Appendix 4C
Direct and Indirect Effects and Cultural Resources

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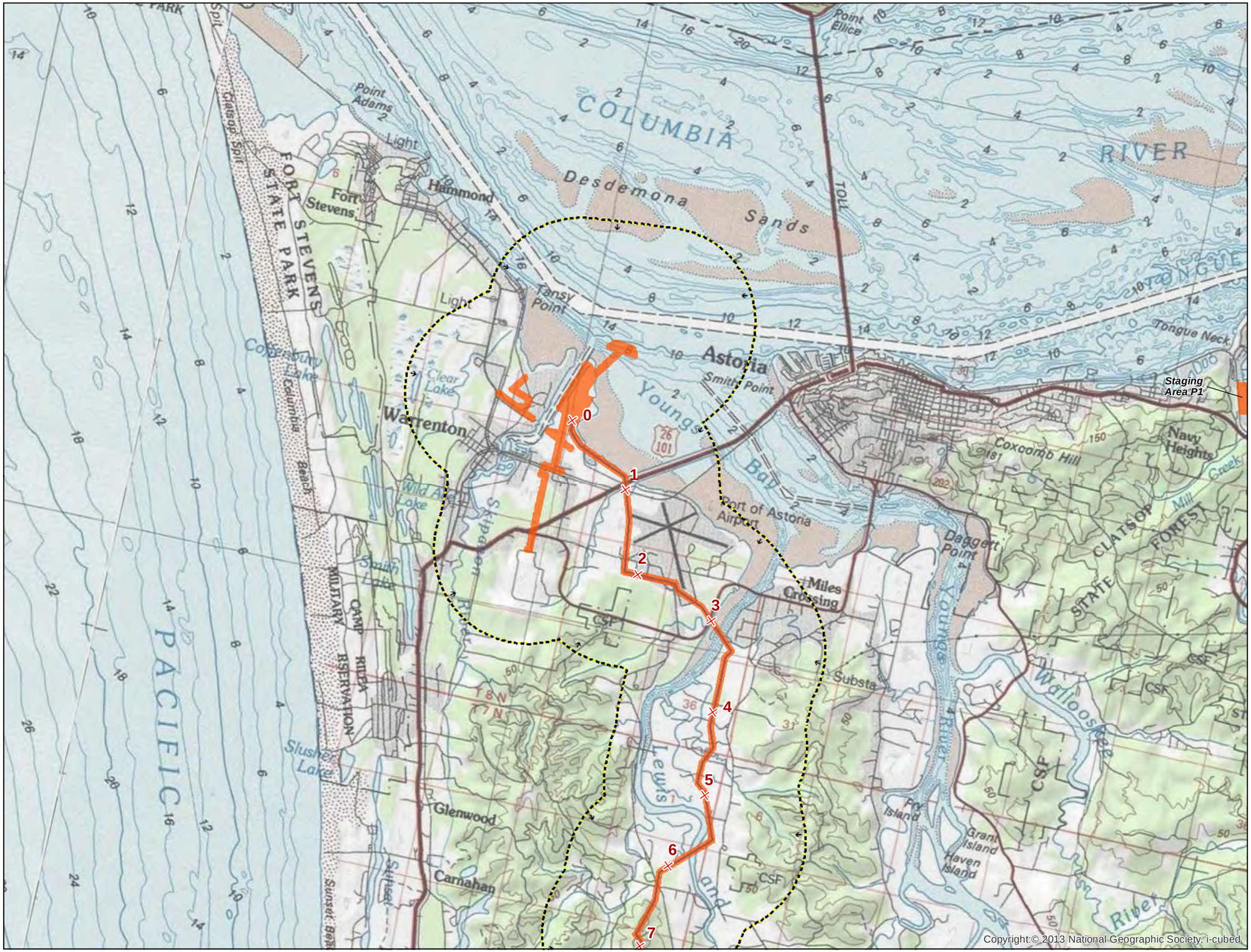

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Appendix 4C
Figure 1
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

