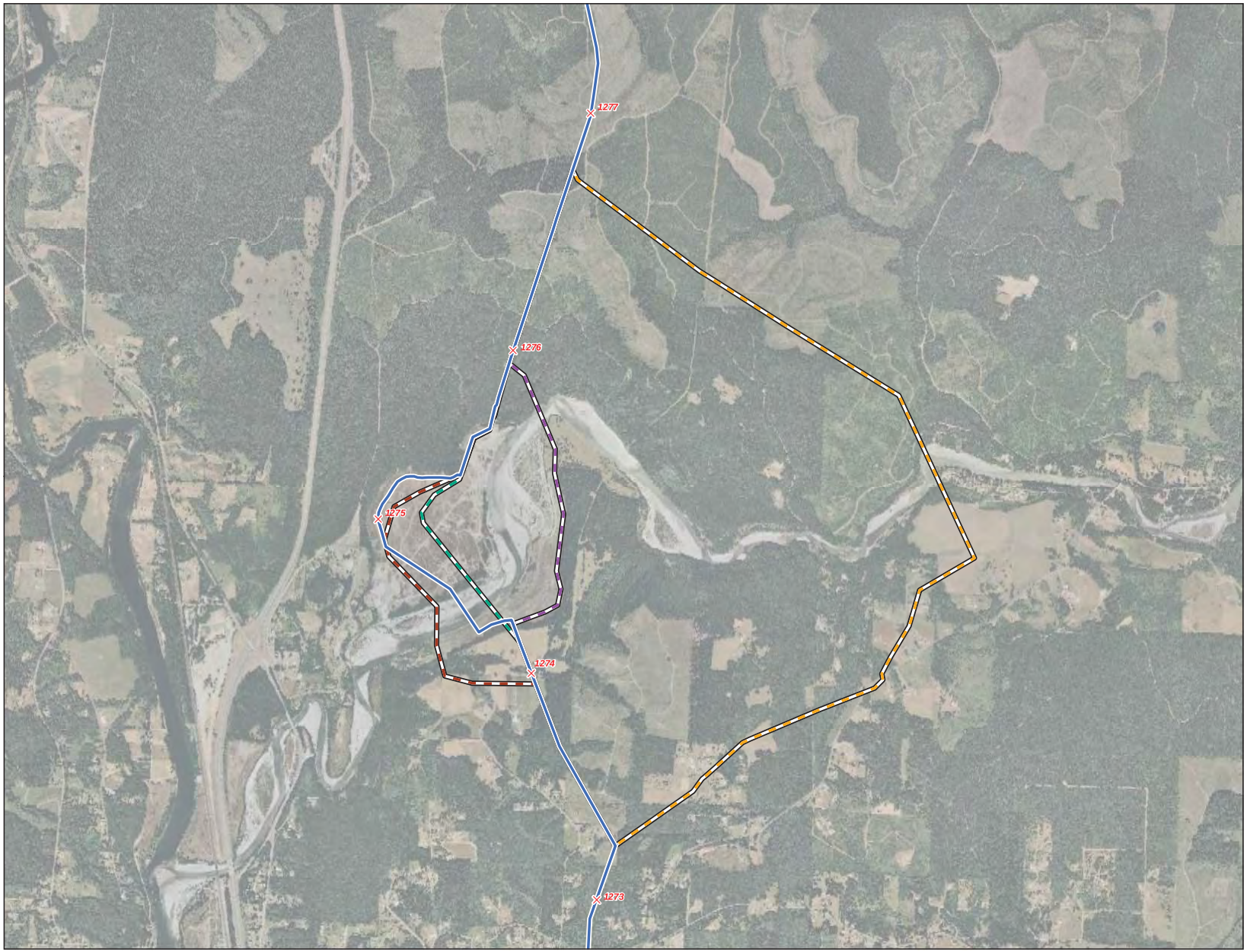
LEGEND

- Existing Williams Pipeline Route
- Alternative A Alternative B
- Alternative B/C
- Alternative C
- Alternative D
- Alternative E

Area of Interest

N

0 1,000 2,000
Feet



Appendix I3
Figure 3

Toutle River Crossing

LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Toutle River - Option B
- Toutle River - Option C
- Toutle River - Option D
- Toutle River - Option E

Area of Interest

N

0 1,000 2,000
Feet

Appendix I3
Figure 4a

Deschutes River and Vail Mountain Crossing

LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Deschutes River/Vail Moutain - Option B

Area of Interest

N

0 1,000 2,000
Feet

Appendix I3
Figure 4b

Deschutes River and Vail Mountain Crossing

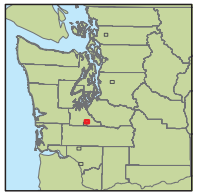
LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Deschutes River/Vail Moutain - Option B

Area of Interest



N

0 1,000 2,000
Feet

Appendix I3
Figure 5

Queens Bog and Unnamed Bog at MP 1381.3 Crossing

LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Queens Bog - Option B
- Unnamed Bog at MP 1381.3 - Option B

Area of Interest

N

0 1,000 2,000
Feet

Appendix I3
Figure 6

Skagit River and Heartbreak Hill Crossing

LEGEND

- Washington Expansion Project Route Milepost (10th mile)
- Compressor Station
- Washington Expansion Project Route

Minor Route Variations

- Skagit River - Option B

Area of Interest

N

0 1,000 2,000
Feet

APPENDIX I4

ADDITIONAL TEMPORARY WORKSPACE FOR THE PIPELINE ROUTE

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1244.31a	Mobilization, pipe stockpile, hydrotest, aboveground facilities installation	AR 100.1	62-Nonforested wetland	0.51
1	Woodland	1244.31b	Mobilization, pipe stockpile, hydrotest	AR 100.1	21-Cropland and pasture	4.10
					62-Nonforested wetland	0.00
					62-Nonforested wetland	0.39
1	Woodland	1244.78	Steep terrain	ROW	11-Residential	0.43
					14-Transportation, communication, utilities	0.00
1	Woodland	1244.89	Steep terrain	ROW	11-Residential	0.07
1	Woodland	1245.12	Removal of existing pipe, equipment staging	AR 101	43-Mixed forest land	0.40
1	Woodland	1246.03	Spoil storage, passing lane	ROW	21-Cropland and pasture	0.14
1	Woodland	1246.04	Spoil storage, passing lane	ROW	21-Cropland and pasture	0.08
1	Woodland	1246.19	Removal of existing pipe, equipment staging	AR 103	11-Residential	0.43
1	Woodland	1246.99	Removal of existing pipe, timber storage, equipment staging, nearby valve installation	AR 105	43-Mixed forest land	0.25
1	Woodland	1248.09	Steep terrain, point of intersection	ROW	43-Mixed forest land	0.34
1	Woodland	1248.21	Steep terrain, point of intersection	ROW	21-Cropland and pasture	0.22
1	Woodland	1248.42	Removal of existing pipe, equipment staging, road crossing, vehicle parking	AR 107	21-Cropland and pasture	0.94
					14-Transportation, communication, utilities	0.00
1	Woodland	1248.65	Spoil storage, slight side hill	ROW	21-Cropland and pasture	0.44
1	Woodland	1249.07	Removal of existing pipe, timber storage, equipment staging	AR 109.1	43-Mixed forest land	0.22
1	Woodland	1249.21	Removal of existing pipe, timber storage, equipment staging	AR 109	43-Mixed forest land	0.22
1	Woodland	1249.22	Side slope	AR 109	43-Mixed forest land	0.11
1	Woodland	1249.38	Point of intersection	ROW	43-Mixed forest land	0.07
1	Woodland	1250.66	Removal of existing pipe, timber storage, equipment staging	AR 110	14-Transportation, communication, utilities	0.22
1	Woodland	1251.27	Existing Northwest Pipeline facility, road crossing	China Garden Road	11-Residential	0.17
					14-Transportation, communication, utilities	0.00
1	Woodland	1251.67	Removal of existing pipe, timber storage, equipment staging	AR 111	43-Mixed forest land	0.46
1	Woodland	1252.46	Steep terrain, timber storage	AR 112.1	43-Mixed forest land	0.15
1	Woodland	1252.58	Steep terrain, timber storage	ROW	21-Cropland and pasture	0.25
1	Woodland	1252.94	Removal of existing pipe, equipment staging	AR 113	43-Mixed forest land	0.23
1	Woodland	1253.37	Point of intersection, river crossing construction, equipment egress, hydrotest	AR 114	43-Mixed forest land	0.13
1	Woodland	1253.47	Point of intersection, river crossing construction, road crossing, hydrotest	Kalama River Road	11-Residential	0.64
					51-Streams and canals	0.00
					14-Transportation, communication, utilities	0.01
1	Woodland	1253.52	Road crossing, equipment staging	Kalama River Road	11-Residential	0.11
					14-Transportation, communication, utilities	0.06

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1253.95	Equipment/crew staging, parking area	AR 115.1	43-Mixed forest land	0.03
1	Woodland	1253.96	Pipe staging, removal of existing pipe, timber storage, steep terrain, turnaround area	AR 115.1	43-Mixed forest land	0.29
1	Woodland	1253.97a	Equipment/crew staging, parking area	AR 115.1	43-Mixed forest land	0.10
1	Woodland	1253.97b	Equipment/crew staging, parking area	AR 115.1	43-Mixed forest land	0.33
1	Woodland	1253.98	Removal of existing pipe, equipment staging	AR 115.1	43-Mixed forest land	0.21
1	Woodland	1254.50	Timber storage, turnaround area, equipment staging	AR 116	42-Evergreen forest land	0.14
					43-Mixed forest land	0.09
1	Woodland	1255.74	Road crossing, valve installation	Kool Road	21-Cropland and pasture	0.34
					14-Transportation, communication, utilities	0.02
1	Woodland	1256.58	Removal of existing pipe, timber storage, equipment staging	AR 117	43-Mixed forest land	0.15
1	Woodland	1256.95	Pipe staging, removal of existing pipe, road crossing, wetland staging	Fishpond Road	21-Cropland and pasture	0.50
1	Woodland	1257.07	Point of intersection, wetland/stream crossing	ROW	21-Cropland and pasture	0.05
1	Woodland	1257.09	Wetland/stream crossing	ROW	21-Cropland and pasture	0.01
1	Woodland	1257.15	Wetland/stream crossing, passing lane	AR 118	21-Cropland and pasture	0.10
					11-Residential	0.08
					14-Transportation, communication, utilities	0.00
1	Woodland	1257.20	Pipe staging, removal of existing pipe, equipment staging	AR 118	21-Cropland and pasture	0.23
1	Woodland	1257.51	Point of intersection, road crossing, wetland staging	Rose Valley Road	21-Cropland and pasture	0.22
					14-Transportation, communication, utilities	0.03
1	Woodland	1258.19a	Existing Northwest Pipeline facility, parking	AR 120	14-Transportation, communication, utilities	0.29
1	Woodland	1258.19b	Removal of existing pipe, equipment staging, wetland staging	AR 120	21-Cropland and pasture	0.36
1	Woodland	1258.33	Passing lane, wetland crossing	ROW	21-Cropland and pasture	0.14
1	Woodland	1258.78	Road crossing	AR 121.1	43-Mixed forest land	0.02
					14-Transportation, communication, utilities	0.00
1	Woodland	1258.86	Side slope, wetland crossing	AR 120	43-Mixed forest land	0.33
					14-Transportation, communication, utilities	0.00
1	Woodland	1258.95	Points of intersection, road crossing, side slope, 26-inch abandonment cap	AR 120	43-Mixed forest land	0.07
					11-Residential	0.01
					14-Transportation, communication, utilities	0.01
1	Woodland	1259.02	Side slope, stream crossing	ROW	43-Mixed forest land	0.12
					11-Residential	0.02
1	Woodland	1259.16	Steep terrain, stream crossing	ROW	43-Mixed forest land	0.43
1	Woodland	1259.36	Steep terrain, stream crossing	ROW	43-Mixed forest land	0.44
1	Woodland	1259.55	Steep terrain, stream crossing	ROW	43-Mixed forest land	0.32