N

0 0.25 0.5
Miles

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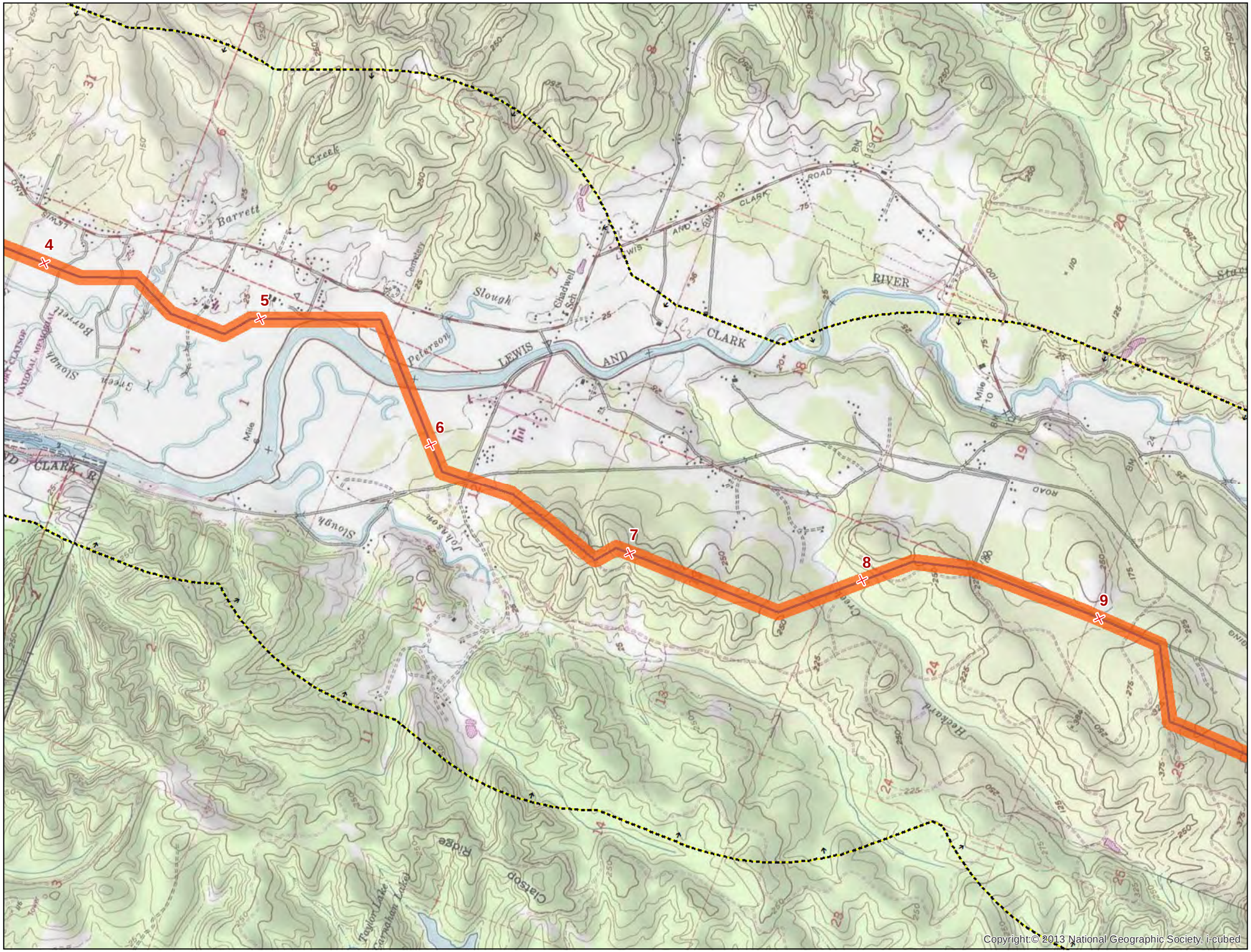
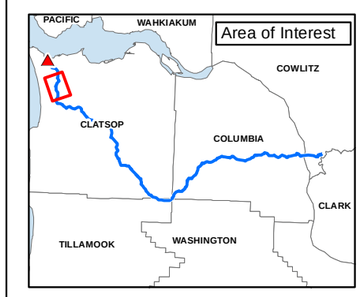


Appendix 4C
Figure 2
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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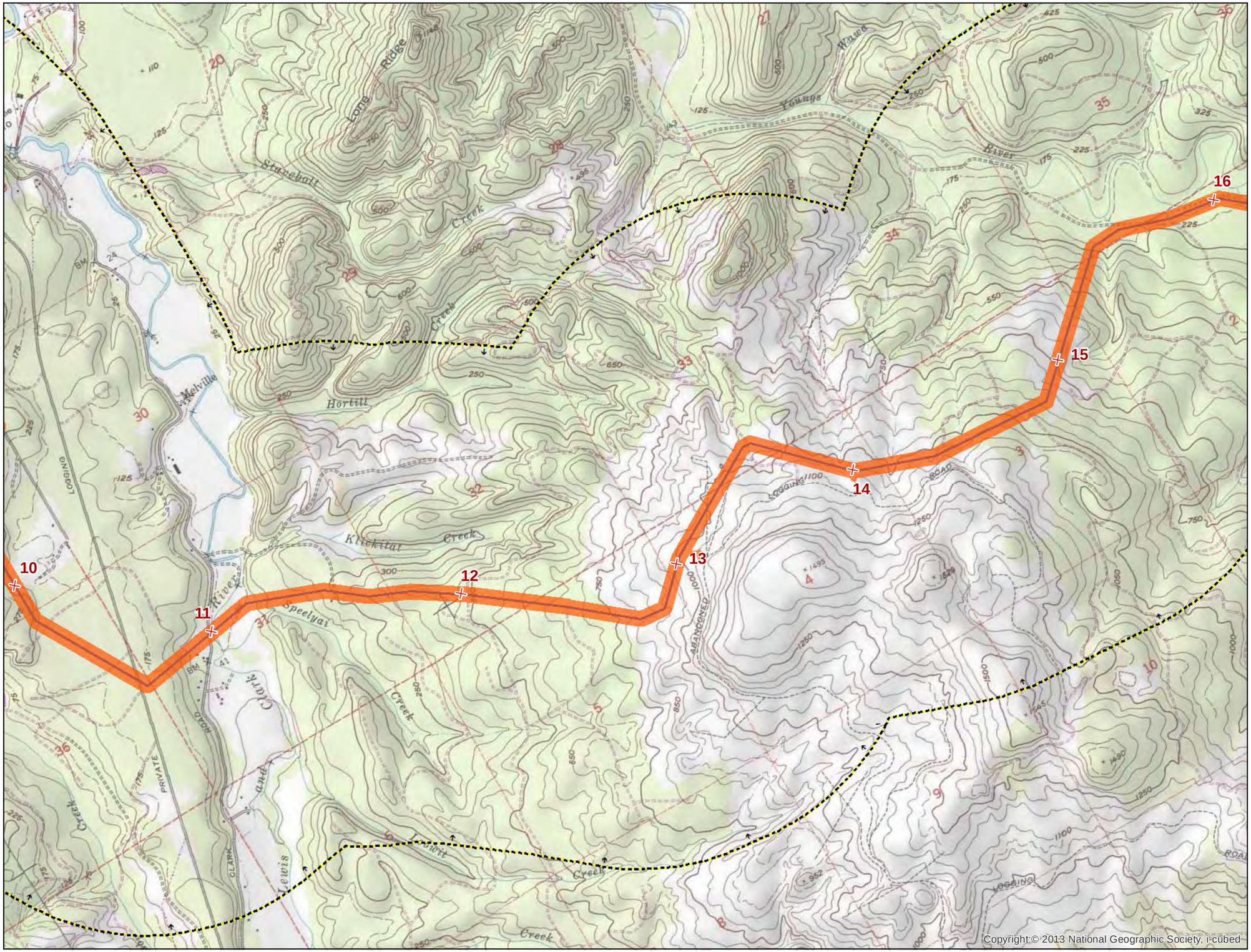