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1259.78	Side slope, steep terrain, stream crossing	ROW	43-Mixed forest land	0.63
1	Woodland	1260.07	Steep terrain, stream crossing	AR 122	43-Mixed forest land	0.69
1	Woodland	1260.44	Side slope, steep terrain, wetland/waterbody crossing, points of intersection	AR 122.1/AR 122.2	21-Cropland and pasture	1.23
					43-Mixed forest land	0.22
					62-Nonforested wetland	0.00
					62-Nonforested wetland	0.52
					51-Streams and canals	0.04
1	Woodland	1260.49	Waterbody crossing, points of intersection, hydrotest	AR 122.1/AR 122.2	21-Cropland and pasture	0.22
					51-Streams and canals	0.05
					62-Nonforested wetland	0.07
1	Woodland	1260.68	Removal of existing pipe, pipe/equipment staging	AR 122	21-Cropland and pasture	0.51
1	Woodland	1261.40	Removal of existing pipe, pipe/equipment staging	AR 123	43-Mixed forest land	0.30
1	Woodland	1262.23	Removal of existing pipe, timber storage, 26-inch abandonment cap	ROW	43-Mixed forest land	0.27
1	Woodland	1262.56	Turnaround area, valve installation	ROW	11-Residential	0.05
1	Woodland	1262.60	Existing Northwest Pipeline facility, parking, road crossing, 26-inch abandonment cap	Mt Brynion Road	11-Residential	0.08
					14-Transportation, communication, utilities	0.07
1	Woodland	1263.67	Timber storage, removal of existing pipe, equipment/pipe staging	AR 124	43-Mixed forest land	0.32
1	Woodland	1264.16	Point of intersection	ROW	43-Mixed forest land	0.10
1	Woodland	1264.90	Waterbody crossing	ROW	43-Mixed forest land	0.06
1	Woodland	1264.94	Waterbody crossing	ROW	43-Mixed forest land	0.06
1	Woodland	1265.08	Pipe staging, removal of existing pipe, timber storage, road crossing, wetland staging	Ostrander Road	21-Cropland and pasture	0.51
1	Woodland	1265.14	Existing Northwest Pipeline facility, parking, road crossing	AR 126.1	62-Nonforested wetland	0.00
					14-Transportation, communication, utilities	0.27
1	Woodland	1265.17	Pipe staging, removal of existing pipe, timber storage, road crossing, wetland staging	AR 126	21-Cropland and pasture	0.47
					14-Transportation, communication, utilities	0.07
1	Woodland	1265.21	Side slope	ROW	43-Mixed forest land	0.16
					14-Transportation, communication, utilities	0.00
1	Woodland	1265.22	Wetland staging, stream crossing	ROW	43-Mixed forest land	0.08
1	Woodland	1266.26	Side slope, parking, stream crossing, parking	AR 128	43-Mixed forest land	1.20
					14-Transportation, communication, utilities	0.03
1	Woodland	1266.55	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	0.18
1	Woodland	1266.68	Side slope, wetland/stream crossing	ROW	21-Cropland and pasture	0.10
					43-Mixed forest land	0.25
1	Woodland	1266.84	Side slope, wetland/stream crossing	ROW	21-Cropland and pasture	0.03
					43-Mixed forest land	0.34
1	Woodland	1266.95	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	0.03
1	Woodland	1267.00	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	0.15

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1267.11	Wetland/stream crossing, timber storage	ROW	43-Mixed forest land	0.12
1	Woodland	1267.15	Side slope, wetland/stream crossing	ROW	21-Cropland and pasture	0.08
					43-Mixed forest land	0.20
1	Woodland	1267.28	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	0.27
1	Woodland	1267.31	Wetland/stream crossing, turnaround area, equipment staging	ROW	43-Mixed forest land	0.32
1	Woodland	1267.49	Wetland/stream crossing, road crossing	Headquarters Road	21-Cropland and pasture	0.23
					43-Mixed forest land	0.10
					14-Transportation, communication, utilities	0.01
1	Woodland	1267.54	Road crossing, pipe/equipment staging	Headquarters Road	21-Cropland and pasture	0.16
					14-Transportation, communication, utilities	0.01
1	Woodland	1267.60	Stream crossing, road crossing	Headquarters Road	43-Mixed forest land	0.11
					14-Transportation, communication, utilities	0.01
1	Woodland	1267.77	Side slope, stream crossing	AR 129	43-Mixed forest land	0.65
1	Woodland	1267.95	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	0.08
1	Woodland	1268.20	Side slope, wetland/stream crossing	ROW	43-Mixed forest land	1.06
1	Woodland	1268.47	Side slope, wetland/stream crossing	AR 130	43-Mixed forest land	0.11
					14-Transportation, communication, utilities	0.01
1	Woodland	1268.60	Side slope, wetland/stream crossing	ROW	11-Residential	0.14
1	Woodland	1268.64	Pipe/equipment staging, removal of existing pipe, timber storage	AR 130	21-Cropland and pasture	0.35
1	Woodland	1268.75	Wetland/stream crossings, side slope	AR 130/ROW	11-Residential	0.48
1	Woodland	1269.04	Point of intersection, wetland/stream crossings	ROW	43-Mixed forest land	0.13
					11-Residential	0.43
1	Woodland	1269.26	Point of intersection, wetland/stream crossings	AR 131	43-Mixed forest land	0.41
1	Woodland	1269.39	Pipe staging, removal of existing pipe, timber storage, road crossing, wetland staging	AR 132	21-Cropland and pasture	0.14
1	Woodland	1269.46	Side slope, point of intersection, 26-inch abandonment cap	AR 133	43-Mixed forest land	0.11
					14-Transportation, communication, utilities	0.00
1	Woodland	1269.63	Side slope, point of intersection, 26-inch abandonment cap, road crossing, valve installation	Kalmbach Road	43-Mixed forest land	0.15
1	Woodland	1269.75	Side slope, road crossing, stream crossing	Kalmbach Road	43-Mixed forest land	0.36
1	Woodland	1270.77	Vehicle parking	AR 134.1	43-Mixed forest land	0.03
1	Woodland	1271.26	Pipe/equipment staging, timber storage, removal of existing pipe	AR 134.2	43-Mixed forest land	0.21
1	Woodland	1272.08	Side slope, point of intersection, 26-inch abandonment cap	ROW	43-Mixed forest land	0.16
1	Woodland	1272.19	Pipe/equipment staging, timber storage, removal of existing pipe	AR 134	43-Mixed forest land	0.12
1	Woodland	1272.40	Wetland crossing	ROW	43-Mixed forest land	0.17
1	Woodland	1272.48	Wetland/stream crossings	ROW	43-Mixed forest land	0.20
1	Woodland	1272.51	Point of intersection, timber storage	ROW	43-Mixed forest land	0.09

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1272.60	Timber storage, removal of existing pipe	AR 135	43-Mixed forest land	0.13
1	Woodland	1272.71	Road crossing	504 Road	21-Cropland and pasture	0.11
1	Woodland	1272.76	Pipe/equipment staging, removal of existing pipe, road crossing	504 Road	21-Cropland and pasture	0.36
					43-Mixed forest land	0.11
1	Woodland	1272.77	Pipe/equipment staging, removal of existing pipe, road crossing	504 Road	21-Cropland and pasture	0.19
1	Woodland	1273.22	Point of intersection	ROW	21-Cropland and pasture	0.23
					43-Mixed forest land	0.15
1	Woodland	1273.48	Pipe/equipment staging, removal of existing pipe	AR 136.1	43-Mixed forest land	0.14
					14-Transportation, communication, utilities	0.00
1	Woodland	1273.50	Pipe/equipment staging, removal of existing pipe	AR 136.1	43-Mixed forest land	0.11
1	Woodland	1274.13	Passing lane, equipment staging	AR 136.2	21-Cropland and pasture	0.49
					51-Streams and canals	0.00
1	Woodland	1274.22a	Spoil placement for waterbody crossing, timber storage, hydrotest	AR 136.3	21-Cropland and pasture	10.76
					43-Mixed forest land	1.51
					51-Streams and canals	2.8
					73-Barren land - Non-beach sandy area	7.94
1	Woodland	1274.22b	Spoil placement for waterbody crossing, pipe section layout, sharp point of intersection, 26 inch abandonment cap, timber storage, hydrotest	AR 136.3/AR 137.1	21-Cropland and pasture	3.62
					43-Mixed forest land	2.63
					51-Streams and canals	1.71
					73-Barren land - Non-beach sandy area	18.77
1	Woodland	1275.43	Passing lane, pipe staging, pipeline crossover, timber storage	ROW	43-Mixed forest land	0.16
					73-Barren land - Non-beach sandy area	0.96
1	Woodland	1276.17	Pipe/equipment staging, removal of existing pipe, timber storage	AR 137	43-Mixed forest land	1.11
1	Woodland	1276.95	Parking	AR 137.4	42-Evergreen forest land	0.08
1	Woodland	1277.08	Side slope, steep terrain, points of intersection, wetland/stream crossings	AR 137/ROW	21-Cropland and pasture	1.36
					42-Evergreen forest land	0.29
					43-Mixed forest land	0.03
1	Woodland	1277.33	Side slope, steep terrain, points of intersection, wetland/stream crossings	ROW	43-Mixed forest land	0.15
1	Woodland	1277.65	Side slope, points of intersection	ROW	42-Evergreen forest land	0.15
1	Woodland	1278.42	Pipe/equipment staging, removal of existing pipe, timber storage, wetland crossing	AR 138	43-Mixed forest land	1.09
1	Woodland	1278.47	Pipe/equipment staging, removal of existing pipe	AR 138	43-Mixed forest land	0.92
1	Woodland	1279.04a	Pipe/equipment staging, removal of existing pipe, timber storage	AR 139	43-Mixed forest land	0.40
1	Woodland	1279.04b	Pipe/equipment staging, removal of existing pipe, timber storage	AR 139	43-Mixed forest land	0.57
1	Woodland	1279.83	Road crossing, valve installation	Smokey Valley Road	62-Nonforested wetland	0.01
					62-Nonforested wetland	0.02
1	Woodland	1280.73a	Pipe/equipment staging, removal of existing pipe, road crossing	Jackson Hwy	21-Cropland and pasture	0.25

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
1	Woodland	1280.73b	Pipe/equipment staging, removal of existing pipe, road crossing	AR 140	21-Cropland and pasture	0.53
					14-Transportation, communication, utilities	0.00
1	Woodland	1281.30	Parking, turnaround area	AR 141.2	21-Cropland and pasture	0.08
1	Woodland	1281.32	Parking, turnaround area	AR 141.2	21-Cropland and pasture	0.08
1	Woodland	1281.78	HDD entry, hydrotest	AR 141.1	21-Cropland and pasture	1.24
1	Woodland	1282.34	HDD pullback	AR 142	61-Forested wetland	0.17
					43-Mixed forest land	3.36
					62-Nonforested wetland	0.81
1	Woodland	1282.94	Wetland crossing, pipeline crossover	ROW	43-Mixed forest land	0.05
1	Woodland	1283.12	Road crossing	Toledo Vader Road	42-Evergreen forest land	0.12
1	Woodland	1283.16	Road crossing, pipe/equipment staging	Toledo Vader Road	42-Evergreen forest land	0.44
1	Woodland	1283.59	Road crossing, wetland crossing	Drews Prairie Road	21-Cropland and pasture	0.26
					14-Transportation, communication, utilities	0.01
1	Woodland	1283.63	Road crossing, pipe/equipment staging	Drews Prairie Road	21-Cropland and pasture	0.24
1	Woodland	1284.21	Wetland crossing	ROW	42-Evergreen forest land	0.14
1	Woodland	1284.75	Road crossing	505 Hwy	43-Mixed forest land	0.13
1	Woodland	1284.78	Road crossing	505 Hwy	43-Mixed forest land	0.08
					62-Nonforested wetland	0.01
1	Woodland	1284.89	Pipe/equipment staging, removal of existing pipe, timber storage, wetland/stream crossings	AR 143	21-Cropland and pasture	0.78
					43-Mixed forest land	0.78
1	Woodland	1285.78	Wetland crossing, parking	AR 144	41-Deciduous forest land	0.08
1	Woodland	1286.40	Road crossing	Frost Road	21-Cropland and pasture	0.00
					11-Residential	0.17
1	Woodland	1286.57	Pipe/equipment staging, removal of existing pipe	AR 145	21-Cropland and pasture	0.51
1	Woodland	1287.16	Pipe/equipment staging, removal of existing pipe	AR 146	21-Cropland and pasture	0.64
1	Woodland	1287.53a	Road crossing	Bremgartner Road	21-Cropland and pasture	0.15
1	Woodland	1287.53b	Road crossing	Bremgartner Road	21-Cropland and pasture	0.14
1	Woodland	1287.92	Road crossing, wetland crossing	Park Road	21-Cropland and pasture	0.02
					62-Nonforested wetland	0.08
					14-Transportation, communication, utilities	0.01
1	Woodland	1288.61	Spoil storage, passing lane, pipe/equipment staging	ROW	21-Cropland and pasture	0.23
1	Woodland	1289.00	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, aboveground facilities installation, hydrotest	AR 148	21-Cropland and pasture	4.20
					62-Nonforested wetland	2.23
					14-Transportation, communication, utilities	5.22