Appendix 4C
Figure 3

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

0 0.25 0.5
Miles

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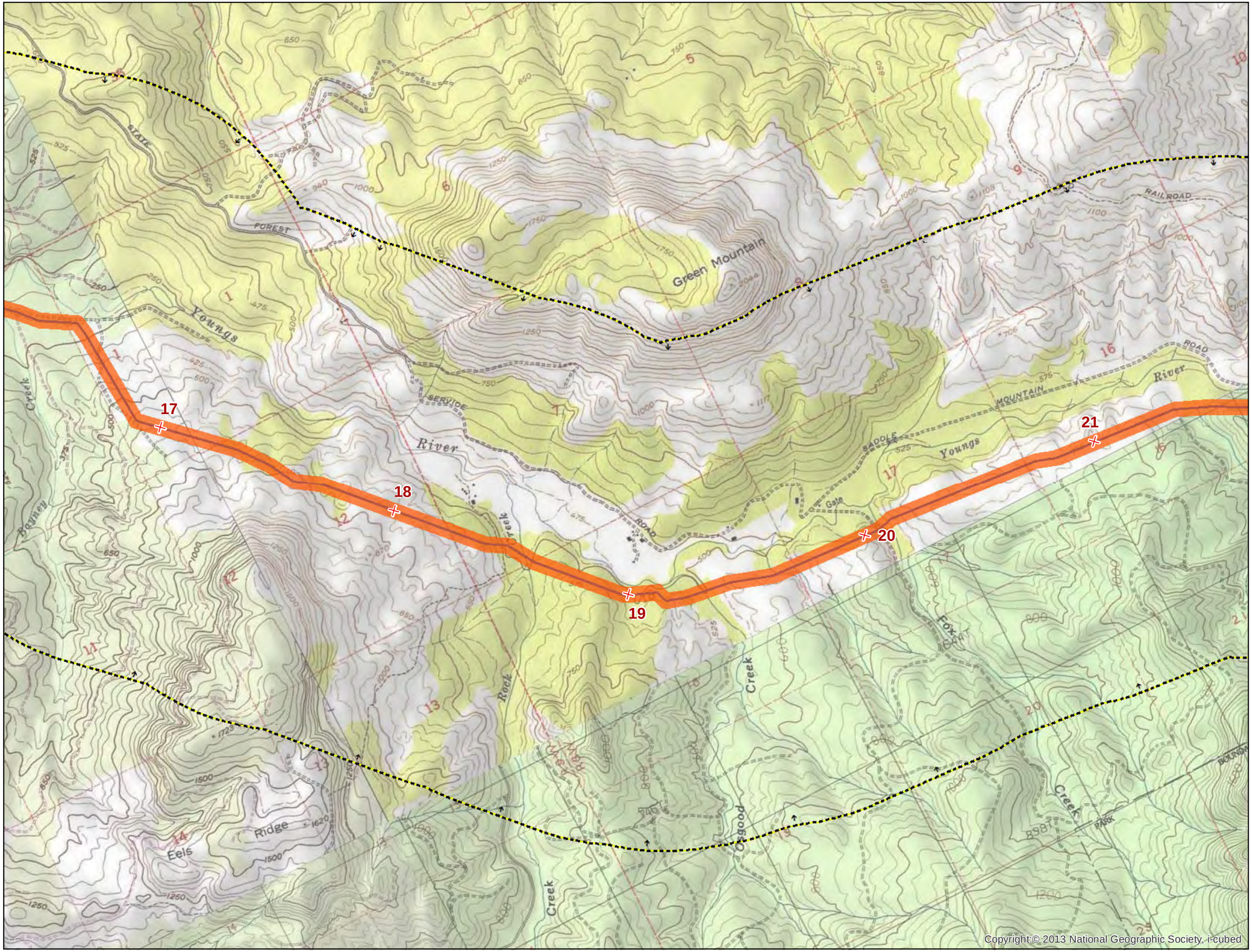

Appendix 4C
Figure 4

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

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Miles

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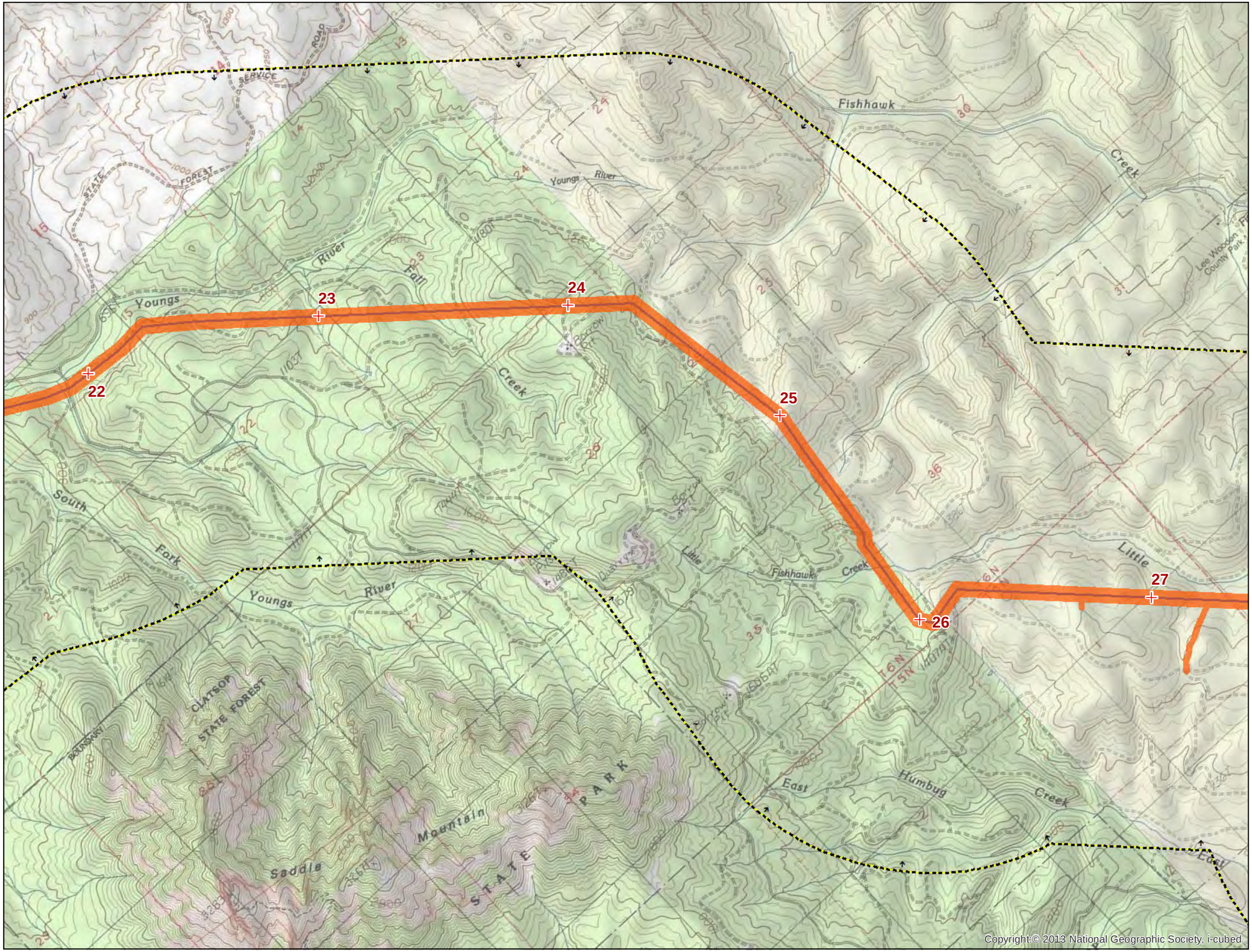