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
2	Chehalis	1291.27	Mobilization, pipe stockpile, hydrotest, aboveground facilities installation	Koontz Road	21-Cropland and pasture	3.28
2	Chehalis	1291.35	Road crossing, wetland/stream crossing	Koontz Road	43-Mixed forest land	0.22
					14-Transportation, communication, utilities	0.00
2	Chehalis	1291.46	Pipe/equipment staging, removal of existing pipe, wetland crossing	AR 200	21-Cropland and pasture	0.96
2	Chehalis	1291.72	Wetland crossing	AR 201	62-Nonforested wetland	0.00
					62-Nonforested wetland	0.28
					11-Residential	0.00
2	Chehalis	1292.64	Road crossing	Hwy 508	61-Forested wetland	0.05
2	Chehalis	1292.68	Road crossing	Hwy 508	11-Residential	0.11
2	Chehalis	1292.69	Road crossing	Hwy 508	11-Residential	0.08
2	Chehalis	1292.76	Removal of existing pipe, timber storage, wetland staging	AR 202	11-Residential	0.11
2	Chehalis	1293.11	Road crossing, wetland staging	Forest Napavine	21-Cropland and pasture	0.00
					62-Nonforested wetland	0.24
2	Chehalis	1293.47	Point of intersection, wetland crossing	ROW	42-Evergreen forest land	0.05
2	Chehalis	1293.59	Parking, turnaround area	AR 203	42-Evergreen forest land	0.01
2	Chehalis	1293.60	Parking, turnaround area	AR 203	42-Evergreen forest land	0.01
2	Chehalis	1294.01	HDD entry	AR 204	43-Mixed forest land	0.06
2	Chehalis	1294.03	HDD entry	AR 204	21-Cropland and pasture	0.28
					43-Mixed forest land	0.64
					14-Transportation, communication, utilities	0.02
2	Chehalis	1294.14	Access to hydrotest/HDD water	AR 204	21-Cropland and pasture	0.21
					61-Forested wetland	0.02
2	Chehalis	1294.42	HDD pullback, equipment staging, pipe stockpile, road crossing, wetlands, vehicle parking	Jackson Hwy	21-Cropland and pasture	12.60
					62-Nonforested wetland	12.45
2	Chehalis	1294.48	Road crossing, wetlands	Jackson Hwy	62-Nonforested wetland	0.37
2	Chehalis	1294.54	Road crossing, point of intersection	Jackson Hwy	62-Nonforested wetland	0.25
2	Chehalis	1294.61	Pipe/equipment staging, removal of existing pipe, wetland crossing	AR 205	62-Nonforested wetland	0.00
					62-Nonforested wetland	0.20
					14-Transportation, communication, utilities	0.03
2	Chehalis	1295.44	Point of intersection, 26-inch abandonment cap	ROW	21-Cropland and pasture	0.02
					43-Mixed forest land	0.09
					62-Nonforested wetland	0.00
2	Chehalis	1295.61	Pipe/equipment staging, removal of existing pipe, road crossing, valve installation	Yates Road	21-Cropland and pasture	0.34
					11-Residential	0.17
2	Chehalis	1295.67	Road crossing	Yates Road	21-Cropland and pasture	0.27
2	Chehalis	1296.09	Point of intersection, road crossing, wetland/stream crossings	ROW	43-Mixed forest land	0.14
2	Chehalis	1296.12	Road crossing, wetland/stream crossings	ROW	43-Mixed forest land	0.12
2	Chehalis	1296.17	Road crossing, wetland/stream crossings	Logan Hill Road	21-Cropland and pasture	0.03
					43-Mixed forest land	0.09

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
2	Chehalis	1296.20	Road crossing, wetland/stream crossings	ROW via Logan Hill	21-Cropland and pasture	0.31
					43-Mixed forest land	0.05
2	Chehalis	1296.31	Removal of existing pipe, pipe/equipment staging	AR 208	21-Cropland and pasture	0.28
2	Chehalis	1297.83	Removal of existing pipe, pipe/equipment staging, timber storage	AR 210	42-Evergreen forest land	0.27
2	Chehalis	1298.17	Existing Northwest Pipeline facility, road crossing, parking	Centralia Alpha Road	14-Transportation, communication, utilities	0.04
2	Chehalis	1298.20	Road crossing, equipment staging	Centralia Alpha Road	42-Evergreen forest land	0.09
					43-Mixed forest land	0.60
					14-Transportation, communication, utilities	0.00
2	Chehalis	1298.96	Timber storage, wetland/stream crossing, pipe/equipment staging	ROW	21-Cropland and pasture	0.47
2	Chehalis	1299.08	Road crossing	Profitt Road	43-Mixed forest land	0.08
					14-Transportation, communication, utilities	0.00
2	Chehalis	1299.64	Removal of existing pipe, pipe/equipment staging, timber storage	AR 211.1	43-Mixed forest land	0.27
2	Chehalis	1300.08	wetland crossing	AR 212.2	43-Mixed forest land	0.07
					62-Nonforested wetland	0.02
2	Chehalis	1300.34	Removal of existing pipe, pipe/equipment staging, timber storage	AR 212	43-Mixed forest land	0.18
2	Chehalis	1300.51	Point of intersection	ROW	43-Mixed forest land	0.23
2	Chehalis	1300.63	Point of intersection	ROW	43-Mixed forest land	0.23
2	Chehalis	1300.98	Point of intersection, side slope	ROW	14-Transportation, communication, utilities	0.05
2	Chehalis	1301.06	Point of intersection, side slope	ROW	14-Transportation, communication, utilities	0.01
2	Chehalis	1301.07	Point of intersection, side slope, equipment staging	ROW	43-Mixed forest land	0.35
2	Chehalis	1301.54	Pipe/equipment staging, removal of existing pipe, timber storage, road crossing, wetland crossing	Little Hanaford	21-Cropland and pasture	0.26
					62-Nonforested wetland	2.27
2	Chehalis	1301.61	Road crossing, wetland crossing	Little Hanaford	21-Cropland and pasture	0.00
					62-Nonforested wetland	0.26
2	Chehalis	1302.24	Points of intersection	AR 214	43-Mixed forest land	0.10
					14-Transportation, communication, utilities	0.58
2	Chehalis	1302.94	Removal of existing pipe, pipe/equipment staging	AR 214.2	43-Mixed forest land	1.95
2	Chehalis	1304.23	Road crossing, stream crossing	AR 215	43-Mixed forest land	0.16
2	Chehalis	1304.31	Pipe/equipment staging, removal of existing pipe, timber storage, road	AR 216	62-Nonforested wetland	0.13
2	Chehalis	1304.31	Pipe/equipment staging, removal of existing pipe, timber storage, road crossing, wetland crossing	AR 216	75-Strip mines, quarries, gravel pits	1.17
2	Chehalis	1305.07	wetland/stream crossing	AR 216.1	43-Mixed forest land	0.17
2	Chehalis	1305.70	Pipe/equipment staging, removal of existing pipe, timber storage, road crossing	AR 216	43-Mixed forest land	1.31
					75-Strip mines, quarries, gravel pits	0.07
2	Chehalis	1305.79	Pipe/equipment staging, removal of existing pipe, timber storage, road crossing	AR 216	43-Mixed forest land	1.54

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
2	Chehalis	1306.65	Road crossing	Big Hanaford Road	21-Cropland and pasture	0.11
2	Chehalis	1307.28	Pipe/equipment staging, removal of existing pipe	AR 218.1	43-Mixed forest land	1.09
					62-Nonforested wetland	0.02
2	Chehalis	1308.01	Points of intersection	AR 218	14-Transportation, communication, utilities	0.37
2	Chehalis	1308.06	Points of intersection	AR 218.3	14-Transportation, communication, utilities	0.11
2	Chehalis	1309.03	Stream crossing, access	AR 218	43-Mixed forest land	0.53
					62-Nonforested wetland	0.10
2	Chehalis	1309.32	Waterbody crossing, points of intersection	ROW	43-Mixed forest land	0.29
2	Chehalis	1309.40	Waterbody crossing, points of intersection, hydrotest	ROW	21-Cropland and pasture	1.05
					43-Mixed forest land	0.10
2	Chehalis	1309.77	Removal of existing pipe, pipe/equipment staging, sharp point of intersection, road crossing, valve installation	Skookumchuck Road	21-Cropland and pasture	1.33
					14-Transportation, communication, utilities	0.14
2	Chehalis	1309.81	Point of intersection, road crossing, 26-inch abandonment cap	AR 220	14-Transportation, communication, utilities	0.02
2	Chehalis	1309.99	Equipment and pipe staging/layout area for short section of non-typical construction workspace	ROW	21-Cropland and pasture	1.69
2	Chehalis	1310.12	Removal of existing pipe, pipe/equipment staging, sharp point of intersection, cross-over	Skookumchuck Road	21-Cropland and pasture	0.99
					43-Mixed forest land	0.17
					14-Transportation, communication, utilities	0.06
2	Chehalis	1310.40	Side slope, steep terrain, passing lane	ROW	43-Mixed forest land	0.32
2	Chehalis	1310.51	Side slope, steep terrain, passing lane	ROW	21-Cropland and pasture	0.28
2	Chehalis	1310.96	Steep terrain, side slope, timber storage	ROW	21-Cropland and pasture	1.38
					43-Mixed forest land	0.00
2	Chehalis	1311.80	Point of intersection	AR 221	43-Mixed forest land	0.04
					14-Transportation, communication, utilities	0.03
2	Chehalis	1312.32	Pipe/equipment staging, removal of existing pipe, timber storage	AR 221	43-Mixed forest land	0.73
2	Chehalis	1312.73	Pipe/equipment staging, removal of existing pipe, timber storage	AR 221.2	43-Mixed forest land	0.75
					62-Nonforested wetland	0.03
2	Chehalis	1313.20	Pipe/equipment staging, removal of existing pipe, timber storage	AR 221.3	43-Mixed forest land	0.90
					14-Transportation, communication, utilities	0.00
2	Chehalis	1314.10	Pipe/equipment staging, removal of existing pipe, timber storage	AR 223	43-Mixed forest land	0.85
2	Chehalis	1314.28	Pipe/equipment staging, removal of existing pipe, timber storage	AR 223	43-Mixed forest land	0.82
2	Chehalis	1314.47	Steep terrain, side slope	AR 223	43-Mixed forest land	1.41
					62-Nonforested wetland	0.01
2	Chehalis	1315.13	Waterbody crossing, steep terrain, hydrotest	ROW	43-Mixed forest land	0.18
2	Chehalis	1315.15	Waterbody crossing, steep terrain, hydrotest	ROW	43-Mixed forest land	0.39

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
2	Chehalis	1315.62	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, aboveground facilities removal	AR 225	14-Transportation, communication, utilities	0.10
2	Chehalis	1315.63	Existing Northwest Pipeline facility, demobilization, removal of existing pipe	AR 225	21-Cropland and pasture	0.11
					43-Mixed forest land	0.01
					14-Transportation, communication, utilities	0.19
3	Sumner South	1338.03	Existing Northwest Pipeline facility, mobilization, pipe stockpile, road crossing	192nd St	21-Cropland and pasture	3.43
					43-Mixed forest land	0.08
					14-Transportation, communication, utilities	2.45
3	Sumner South	1338.14	Road crossing, pipe stockpile	192nd St	21-Cropland and pasture	0.90
3	Sumner South	1338.33	Removal of existing pipe, road crossing, parking	Canyon Road	15-Industrial and commercial complexes	0.52
					14-Transportation, communication, utilities	0.14
3	Sumner South	1338.37	Road/railroad crossing, parking	Canyon Road	15-Industrial and commercial complexes	0.03
					14-Transportation, communication, utilities	0.32
3	Sumner South	1338.45	Parking	Canyon Road	15-Industrial and commercial complexes	0.04
					14-Transportation, communication, utilities	0.10
3	Sumner South	1338.63	Removal of existing pipe, pipe/equipment staging, road crossing, parking	184th St	15-Industrial and commercial complexes	1.51
3	Sumner South	1338.73	Spoil and concrete storage	184th St	15-Industrial and commercial complexes	0.33
3	Sumner South	1338.87	Road/railroad crossing, pipe/equipment staging, parking	Fredrickson Industrial Park	21-Cropland and pasture	1.20
					14-Transportation, communication, utilities	0.13
3	Sumner South	1339.18	Points of intersection, 26" abandonment caps	ROW	42-Evergreen forest land	0.01
					43-Mixed forest land	0.19
					62-Nonforested wetland	0.03
					14-Transportation, communication, utilities	0.01
3	Sumner South	1339.24	Existing Northwest Pipeline facility, parking, valve removal	ROW	11-Residential	0.03
					14-Transportation, communication, utilities	0.23
3	Sumner South	1339.30	Road crossing	176th St	42-Evergreen forest land	0.34
3	Sumner South	1339.35	Road crossing, wetland	176th St	11-Residential	0.12
3	Sumner South	1339.45	Removal of existing pipe, pipe/equipment staging, road crossing, parking	176th St	21-Cropland and pasture	4.10
					11-Residential	0.39
3	Sumner South	1340.15	Stream crossing, pipe/equipment staging	ROW	21-Cropland and pasture	0.04
					43-Mixed forest land	0.12
3	Sumner South	1340.61	Removal of existing pipe, pipe/equipment staging, parking	AR 302.1	43-Mixed forest land	0.23
					11-Residential	0.25
3	Sumner South	1340.69	Road crossing, parking, turnaround area	AR 302.2	11-Residential	0.12

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
3	Sumner South	1341.07	Removal of existing pipe, pipe/equipment staging, parking	AR 303	21-Cropland and pasture	1.52
					43-Mixed forest land	0.25
3	Sumner South	1341.13	Spoil storage	ROW	11-Residential	0.22
3	Sumner South	1341.21	Spoil storage	AR 304	21-Cropland and pasture	0.00
					11-Residential	0.09
3	Sumner South	1341.24	Parking, Road Crossing	76th Ave	11-Residential	0.09
3	Sumner South	1342.14	Removal of existing pipe, pipe/equipment staging, road crossing, parking	86th Ave	21-Cropland and pasture	0.44
					62-Nonforested wetland	0.15
					11-Residential	0.26
3	Sumner South	1342.17	Pipe/equipment staging, road crossing, parking, wetlands	86th Ave	12-Commercial and services	0.60
					41-Deciduous forest land	0.11
					14-Transportation, communication, utilities	0.01
3	Sumner South	1342.41	wetland crossings	ROW	41-Deciduous forest land	0.14
3	Sumner South	1342.63	Removal of existing pipe, pipe/equipment staging, road crossing, parking, stream crossing	AR 305	41-Deciduous forest land	0.41
3	Sumner South	1342.78	Road crossing, pipe/equipment staging	94th Ave	12-Commercial and services	0.45
					41-Deciduous forest land	0.26
3	Sumner South	1342.84	Sharp point of intersection, road crossing	94th Ave	11-Residential	0.10
					14-Transportation, communication, utilities	0.01
3	Sumner South	1342.98	Pipe/equipment staging, spoil storage	94th Ave	11-Residential	0.94
					14-Transportation, communication, utilities	0.02
3	Sumner South	1343.19	Pipe/equipment staging, spoil storage	ROW	12-Commercial and services	0.00
					21-Cropland and pasture	0.44
					11-Residential	0.00
3	Sumner South	1343.28	Road crossing, Existing Northwest Facility	128th St	11-Residential	0.05
					14-Transportation, communication, utilities	0.08
3	Sumner South	1343.32	Road crossing	128th St	11-Residential	0.12
3	Sumner South	1343.45	Spoil storage	126th St	11-Residential	0.03
					14-Transportation, communication, utilities	0.00
3	Sumner South	1343.51	Pipe/equipment staging access	98th Ave	11-Residential	0.32
3	Sumner South	1343.52	Pipe/equipment staging, nearby valve installation	98th Ave	11-Residential	0.12
3	Sumner South	1343.68	Spoil storage, point of intersection	99th Ave E /ROW	11-Residential	0.07
3	Sumner South	1343.73	Spoil storage	122nd St	11-Residential	0.03
					14-Transportation, communication, utilities	0.01

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
3	Sumner South	1343.89	Point of intersection	120th St/ROW	12-Commercial and services	0.09
					14-Transportation, communication, utilities	0.02
3	Sumner South	1343.93	Road crossing	Meridian Ave	12-Commercial and services	0.14
3	Sumner South	1343.95	Road crossing	Meridian Ave	12-Commercial and services	0.14
3	Sumner South	1344.11	Pipe staging, points of intersection, parking, spoil storage	ROW	12-Commercial and services	0.53
3	Sumner South	1344.20	Pipe staging, side slope	ROW	12-Commercial and services	0.30
					11-Residential	0.14
3	Sumner South	1344.42	Removal of existing pipe, pipe stockpile, equipment staging, road crossing, wetland crossing	43rd Ave	21-Cropland and pasture	8.18
					42-Evergreen forest land	0.50
3	Sumner South	1344.64	Road crossing, spoil storage	ROW	11-Residential	0.13
3	Sumner South	1344.69	Road crossing	39th Ave	11-Residential	0.26
					14-Transportation, communication, utilities	0.00
3	Sumner South	1344.72	Road crossing	39th Ave	43-Mixed forest land	0.02
					14-Transportation, communication, utilities	0.02
3	Sumner South	1345.44	Removal of existing pipe, pipe/equipment staging, road crossing, parking, spoil storage	31st Ave	11-Residential	0.17
					14-Transportation, communication, utilities	0.00
3	Sumner South	1345.57	Removal of existing pipe, pipe/equipment staging, road crossing, parking, spoil storage	Thornhill Road	11-Residential	0.31
3	Sumner South	1345.68	Removal of existing pipe, pipe/equipment staging, road crossing, parking, spoil storage	Larkspur Dr	11-Residential	0.12
3	Sumner South	1345.72	Removal of existing pipe, pipe/equipment staging, road crossing, parking, spoil storage	ROW via 20th St	11-Residential	0.08
3	Sumner South	1346.91	Pipe/equipment staging, point of Intersection, wetland staging, valve installation	12th Ave	43-Mixed forest land	0.68
					62-Nonforested wetland	1.12
					62-Nonforested wetland	1.02
3	Sumner South	1347.25	Existing Northwest Pipeline facility, road/railroad crossing, parking	Pioneer Way	21-Cropland and pasture	0.25
					62-Nonforested wetland	0.79
					14-Transportation, communication, utilities	0.14
3	Sumner South	1347.33	Road/railroad crossing, pipe/equipment staging, spoil storage, point of intersection	AR 309	21-Cropland and pasture	0.57
					62-Nonforested wetland	0.19
					62-Nonforested wetland	0.07
					14-Transportation, communication, utilities	0.03
3	Sumner South	1347.35	Road/railroad crossing, pipe/equipment staging, spoil storage, point of intersection	AR 309	21-Cropland and pasture	0.42
					62-Nonforested wetland	0.84
					14-Transportation, communication, utilities	0.01

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
3	Sumner South	1347.60	HDD pullback and entry point	ROW via AR 309	21-Cropland and pasture	1.48
					62-Nonforested wetland	4.97
3	Sumner South	1347.86	Access to hydrotest/HDD water	AR 310	21-Cropland and pasture	0.58
					43-Mixed forest land	0.01
					62-Nonforested wetland	0.14
3	Sumner South	1348.02	HDD exit, spoil storage	ROW via AR 311	11-Residential	0.50
3	Sumner South	1348.88	Removal of existing pipe, point of intersection, pipeline crossover, spoil storage	ROW	21-Cropland and pasture	1.00
					43-Mixed forest land	0.10
					62-Nonforested wetland	0.40
3	Sumner South	1349.07	Point of intersection, pipeline crossover	ROW	21-Cropland and pasture	0.01
					62-Nonforested wetland	0.07
3	Sumner South	1349.26	Highway crossing	AR 314	21-Cropland and pasture	0.62
					62-Nonforested wetland	0.07
3	Sumner South	1349.35	Highway crossing	ROW	21-Cropland and pasture	1.64
3	Sumner South	1349.35	Highway crossing	ROW	14-Transportation, communication, utilities	0.00
3	Sumner South	1349.54	Spoil storage, sharp point of intersection, road crossing	64th St	12-Commercial and services	0.02
					21-Cropland and pasture	0.48
					62-Nonforested wetland	0.02
					11-Residential	0.37
					14-Transportation, communication, utilities	0.02
3	Sumner South	1349.62	Road crossing, parking	64th St	62-Nonforested wetland	0.00
					11-Residential	0.28
					14-Transportation, communication, utilities	0.00
3	Sumner South	1349.67	Road crossing, spoil storage	64th St	11-Residential	0.08
3	Sumner South	1349.8	Spoil storage, timber storage, pipe/equipment staging	60th St/ROW	21-Cropland and pasture	0.13
					11-Residential	0.34
					14-Transportation, communication, utilities	0.01
3	Sumner South	1350.98	Road crossing, pipe/equipment staging	ROW	21-Cropland and pasture	0.43
3	Sumner South	1351.26	Pipe/equipment staging, road crossing, parking, spoil storage	38th St	21-Cropland and pasture	0.53
3	Sumner South	1351.74	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, aboveground facilities removal, hydrotest	Compressor Station (166th Ave)	11-Residential	0.35
					14-Transportation, communication, utilities	5.33

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
4	Sumner North A	1356.90a	Access to hydrotest/HDD water	ROW via Green Valley Road	21-Cropland and pasture	0.58
					41-Deciduous forest land	0.01
					61-Forested wetland	0.04
4	Sumner North A	1356.90b	Existing Northwest Pipeline facility, mobilization, removal of existing pipe, road crossing, hydrotest, aboveground facility installation	Green Valley Road	21-Cropland and pasture	0.21
					14-Transportation, communication, utilities	0.00
4	Sumner North A	1356.90c	Existing Northwest Pipeline facility, mobilization, removal of existing pipe, road crossing	Green Valley Road	21-Cropland and pasture	0.89
4	Sumner North A	1356.92	Road crossing, avoidance of structure on east side of ROW	Green Valley Road	11-Residential	0.05
4	Sumner North A	1357.49	Point of intersection, equipment staging, parking, access	AR 401	43-Mixed forest land	0.73
4	Sumner North A	1358.01	Removal of existing pipe, pipe/equipment staging, road crossing, point of Intersection, valve installation	Lake Holm Road	11-Residential	1.01
4	Sumner North A	1358.10	Road crossing, wetland staging	Lake Holm Road	43-Mixed forest land	0.27
					14-Transportation, communication, utilities	0.07
4	Sumner North A	1358.84	Road crossings, hydrotest	326th St	41-Deciduous forest land	0.17
4	Sumner North A	1359.09	Turnaround area, parking, spoil storage, pipe/equipment staging	ROW via 322nd St	11-Residential	0.16
4	Sumner North A	1359.33a	Pipe staging, timber storage, spoil storage	ROW	21-Cropland and pasture	0.37
					42-Evergreen forest land	0.01
4	Sumner North A	1359.33b	Pipe staging, timber storage, spoil storage	ROW	21-Cropland and pasture	0.21
4	Sumner North A	1359.65	Road crossing, spoil storage pipe/equipment staging	169th Ave	11-Residential	0.13
4	Sumner North A	1360.04	Removal of existing pipe, avoidance of structure on east side of ROW	AR 405	11-Residential	0.17
4	Sumner North A	1360.12	Existing Northwest Pipeline facility, road crossing, parking	Kent Black Diamond Road	14-Transportation, communication, utilities	0.84
4	Sumner North A	1360.47	Removal of existing pipe, pipe/equipment staging	AR 406	43-Mixed forest land	0.00
					14-Transportation, communication, utilities	0.18
4	Sumner North A	1360.59	Removal of existing pipe, pipe/equipment staging, timber storage, spoil storage	AR 407	43-Mixed forest land	0.66
					11-Residential	0.02
4	Sumner North A	1360.88	Point of intersection, road crossing, wetland crossing	Thomas Road	43-Mixed forest land	0.29
					14-Transportation, communication, utilities	0.01
4	Sumner North A	1361.08	wetland crossing	AR 408	21-Cropland and pasture	0.00
					62-Nonforested wetland	0.36
					14-Transportation, communication, utilities	0.00
4	Sumner North A	1361.58	Road crossing, pipe/equipment staging	AR 409	21-Cropland and pasture	0.00
					11-Residential	0.08
					14-Transportation, communication, utilities	0.00