Appendix 4C
Figure 5

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

0 0.25 0.5
Miles

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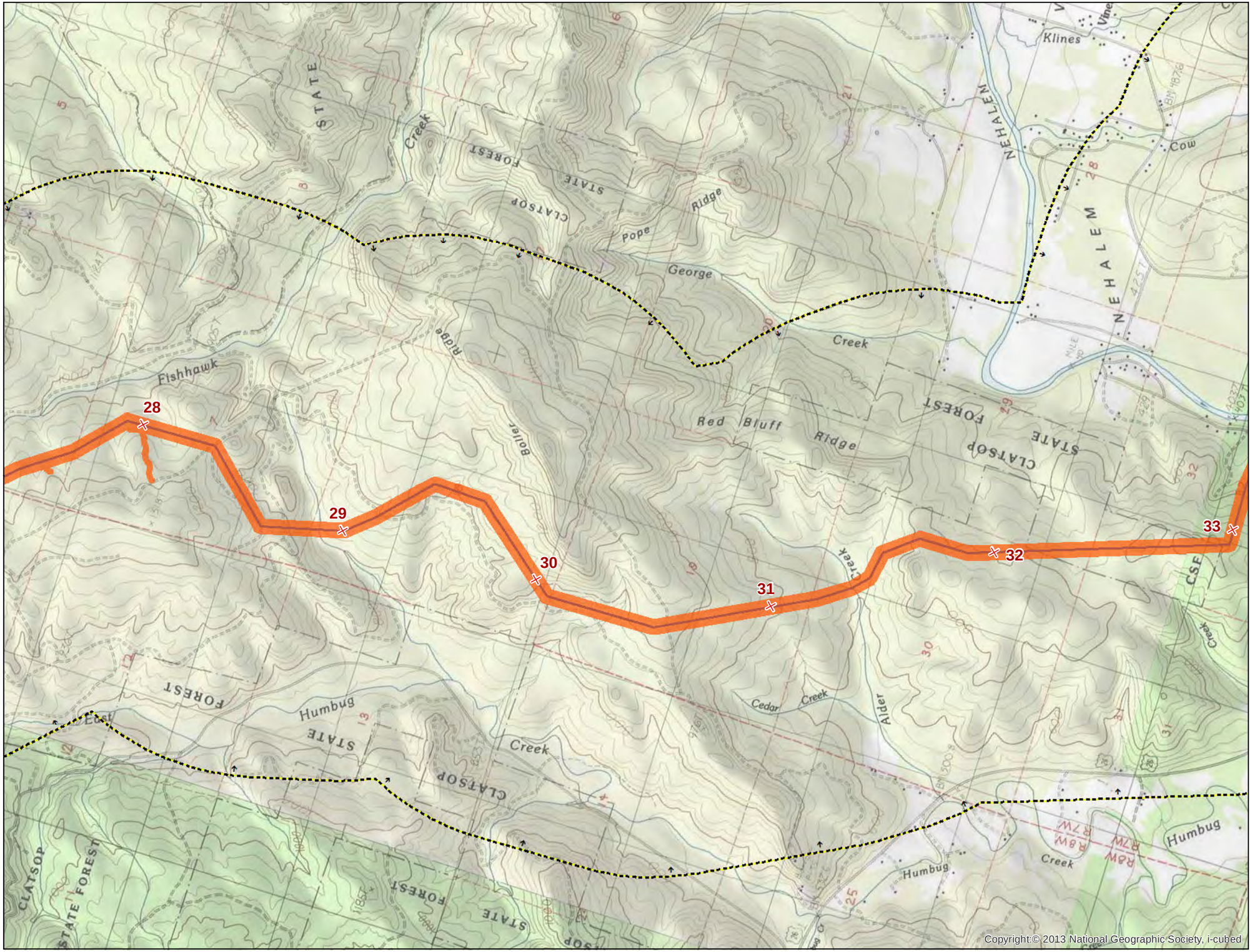
PUBLIC