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
4	Sumner North A	1361.64	Avoidance of firehouse, valve removal	AR 410	12-Commercial and services	0.02
					11-Residential	0.04
4	Sumner North A	1361.92	Spoil storage, pipe/equipment staging	ROW	11-Residential	0.00
					14-Transportation, communication, utilities	0.13
4	Sumner North A	1361.99	Turnaround area, parking	ROW	11-Residential	0.08
4	Sumner North A	1362.05	Spoil storage, equipment/pipe staging	ROW	11-Residential	0.13
4	Sumner North A	1362.63	Railroad crossing, stream crossing	ROW	11-Residential	0.01
					14-Transportation, communication, utilities	0.05
4	Sumner North A	1362.69	Railroad crossing, stream crossing, points of intersection, 26-inch abandonment cap	ROW	11-Residential	0.10
4	Sumner North A	1362.79	Existing Northwest Pipeline facility, road crossing, parking, equipment/pipe staging, removal of existing pipe	516th St	14-Transportation, communication, utilities	0.65
4	Sumner North A	1363.51	Equipment/pipe staging, spoil storage	262nd St	43-Mixed forest land	0.65
4	Sumner North A	1363.92	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, aboveground facilities removal, hydrotest	AR 413	43-Mixed forest land	1.19
					14-Transportation, communication, utilities	0.44
5	Sumner North B	1370.89	Existing Northwest Pipeline facility, removal of existing pipe and aboveground facility, pipe/equipment staging, road crossing	AR 500	41-Deciduous forest land	1.13
5	Sumner North B	1371.14	Stream crossing, wetland staging, point of Intersection	ROW	41-Deciduous forest land	0.06
					62-Nonforested wetland	0.00
5	Sumner North B	1371.20	Removal of existing pipe, pipe/equipment staging	AR 501	41-Deciduous forest land	0.33
5	Sumner North B	1371.28	Equipment/pipe staging, spoil storage, timber storage	AR 502	41-Deciduous forest land	0.46
					11-Residential	0.00
5	Sumner North B	1371.54	Stream crossings, staging	ROW	43-Mixed forest land	0.22
5	Sumner North B	1371.89	Road crossing, stream crossing	Issaquah Hobart Dr	43-Mixed forest land	0.15
5	Sumner North B	1372.75	Existing Northwest Pipeline facility, parking	AR 505	11-Residential	0.24
					14-Transportation, communication, utilities	0.01
5	Sumner North B	1372.86	Pipeline crossover, spoil storage	AR 507	15-Industrial and commercial complexes	0.21
					11-Residential	0.50
5	Sumner North B	1372.88	Removal of existing pipe, pipe/equipment staging	Issaquah-Hobart Rd	11-Residential	0.23
5	Sumner North B	1373.91	Timber storage	ROW	21-Cropland and pasture	0.00
					42-Evergreen forest land	0.04
					11-Residential	0.09

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
5	Sumner North B	1374.20	Removal of existing pipe, pipe/equipment staging, points of intersection, 26-inch abandonment caps	AR 511	41-Deciduous forest land	0.01
					43-Mixed forest land	0.36
					11-Residential	0.15
					14-Transportation, communication, utilities	0.00
5	Sumner North B	1375.65	Parking, timber storage	AR 512	14-Transportation, communication, utilities	0.18
5	Sumner North B	1375.67	Removal of existing pipe, pipe/equipment staging, points of intersection, 26-inch abandonment caps	AR 512	42-Evergreen forest land	0.20
					43-Mixed forest land	0.34
					14-Transportation, communication, utilities	0.08
5	Sumner North B	1376.08a	Highway crossing	I-90	42-Evergreen forest land	0.00
					14-Transportation, communication, utilities	0.06
5	Sumner North B	1376.08b	Highway crossing	I-90	14-Transportation, communication, utilities	0.08
5	Sumner North B	1376.09	Highway crossing, stream crossing	I-90	14-Transportation, communication, utilities	1.49
5	Sumner North B	1376.13	Highway crossing, stream crossing	I-90	14-Transportation, communication, utilities	0.24
5	Sumner North B	1376.17a	Highway crossing, stream crossing	I-90	43-Mixed forest land	0.07
					14-Transportation, communication, utilities	0.13
5	Sumner North B	1376.17b	Highway crossing, stream crossing	I-90	43-Mixed forest land	0.05
					14-Transportation, communication, utilities	0.07
5	Sumner North B	1376.26	Parking, turnaround area, hydrotest	ROW	43-Mixed forest land	0.19
5	Sumner North B	1376.47	Road crossing, spoil storage	ROW	14-Transportation, communication, utilities	0.19
5	Sumner North B	1377.07	Steep terrain, road crossings	Black Nugget Road	43-Mixed forest land	0.23
5	Sumner North B	1377.14	Pipe/equipment staging, parking	Black Nugget Road	43-Mixed forest land	0.11
5	Sumner North B	1377.40	wetland crossings	AR 514	43-Mixed forest land	0.03
					62-Nonforested wetland	0.01
					62-Nonforested wetland	0.05
5	Sumner North B	1377.43	wetland crossings	ROW	43-Mixed forest land	0.08
5	Sumner North B	1377.54	Removal of existing pipe, pipe/equipment staging, timber storage	ROW	12-Commercial and services	0.03
					43-Mixed forest land	0.35
5	Sumner North B	1377.62	Road crossing	Issaquah Fall City Road	14-Transportation, communication, utilities	0.09
5	Sumner North B	1378.42	Removal of existing pipe, pipe/equipment staging, spoil storage	244th Pl	43-Mixed forest land	0.21
5	Sumner North B	1378.55	Road crossing	Klahanie Blvd	43-Mixed forest land	0.07

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
5	Sumner North B	1379.05	Wetland crossing, 26" abandonment	ROW	43-Mixed forest land	0.06
5	Sumner North B	1379.18	Wetland crossing, road crossing	32nd St	43-Mixed forest land	0.07
					14-Transportation, communication, utilities	0.10
5	Sumner North B	1379.19	Existing Northwest Pipeline facility, parking, abovegound facility installation	32nd St	14-Transportation, communication, utilities	0.40
5	Sumner North B	1379.28	Passing lane, parking, turnaround area, spoil storage	ROW	11-Residential	0.25
5	Sumner North B	1380.61	Removal of existing pipe, pipe/equipment staging, passing lane, parking, turnaround area	ROW	11-Residential	0.40
5	Sumner North B	1380.70	Road crossing, staging	244th Ave	41-Deciduous forest land	0.32
5	Sumner North B	1380.90	Removal of existing pipe, pipe/equipment staging, passing lane, parking, turnaround area, spoil storage	ROW	21-Cropland and pasture	0.73
					11-Residential	0.22
5	Sumner North B	1381.22	Pipe/equipment staging for wetland crossing, steep terrain	ROW	43-Mixed forest land	1.57
5	Sumner North B	1381.26	Pipe/equipment staging for wetland crossing, steep terrain	ROW	43-Mixed forest land	0.57
					62-Nonforested wetland	0.01
					11-Residential	0.11
					51-Streams and canals	0.01
5	Sumner North B	1381.49a	Pipe/equipment staging for wetland crossing, steep terrain	ROW via AR 517	61-Forested wetland	0.08
					43-Mixed forest land	0.67
					62-Nonforested wetland	0.03
5	Sumner North B	1381.49b	Pipe/equipment staging for wetland crossing, steep terrain	ROW via AR 517	61-Forested wetland	0.04
					43-Mixed forest land	0.29
5	Sumner North B	1381.84	Removal of existing pipe, demobilization, timber storage	AR 518.1	43-Mixed forest land	0.67
5	Sumner North B	1381.89	Existing Northwest Pipeline facility, hydrotest, aboveground facility removal	AR 518	43-Mixed forest land	0.35
					62-Nonforested wetland	0.22
6	Snohomish	1393.94	Existing Northwest Pipeline facility, mobilization, pipe/equipment staging, road crossing, aboveground facility installation	Echo Lake Road	43-Mixed forest land	1.46
					14-Transportation, communication, utilities	5.29
6	Snohomish	1395.93	Pipe/equipment staging, wetland crossing	ROW	21-Cropland and pasture	0.33
6	Snohomish	1396.95	Highway crossing, parking	Hwy 522	43-Mixed forest land	0.01
					14-Transportation, communication, utilities	0.28
6	Snohomish	1397.05	26-inch abandonment cap, sharp point of intersection	Elliott Road	21-Cropland and pasture	0.25
					43-Mixed forest land	0.02
					14-Transportation, communication, utilities	0.08
6	Snohomish	1397.40	HDD pullback	ROW	21-Cropland and pasture	0.27
6	Snohomish	1397.43	HDD pullback, point of intersection	ROW	21-Cropland and pasture	8.18
					43-Mixed forest land	0.30
					62-Nonforested wetland	3.50
6	Snohomish	1397.92	HDD entry, point of intersection, 26-inch abandonment cap, hydrotest	AR 603	43-Mixed forest land	1.30

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
6	Snohomish	1398.02	Valve installation	AR 603.1	43-Mixed forest land	0.16
					14-Transportation, communication, utilities	0.03
6	Snohomish	1398.19	HDD entry, pipe/equipment staging	AR 603.1	21-Cropland and pasture	2.17
					43-Mixed forest land	3.05
					51-Streams and canals	0.16
					14-Transportation, communication, utilities	0.01
6	Snohomish	1398.64	Steep terrain, wetland crossings	ROW	43-Mixed forest land	0.07
6	Snohomish	1399.00	Steep terrain, wetland crossings	ROW	41-Deciduous forest land	1.01
					43-Mixed forest land	0.07
6	Snohomish	1399.49	Steep terrain, wetland crossings	ROW	41-Deciduous forest land	1.15
6	Snohomish	1399.82	Steep terrain, wetland crossings	139th Ave SE	41-Deciduous forest land	0.13
					43-Mixed forest land	0.20
6	Snohomish	1399.82	Steep terrain, wetland crossings	139th Ave SE	14-Transportation, communication, utilities	0.00
6	Snohomish	1400.74	Road crossing, removal of existing pipe, pipe/equipment staging	Old Snohomish Monroe Road	21-Cropland and pasture	0.32
6	Snohomish	1400.74	Road crossing, removal of existing pipe, pipe/equipment staging	Old Snohomish Monroe Road	14-Transportation, communication, utilities	0.03
6	Snohomish	1401.58	Road crossing	AR 605	21-Cropland and pasture	0.00
					43-Mixed forest land	0.06
					14-Transportation, communication, utilities	0.00
6	Snohomish	1401.59	Road crossing	AR 605	43-Mixed forest land	0.05
6	Snohomish	1401.60	Road crossing	AR 605	21-Cropland and pasture	0.02
					62-Nonforested wetland	0.08
6	Snohomish	1401.62	Road crossing, removal of existing pipe, pipe/equipment staging	AR 605	21-Cropland and pasture	0.08
					62-Nonforested wetland	0.29
6	Snohomish	1402.41	Ditch crossing	ROW	21-Cropland and pasture	0.02
6	Snohomish	1402.44	Ditch crossing	ROW	21-Cropland and pasture	0.02
6	Snohomish	1402.88	Road crossing, removal of existing pipe, pipe/equipment staging, point of intersection	AR 606	21-Cropland and pasture	0.41
					61-Forested wetland	0.24
					62-Nonforested wetland	0.47
					14-Transportation, communication, utilities	0.00
6	Snohomish	1402.97	Existing Northwest Pipeline facility, road crossing, removal of existing pipe, pipe/equipment staging, point of intersection	State Hwy 2-Stevens Pass Hwy	14-Transportation, communication, utilities	0.36

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
6	Snohomish	1403.72	Removal of existing pipe, pipe/equipment staging	AR 608	21-Cropland and pasture	0.24
6	Snohomish	1403.90	Road crossing	84th St	21-Cropland and pasture	0.20
6	Snohomish	1404.21	Road crossing, removal of existing pipe, pipe/equipment staging, 26-inch abandonment cap, hydrotest	80th St	43-Mixed forest land	0.63
					62-Nonforested wetland	0.00
					62-Nonforested wetland	0.27
6	Snohomish	1404.96	Road crossing	Three Lakes Road	11-Residential	0.06
6	Snohomish	1405.15	Valve installation, 26-inch abandonment cap, wetland crossing, and spoil storage for pipeline crossover	ROW via AR 609	43-Mixed forest land	0.53
6	Snohomish	1406.72	Pipeline crossover, road crossing	ROW via Dubuque Road	11-Residential	0.14
6	Snohomish	1406.78	Road crossing, parking	Dubuque Road	14-Transportation, communication, utilities	0.13
6	Snohomish	1407.04	Removal of existing pipe, pipe/equipment staging	AR 611	21-Cropland and pasture	0.35
6	Snohomish	1407.78a	Point of intersection, steep terrain, waterbody crossing	ROW	43-Mixed forest land	0.11
6	Snohomish	1407.78b	Point of intersection, steep terrain, waterbody crossing	ROW	43-Mixed forest land	0.16
6	Snohomish	1407.84a	Point of intersection, steep terrain, waterbody crossing, road crossing, hydrotest water access	Pilchuck Way	43-Mixed forest land	0.06
6	Snohomish	1407.84b	Point of intersection, steep terrain, waterbody crossing, road crossing, hydrotest water access	Pilchuck Way	43-Mixed forest land	0.08
6	Snohomish	1407.88	Removal of existing pipe, pipe/equipment staging	Pilchuck Way	21-Cropland and pasture	0.54
					43-Mixed forest land	0.01
6	Snohomish	1407.89	Removal of existing pipe, pipe/equipment staging, pipe stockpile	Pilchuck Way	21-Cropland and pasture	0.99
6	Snohomish	1408.50	Existing Northwest Pipeline facility, removal of existing pipe, pipe/equipment staging	AR 613	21-Cropland and pasture	2.50
					43-Mixed forest land	0.05
					14-Transportation, communication, utilities	0.36
6	Snohomish	1409.35	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, road crossing, wetland crossing, hydrotest, aboveground facility removal	Meridian St	43-Mixed forest land	0.33
					14-Transportation, communication, utilities	0.10
6	Snohomish	1409.39	Existing Northwest Pipeline facility, demobilization, removal of existing pipe, road crossing, wetland crossing, hydrotest, aboveground facility removal	ROW via Meridian St	14-Transportation, communication, utilities	0.13
7	Mt Vernon South	1435.67	Existing Northwest Pipeline facility, mobilization, pipe/equipment staging, road crossing, hydrotest, aboveground facility installation	Lake Cavanaugh Road	43-Mixed forest land	0.48
					14-Transportation, communication, utilities	0.06
7	Mt Vernon South	1435.70	Road crossing	Lake Cavanaugh Road	43-Mixed forest land	0.05
					14-Transportation, communication, utilities	0.02

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Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
7	Mt Vernon South	1435.79	Passing lane, hilly terrain, side slope	Lake Cavanaugh Road	43-Mixed forest land	0.36
					14-Transportation, communication, utilities	0.00
7	Mt Vernon South	1436.36	Passing lane, parking	AR 700	41-Deciduous forest land	0.98
					43-Mixed forest land	0.35
7	Mt Vernon South	1436.81	Access to hydrotest water	Stonewood Dr	41-Deciduous forest land	0.09
					14-Transportation, communication, utilities	0.13
7	Mt Vernon South	1436.91	Passing lane, hilly terrain, side slope	Crestwood Dr	41-Deciduous forest land	0.18
					11-Residential	0.08
					14-Transportation, communication, utilities	0.04
7	Mt Vernon South	1437.05	Passing lane, hilly terrain, side slope	Crestwood Dr	41-Deciduous forest land	0.18
7	Mt Vernon South	1437.10	Turnaround area, parking, staging	Briarwood Ct	41-Deciduous forest land	0.11
7	Mt Vernon South	1437.18	Passing lane, parking	ROW	41-Deciduous forest land	0.06
					11-Residential	0.24
7	Mt Vernon South	1437.46	Point of intersection	ROW	21-Cropland and pasture	0.05
7	Mt Vernon South	1437.69	Point of intersection	ROW	21-Cropland and pasture	0.05
7	Mt Vernon South	1437.77a	Road crossing, pipe/equipment staging	Walker Valley Road	14-Transportation, communication, utilities	0.08
7	Mt Vernon South	1437.77b	Road crossing, pipe/equipment staging	Walker Valley Road	14-Transportation, communication, utilities	0.18
7	Mt Vernon South	1438.42	Hilly terrain, side slope, parking, turnaround area, timber storage, wetland crossings	AR 703.1/AR 704	42-Evergreen forest land	1.19
					61-Forested wetland	0.08
7	Mt Vernon South	1439.00	Wetland crossings, points of intersection, 26-inch abandonment cap	ROW	21-Cropland and pasture	0.11
7	Mt Vernon South	1439.18	Wetland crossings, points of intersection, 26-inch abandonment cap	ROW	21-Cropland and pasture	0.23
7	Mt Vernon South	1439.32	Road crossing, wetland crossing, pipe/equipment staging, turnaround area	Gunderson Road	62-Nonforested wetland	0.32
					14-Transportation, communication, utilities	0.00
7	Mt Vernon South	1439.44	Wetland crossings	AR 706	42-Evergreen forest land	0.06
					62-Nonforested wetland	0.00
7	Mt Vernon South	1439.45	Wetland crossings	AR 706	42-Evergreen forest land	0.10
7	Mt Vernon South	1439.69	Passing lane, parking, wetland crossings	AR 707	62-Nonforested wetland	0.10
					14-Transportation, communication, utilities	0.48
7	Mt Vernon South	1439.96	wetland crossings	AR 708	21-Cropland and pasture	0.05
7	Mt Vernon South	1440.01	wetland crossings	ROW	21-Cropland and pasture	0.11
7	Mt Vernon South	1440.03	wetland crossings, removal of existing pipe, points of intersection, 26-inch abandonment cap	ROW	21-Cropland and pasture	0.62

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
7	Mt Vernon South	1440.17	Existing Northwest Pipeline facility, mobilization/demobilization, removal of existing pipe, aboveground facilities installation, pipe/equipment staging	Lange Road	21-Cropland and pasture	1.09
					62-Nonforested wetland	0.32
					14-Transportation, communication, utilities	10.84
8	Mt Vernon North A	1440.39	Waterbody crossing, hydrotest water access and discharge	ROW	21-Cropland and pasture	0.16
8	Mt Vernon North A	1440.45	Waterbody crossing, hydrotest water access and discharge	ROW	21-Cropland and pasture	0.22
8	Mt Vernon North A	1440.60	Existing Northwest Pipeline facility, road crossing, parking	Beaver Lake Road	14-Transportation, communication, utilities	0.02
8	Mt Vernon North A	1441.55	wetland crossings, road crossing, turnaround area, parking, staging	ROW	21-Cropland and pasture	0.19
8	Mt Vernon North A	1442.75	Steep terrain, wetland crossing, timber storage, point of intersection, parking, turnaround area	ROW	14-Transportation, communication, utilities	0.35
8	Mt Vernon North A	1442.82	Steep terrain, removal of existing pipe, timber storage, pipe/equipment staging, hydrotest	AR 801.1	21-Cropland and pasture	0.80
8	Mt Vernon North A	1443.59	Steep terrain, timber removal, removal of existing pipe, hydrotest	ROW	42-Evergreen forest land	0.70
8	Mt Vernon North A	1443.90	Steep terrain, timber removal, removal of existing pipe	ROW	42-Evergreen forest land	0.46
8	Mt Vernon North A	1444.15	Steep terrain, pipe/equipment staging	AR 803	42-Evergreen forest land	0.13
					14-Transportation, communication, utilities	0.12
8	Mt Vernon North A	1444.81	Steep terrain, points of intersection, valve installation, demobilization, tie-in to existing span	AR 804	42-Evergreen forest land	0.37
8	Mt Vernon North A	1444.83	Steep terrain, points of intersection, valve installation, demobilization, tie-in to existing span, hydrotest	AR 804	42-Evergreen forest land	0.42
8	Mt Vernon North A	1444.99	Existing Northwest Pipeline facility, aboveground facility removal, demobilization, tie-in to existing span, hydrotest	AR 805	21-Cropland and pasture	3.12
					14-Transportation, communication, utilities	0.96
9	Mt Vernon North B	1453.53	Existing Northwest Pipeline facility, aboveground facility removal, mobilization, pipe/equipment staging, road crossing, hydrotest	AR 900	21-Cropland and pasture	0.22
					14-Transportation, communication, utilities	0.39
9	Mt Vernon North B	1454.04	Cross-over	Cruse Road	11-Residential	0.04
					14-Transportation, communication, utilities	0.05
9	Mt Vernon North B	1454.08	Parking, turnaround area	Cruse Road	14-Transportation, communication, utilities	0.02
9	Mt Vernon North B	1454.12	Wetland crossings, parking, turnaround area	Cruse Road	14-Transportation, communication, utilities	0.02
9	Mt Vernon North B	1454.31	Wetland crossings, parking, turnaround area	Cruse Road	41-Deciduous forest land	0.09
					14-Transportation, communication, utilities	0.04
9	Mt Vernon North B	1454.81	Stream crossing, timber storage, parking, staging	ROW	11-Residential	0.23

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
9	Mt Vernon North B	1455.23	Pipeline crossover, timber storage	ROW	41-Deciduous forest land	0.27
					61-Forested wetland	0.16
9	Mt Vernon North B	1455.48	Pipeline crossover, timber storage, staging	ROW	43-Mixed forest land	0.10
9	Mt Vernon North B	1456.55	Removal of existing pipe, timber storage, pipe/equipment staging, valve installation	AR 901/AR 902	42-Evergreen forest land	1.69
9	Mt Vernon North B	1457.44	Removal of existing pipe, timber storage, pipe/equipment staging, stream crossing	AR 903	21-Cropland and pasture	0.65
					43-Mixed forest land	0.22
9	Mt Vernon North B	1458.21	Removal of existing pipe, pipe/equipment staging, timber storage	AR 904.1	43-Mixed forest land	0.22
9	Mt Vernon North B	1458.60	wetland crossing, point of intersection	ROW	21-Cropland and pasture	0.01
					43-Mixed forest land	0.07
9	Mt Vernon North B	1458.90	Removal of existing pipe, pipe/equipment staging, wetland crossings, road crossing	Doren Road	21-Cropland and pasture	0.73
					62-Nonforested wetland	0.03
9	Mt Vernon North B	1459.57	Road crossing, pipe/equipment staging	Saxon Road	21-Cropland and pasture	0.42
9	Mt Vernon North B	1459.62	Road crossing, pipe/equipment staging	Saxon Road/Lay Road	21-Cropland and pasture	0.47
					14-Transportation, communication, utilities	0.02
9	Mt Vernon North B	1459.87	Removal of existing pipe, pipe/equipment staging, road crossing, wetland staging	Maleng Road	21-Cropland and pasture	0.67
9	Mt Vernon North B	1461.17	HDD pullback	Rothenbuhler Road	21-Cropland and pasture	0.51
					14-Transportation, communication, utilities	0.01
9	Mt Vernon North B	1461.19	Road crossing, HDD equipment, extra pipe for HDD 2nd weld	Rothenbuhler Road	21-Cropland and pasture	0.34
9	Mt Vernon North B	1461.21	HDD pullback, road crossing	Rothenbuhler Road	21-Cropland and pasture	0.07
					62-Nonforested wetland	0.00
9	Mt Vernon North B	1461.30	HDD pullback, HDD equipment, removal of existing pipe, 26-inch abandonment cap	Rothenbuhler Road	21-Cropland and pasture	1.22
					62-Nonforested wetland	0.05
					51-Streams and canals	0.06
					14-Transportation, communication, utilities	0.01
9	Mt Vernon North B	1461.46	Hydrotest water access	ROW	21-Cropland and pasture	0.51
					62-Nonforested wetland	0.17
					51-Streams and canals	0.01
9	Mt Vernon North B	1461.80	Existing Northwest Pipeline Facility, demobilization, hydrotest, waterbody crossing, HDD Entry, aboveground facility removal	Mosquito Lake Road	21-Cropland and pasture	4.44
					43-Mixed forest land	0.40
					14-Transportation, communication, utilities	0.36
10	Sumas	1478.58	Existing Northwest Pipeline facility, mobilization, pipe/equipment staging,	Leibrant Road	21-Cropland and pasture	0.45
10	Sumas	1478.58	Existing Northwest Pipeline facility, mobilization, aboveground facility installation, pipe/equipment staging, road crossing, hydrotest	Leibrant Road	14-Transportation, communication, utilities	0.05
10	Sumas	1479.19	Removal of existing pipe, pipe/equipment staging	AR 1000	21-Cropland and pasture	2.79

Appendix I4

Additional Temporary Workspace for the Pipeline Route

Loop Number	Loop Name	ATWS ID	Description/Justification[a]	Access	Land Use Code and Description	Land Use Acreage[b]
10	Sumas	1480.61	Removal of existing pipe, timber storage, pipe/equipment staging	AR 1002	43-Mixed forest land	0.94
10	Sumas	1481.47	Removal of existing pipe, pipe/equipment staging, road crossing	Minaker Road	21-Cropland and pasture	1.36
					14-Transportation, communication, utilities	0.00
10	Sumas	1481.51	Road crossing	Minaker Road	21-Cropland and pasture	0.30
					14-Transportation, communication, utilities	0.00
10	Sumas	1481.55	Road crossing	Minaker Rd	21-Cropland and pasture	0.39
					14-Transportation, communication, utilities	0.00
10	Sumas	1482.78	Waterbody crossing	Reese Hill Road	21-Cropland and pasture	0.10
					43-Mixed forest land	0.01
10	Sumas	1482.82	Waterbody crossing, road crossing	ROW	21-Cropland and pasture	0.09
10	Sumas	1482.96	Road crossing, removal of existing pipe, pipe/equipment staging	Hillview Road	21-Cropland and pasture	0.30
					14-Transportation, communication, utilities	0.01
10	Sumas	1483.05	Waterbody crossing	ROW	21-Cropland and pasture	0.03
10	Sumas	1483.08	Waterbody crossing	ROW	21-Cropland and pasture	0.02
10	Sumas	1483.86	Road crossing, removal of existing pipe, pipe/equipment staging	Rock Road	21-Cropland and pasture	0.33
10	Sumas	1484.30	Existing Northwest Pipeline facility, mobilization/demobilization, pipe stockpile, removal of existing pipe	Jones Road	21-Cropland and pasture	29.06
					62-Nonforested wetland	4.71
					11-Residential	0.86
					14-Transportation, communication, utilities	0.36
10	Sumas	1484.32	Existing Northwest Pipeline facility, mobilization/demobilization, pipe stockpile, removal of existing pipe	Jones Road	21-Cropland and pasture	1.98
					14-Transportation, communication, utilities	0.17
10	Sumas	1484.48	Existing Northwest Pipeline facility, mobilization/demobilization, pipe stockpile, aboveground facility installation, hydrotest, removal of existing pipe	Jones Road	14-Transportation, communication, utilities	22.83

[a] Only major hydrotest sources and discharge TEWAs are identified on the Alignment Sheets provided in Revised Appendix 1C of Revised Resource Report 1—General Project Description.

[b] Amounts showing as 0.00 indicate a fractional amount less than two decimal places. However, these values are included in TEWA totals presented on the Alignment Sheets provided in Revised Appendix 1C of Revised Resource Report 1—General Project Description.

[c] ROW = right-of-way

APPENDIX I5

TABLE OF ACCESS ROADS

Appendix I5

Table of Access Roads

Washington Expansion Project Access Roads [a, b, c]

Access #	Milepost	Length (Miles)	Approximate Width (Feet)	Road Name	Surfacing	Road Status[d]
Woodland						
100	1244.29	0.86	24	Insel Road	Asphalt	Existing Permanent
100.1	1244.29	0.06	20	Insel Road Extension	Gravel	Future Permanent
100.2	1244.60	0.06	20	Bozarth Heights Road	Gravel	Existing Permanent
101	1245.10	1.07	24	Hillsdale Drive	Asphalt	Existing Permanent
101.1	1245.01	0.01	24	Insel Road	Asphalt	Existing Permanent
102	1245.65	0.15	24	Fairwood Road	Asphalt	Existing Permanent
103	1246.17	0.30	24	Pompano Road/Runyan Road	Asphalt	Existing Permanent
103.1	1246.20	0.01	24	No Name	Asphalt	Existing Permanent
104	1246.53	0.20	20	No Name	Gravel	Existing Permanent
105	1246.98	0.11	24	No Name	Asphalt	Temporary
106	1247.32	0.72	24	Varsity Road	Asphalt	Existing Permanent
107	1248.43	0.19	20	No Name	Gravel	Existing Permanent
108	1248.90	0.05	20	No Name	Gravel	Temporary
109	1249.20	0.16	12	No Name	Two Track	Temporary
109.1	1249.08	0.06	20	No Name	Gravel	Temporary
110	1250.44	4.88	20	JE Johnson Road	Gravel	Existing Permanent
111	1251.65	1.01	20	No Name	Gravel	Future Permanent
111.1	1251.79	0.36	12	No Name	Two Track	Existing Permanent
112	1252.71	1.04	24	Faber Road	Asphalt	Existing Permanent
112.1	1252.46	0.43	24	No Name	Asphalt	Existing Permanent
113	1252.94	0.29	12	Lady Blue Lane	Two Track	Existing Permanent
114	1253.40	0.57	20	Bates Road	Gravel	Existing Permanent
115	1253.55	0.30	12	No Name	Two Track	Existing Permanent
115.1	1253.97	0.99	12	No Name	Two Track	Existing Permanent
116	1254.51	0.74	12	No Name	Two Track	Existing Permanent
116.1	1254.22	0.27	12	No Name	Two Track	Existing Permanent
117	1256.58	0.16	12	No Name	Two Track	Existing Permanent
118	1257.19	0.11	12	No Name	Two Track	Existing Permanent
119	1257.78	0.33	24	Owl Creek Road	Asphalt	Existing Permanent
120	1258.21	0.03	24	Ranch Road	Asphalt	Existing Permanent
121	1258.93	2.03	20	Walker Road	Gravel	Existing Permanent
121.1	1258.79	0.17	24	Wildlife Drive	Asphalt	Existing Permanent
122	1260.13	0.57	12	No Name	Two Track	Existing Permanent
122.1	1260.47	0.06	12	No Name	Two Track	Existing Permanent
122.2	1260.51	0.07	12	No Name	Two Track	Existing Permanent
123	1261.40	0.70	24	Harris Street	Asphalt	Existing Permanent
124	1263.67	0.50	12	No Name	Two Track	Existing Permanent
125	1264.84	1.23	12	No Name	Two Track	Existing Permanent
125.1	1264.69	0.13	12	No Name	Two Track	Existing Permanent
126	1265.19	0.20	20	No Name	Gravel	Existing Permanent
126.1	1265.15	0.12	20	No Name	Gravel	Existing Permanent
127	1265.49	0.74	12	No Name	Two Track	Existing Permanent
127.1	1265.69	0.19	12	No Name	Two Track	Existing Permanent
127.2	1265.80	0.01	12	No Name	Two Track	Existing Permanent
128	1266.22	0.12	12	Walnut Acres Road	Two Track	Existing Permanent
129	1267.82	0.20	12	No Name	Two Track	Existing Permanent
130	1268.46	0.38	20	No Name	Gravel	Existing Permanent
131	1269.23	0.09	20	No Name	Gravel	Existing Permanent
132	1269.38	0.06	12	No Name	Two Track	Existing Permanent

Appendix I5

Table of Access Roads

Washington Expansion Project Access Roads [a, b, c]

Access #	Milepost	Length (Miles)	Approximate Width (Feet)	Road Name	Surfacing	Road Status[d]
133	1269.48	0.12	24	Kalmbach Road	Asphalt	Existing Permanent
134	1272.18	2.04	12	No Name	Two Track	Existing Permanent
134.1	1270.76	0.04	12	No Name	Two Track	Existing Permanent
134.2	1271.25	0.41	12	No Name	Two Track	Existing Permanent
134.3	1271.62	0.25	12	No Name	Two Track	Existing Permanent
134.4	1271.98	0.10	12	No Name	Two Track	Existing Permanent
135	1272.61	0.11	12	No Name	Two Track	Existing Permanent
136	1272.71	1.44	20	Kroll Road	Gravel	Existing Permanent
136.1	1273.49	0.13	12	No Name	Two Track	Existing Permanent
136.2	1274.10	0.19	24	No Name	Asphalt	Existing Permanent
136.3	1274.21	0.59	12	No Name	Two Track	Existing Permanent
137	1276.65	4.06	20	Burma Road	Gravel	Existing Permanent
137.1	1274.77	0.90	30	Toutle Park Road	Gravel	Existing Permanent
137.2	1275.94	1.05	20	No Name	Gravel	Existing Permanent
137.3	1276.15	0.11	12	No Name	Two Track	Existing Permanent
137.4	1276.33	0.82	20	No Name	Gravel	Existing Permanent
137.5	1277.44	0.07	12	No Name	Two Track	Existing Permanent
138	1278.96	1.48	20	No Name	Gravel	Existing Permanent
138.1	1278.37	0.77	20	No Name	Gravel	Existing Permanent
138.2	1278.61	0.22	20	No Name	Gravel	Existing Permanent
139	1279.57	1.35	20	No Name	Gravel	Existing Permanent
139.1	1279.84	0.20	20	No Name	Gravel	Existing Permanent
140	1281.21	0.07	20	No Name	Gravel	Existing Permanent
141	1281.38	0.57	24	Herriford Road / Mandy Road	Asphalt	Existing Permanent
141.1	1282.20	0.89	24	Shoreline Drive	Asphalt	Existing Permanent
141.2	1281.82	0.05	24	No Name	Asphalt	Existing Permanent
142	1282.74	0.67	24	Bill Creek Road	Asphalt	Temporary
143	1285.37	0.07	12	No Name	Two Track	Existing Permanent
144	1286.30	0.28	20	Campground Lane	Gravel	Existing Permanent
145	1287.12	0.18	12	No Name	Two Track	Existing Permanent
146	1287.69	0.30	20	Florence Place	Gravel	Existing Permanent
147	1288.69	0.35	12	No Name	Two Track	Existing Permanent
148	1289.44	0.35	24	Meier Road West	Asphalt	Existing Permanent
Chehalis						
200	1291.46	0.16	12	No Name	Two Track	Temporary
201	1291.70	0.34	12	No Name	Two Track	Existing Permanent
202	1292.75	0.08	20	No Name	Gravel	Temporary
203	1293.59	0.30	12	No Name	Two Track	Future Permanent
204	1294.04	0.58	24	Pier Road	Asphalt	Existing Permanent
205	1294.52	0.19	24	Taylor Road South	Asphalt	Temporary
206	1294.87	0.06	20	No Name	Gravel	Existing Permanent
207	1295.80	0.14	24	Yates Road	Asphalt	Existing Permanent
208	1296.30	0.24	24	Ryan Drive	Asphalt	Existing Permanent
209	1297.16	0.22	20	Mountain Sun Road	Gravel	Existing Permanent
210	1297.85	0.31	12	No Name	Two Track	Temporary
211	1299.48	0.97	12	No Name	Two Track	Future Permanent
211.1	1299.64	0.10	12	No Name	Two Track	Future Permanent
212	1300.33	0.88	24	Reinke Road	Asphalt	Future Permanent
212.1	1300.00	0.14	12	No Name	Two Track	Existing Permanent
212.2	1300.09	0.11	12	No Name	Two Track	Temporary

Appendix I5

Table of Access Roads

Washington Expansion Project Access Roads [a, b, c]

Access #	Milepost	Length (Miles)	Approximate Width (Feet)	Road Name	Surfacing	Road Status[d]
213	1301.21	0.41	12	No Name	Two Track	Existing Permanent
214	1302.23	1.67	12	Anderson Road	Two Track	Existing Permanent
214.1	1301.93	0.11	12	No Name	Two Track	Existing Permanent
214.2	1302.81	1.18	20	No Name	Gravel	Existing Permanent
215	1303.78	0.73	12	No Name	Two Track	Existing Permanent
216	1304.29	1.46	20	No Name	Gravel	Existing Permanent
216.1	1304.77	0.65	12	No Name	Two Track	Existing Permanent
216.2	1305.31	1.02	20	No Name	Gravel	Existing Permanent
217	1306.85	0.19	20	Elkview Lane	Gravel	Existing Permanent
218	1308.04	3.67	20	Thompson Creek Road SE	Gravel	Existing Permanent
218.1	1307.27	1.25	20	No Name	Gravel	Existing Permanent
218.2	1307.81	0.05	12	No Name	Two Track	Existing Permanent
218.3	1308.10	0.05	12	No Name	Two Track	Existing Permanent
218.4	1308.57	0.22	12	No Name	Two Track	Existing Permanent
219	1309.65	0.25	12	No Name	Two Track	Temporary
220	1309.80	0.02	20	No Name	Gravel	Temporary
221	1310.16	5.86	12	No Name	Two Track	Existing Permanent
221.1	1310.30	0.06	12	No Name	Two Track	Existing Permanent
221.2	1312.77	0.75	20	No Name	Gravel	Existing Permanent
221.3	1313.22	1.05	12	No Name	Two Track	Existing Permanent
221.4	1313.48	0.11	12	No Name	Two Track	Existing Permanent
222	1310.84	1.56	12	No Name	Two Track	Temporary
223	1314.11	1.91	20	No Name	Gravel	Existing Permanent
224	1314.76	3.40	20	NF-900	Gravel	Existing Permanent
225	1315.60	0.27	12	160th Lane SE	Two Track	Existing Permanent
Sumner South						
300	1339.96	0.56	20	No Name	Gravel	Existing Permanent
301	1340.44	0.46	24	70th Avenue East / 164th Street East	Asphalt	Existing Permanent
302	1340.52	0.17	20	74th Avenue East	Gravel	Existing Permanent
302.1	1340.58	0.07	20	No Name	Gravel	Temporary
302.2	1340.69	0.06	20	No Name	Gravel	Existing Permanent
303	1341.05	0.08	20	No Name	Gravel	Temporary
304	1341.22	0.42	24	74th Avenue E / 152nd Street East	Asphalt	Existing Permanent
305	1342.59	0.17	24	137th Street East	Asphalt	Existing Permanent
306	1344.82	0.10	24	10th Street SE	Asphalt	Existing Permanent
307	1344.96	0.21	24	No Name	Asphalt	Existing Permanent
308	1347.14	0.15	20	No Name	Gravel	Temporary
309	1347.38	0.10	24	134th Avenue East	Asphalt	Existing Permanent
310	1347.84	0.12	12	No Name	Two Track	Temporary
311	1348.10	0.45	24	143rd Avenue East / Rivergrove Drive East	Asphalt	Existing Permanent
311.1	1348.17	0.14	24	Village Drive East	Asphalt	Existing Permanent
311.2	1348.25	0.16	24	72nd St E / 74th St Ct East	Asphalt	Existing Permanent
312	1348.31	0.03	12	No Name	Two Track	Temporary
313	1348.54	0.29	24	74th Street East / Riverside Road East	Asphalt	Existing Permanent
314	1349.28	0.06	20	No Name	Gravel	Future Permanent
Sumner North A						
400	1357.07	0.26	12	144th Avenue SE	Two Track	Existing Permanent
401	1357.49	0.21	12	No Name	Two Track	Existing Permanent
402	1358.79	0.01	12	No Name	Two Track	Existing Permanent
404	1359.91	0.02	12	No Name	Two Track	Existing Permanent
405	1360.05	0.16	12	No Name	Two Track	Temporary

Appendix I5

Table of Access Roads

Washington Expansion Project Access Roads [a, b, c]

Access #	Milepost	Length (Miles)	Approximate Width (Feet)	Road Name	Surfacing	Road Status[d]
406	1360.47	0.16	12	No Name / 176th Avenue SE	Two Track	Existing Permanent
407	1360.61	0.14	12	SE 303rd Street	Asphalt	Existing Permanent
408	1361.05	0.09	20	SE 299th Place	Gravel	Temporary
409	1361.55	0.04	20	No Name	Gravel	Existing Permanent
410	1361.65	0.05	12	186th Place SE	Two Track	Existing Permanent
411	1361.80	0.42	12	184th Place SE / SE 287th Street	Two Track	Existing Permanent
412	1362.78	0.03	12	No Name	Two Track	Existing Permanent
413	1363.89	0.04	20	No Name	Gravel	Existing Permanent
Sumner North B						
500	1370.89	0.01	20	No Name	Gravel	Existing Permanent
501	1371.18	0.17	20	No Name	Gravel	Temporary
502	1371.30	0.10	20	SE 148th Place	Gravel	Existing Permanent
502.1	1371.45	0.15	20	23Road Avenue SE	Gravel	Existing Permanent
503	1372.00	0.03	20	SE 137th Street	Gravel	Existing Permanent
504	1372.62	0.09	20	SE 127th Street	Gravel	Existing Permanent
505	1372.76	0.05	20	SE 125th Place	Gravel	Existing Permanent
506	1372.83	0.03	24	No Name	Asphalt	Existing Permanent
507	1372.89	0.01	24	No Name	Asphalt	Temporary
508	1373.05	0.01	20	No Name	Gravel	Temporary
509	1373.68	0.18	24	SE 111th Street	Asphalt	Existing Permanent
510	1373.99	0.24	20	SE 106th Place	Gravel	Existing Permanent
511	1374.23	0.19	20	SE 103Road Street	Gravel	Existing Permanent
512	1375.64	1.41	20	SE 79th Street	Gravel	Existing Permanent
513	1376.84	0.07	20	No Name	Gravel	Temporary
514	1377.43	0.32	20	No Name	Gravel	Temporary
515	1380.13	0.47	24	245th Avenue SE / 244th Avenue SE / 242nd Avenue	Asphalt	Existing Permanent
517	1381.57	0.51	24	237th Place NE / NE 5th Street / 242nd Avenue NE	Asphalt	Existing Permanent
518	1381.88	0.15	24	238th Avenue NE	Asphalt	Existing Permanent
518.1	1381.82	0.01	12	No Name	Two Track	Existing Permanent
Snohomish						
600	1394.18	0.07	24	No Name	Asphalt	Temporary
601	1395.69	0.03	20	No Name	Gravel	Existing Permanent
602	1396.60	0.05	24	No Name	Asphalt	Existing Permanent
603	1397.95	0.17	20	Tester Branch Road / No Name	Gravel	Existing Permanent
603.1	1398.01	0.28	20	No Name	Gravel	Existing Permanent
604	1400.61	0.09	20	No Name	Gravel	Existing Permanent
605	1401.59	1.51	20	No Name	Gravel	Existing Permanent
606	1402.89	0.05	20	No Name	Gravel	Existing Permanent
607	1402.94	0.01	20	No Name	Gravel	Existing Permanent
608	1403.75	0.08	20	84th Street SE	Gravel	Existing Permanent
609	1405.09	0.10	20	No Name	Gravel	Existing Permanent
610	1406.19	0.11	20	No Name	Gravel	Existing Permanent
611	1407.02	0.07	20	No Name	Gravel	Existing Permanent
612	1407.25	0.04	20	No Name	Gravel	Existing Permanent
613	1408.53	0.13	24	12th Street SE	Asphalt	Existing Permanent
614	1408.60	0.13	20	No Name	Gravel	Existing Permanent
615	1408.75	0.12	20	No Name	Gravel	Existing Permanent
Mt. Vernon South						
700	1435.70	0.61	20	No Name	Gravel	Existing Permanent
701	1437.64	0.18	20	Walker Valley Road	Gravel	Existing Permanent
702	1437.75	0.03	24	No Name	Asphalt	Existing Permanent

Appendix I5

Table of Access Roads

Washington Expansion Project Access Roads [a, b, c]

Access #	Milepost	Length (Miles)	Approximate Width (Feet)	Road Name	Surfacing	Road Status[d]
703	1437.90	0.13	20	No Name	Gravel	Existing Permanent
703.1	1438.20	0.36	20	No Name	Gravel	Existing Permanent
704	1438.41	0.74	20	No Name	Gravel	Temporary
705	1439.13	0.01	20	No Name	Gravel	Temporary
706	1439.46	0.04	20	No Name	Gravel	Temporary
707	1439.59	0.17	20	No Name	Gravel	Temporary
708	1439.97	0.04	20	No Name	Gravel	Existing Permanent
Mt. Vernon North A						
800	1442.14	0.52	20	Fox Road	Gravel	Existing Permanent
801	1442.89	0.17	20	No Name	Gravel	Existing Permanent
801.1	1442.83	0.03	20	No Name	Gravel	Existing Permanent
802	1443.14	0.09	20	No Name	Gravel	Existing Permanent
803	1444.13	0.57	20	Morford Road	Gravel	Existing Permanent
804	1444.83	0.05	20	No Name	Gravel	Existing Permanent
805	1444.99	0.30	20	River Lane	Gravel	Existing Permanent
Mt. Vernon North B						
900	1453.55	0.22	20	Duvall Drive	Gravel	Existing Permanent
901	1456.81	0.39	20	No Name	Gravel	Temporary
902	1456.61	0.39	20	Pacific Northwest Trail	Gravel	Existing Permanent
903	1457.47	0.15	20	No Name	Gravel	Temporary
904	1457.67	0.46	20	No Name	Gravel	Existing Permanent
904.1	1458.24	0.84	20	No Name	Gravel	Existing Permanent
905	1459.65	0.03	20	No Name	Gravel	Existing Permanent
906	1461.03	0.37	20	No Name	Gravel	Temporary
Sumas						
1000	1479.19	0.13	20	No Name	Gravel	Temporary
1001	1480.20	0.57	20	No Name	Gravel	Existing Permanent
1002	1480.59	0.34	20	No Name	Gravel	Temporary
1003	1481.61	0.08	20	No Name	Gravel	Existing Permanent

NE= northeast

SE= southeast

Note	Purpose	Explanation
a	**Safety**	It is necessary to provide sufficient access for emergency vehicles. The pipeline crosses many locations along the right-of-way (ROW) that emergency vehicles would not be able to travel, and the ability to get emergency vehicles into the ROW requires several access points.
b	**Terrain**	The pipeline crosses several locations along the ROW that construction vehicles would not be able to access, including areas with steep terrain, gorges, creeks, or rivers. Additionally, in order to minimize construction impacts, the ROW is narrow and has multiple side slopes. This type of terrain requires access points for pipe trucks to enter at one end of a construction site and leave at the opposite end. There is limited space for two-way traffic along the construction site and there are minimal turnaround locations for long equipment such as pipe trucks and trailers.
c	**Traffic**	During construction, multiple construction tasks will occur concurrently, including removal of existing 26-inch pipe, delivery of new pipe, timber removal, and dust control operations, and will necessitate continual site access for construction vehicles and equipment.
d		Existing Permanent: Existing roads used currently and in the past by Northwest operations personnel for ROW,