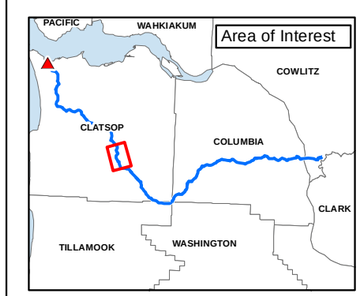
Appendix 4C
Figure 6

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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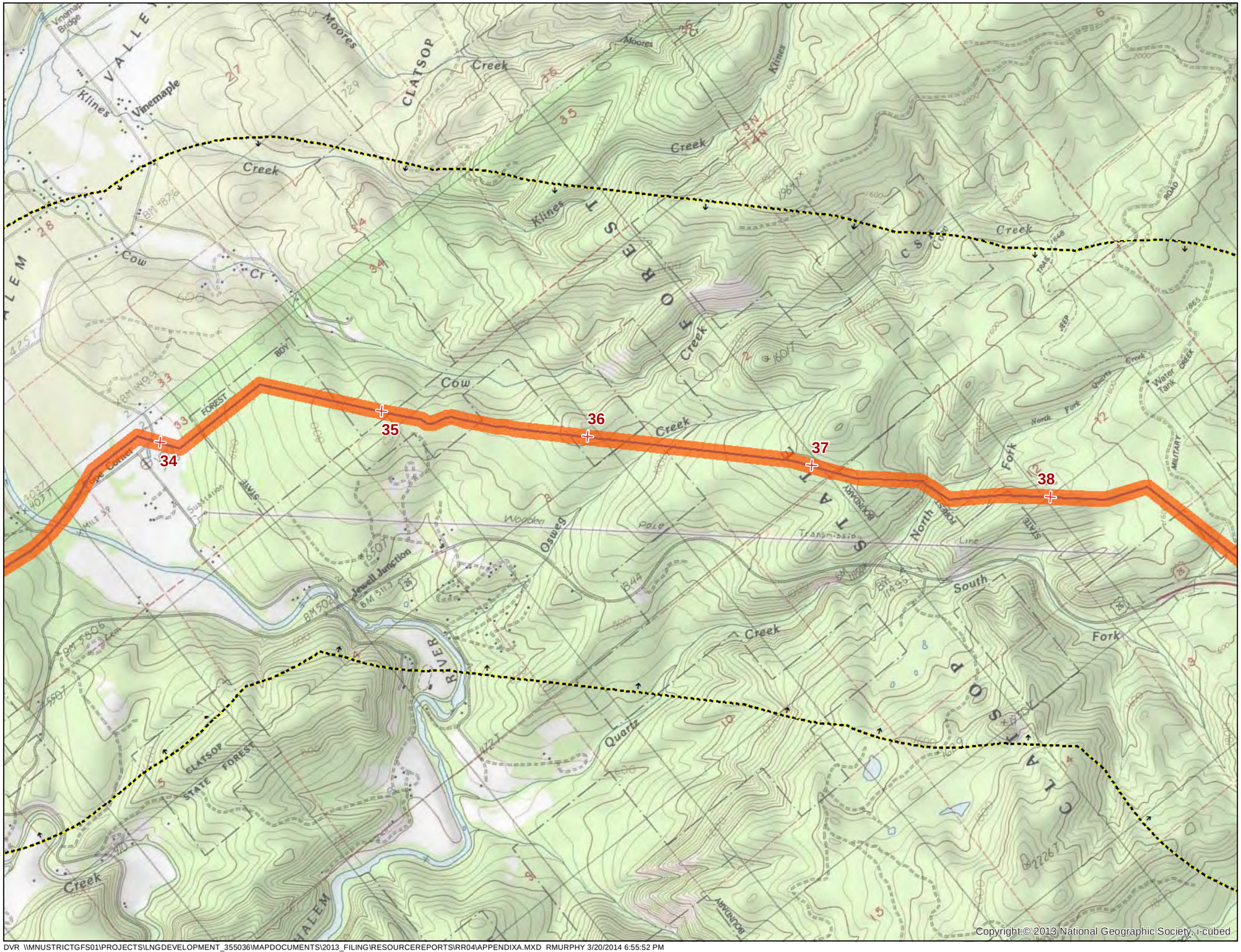


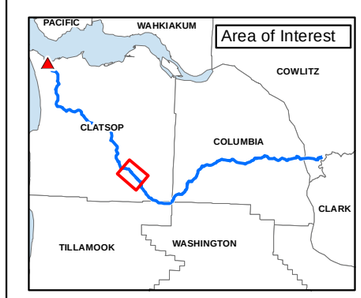
Appendix 4C
Figure 7

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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Appendix 4C
Figure 8

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

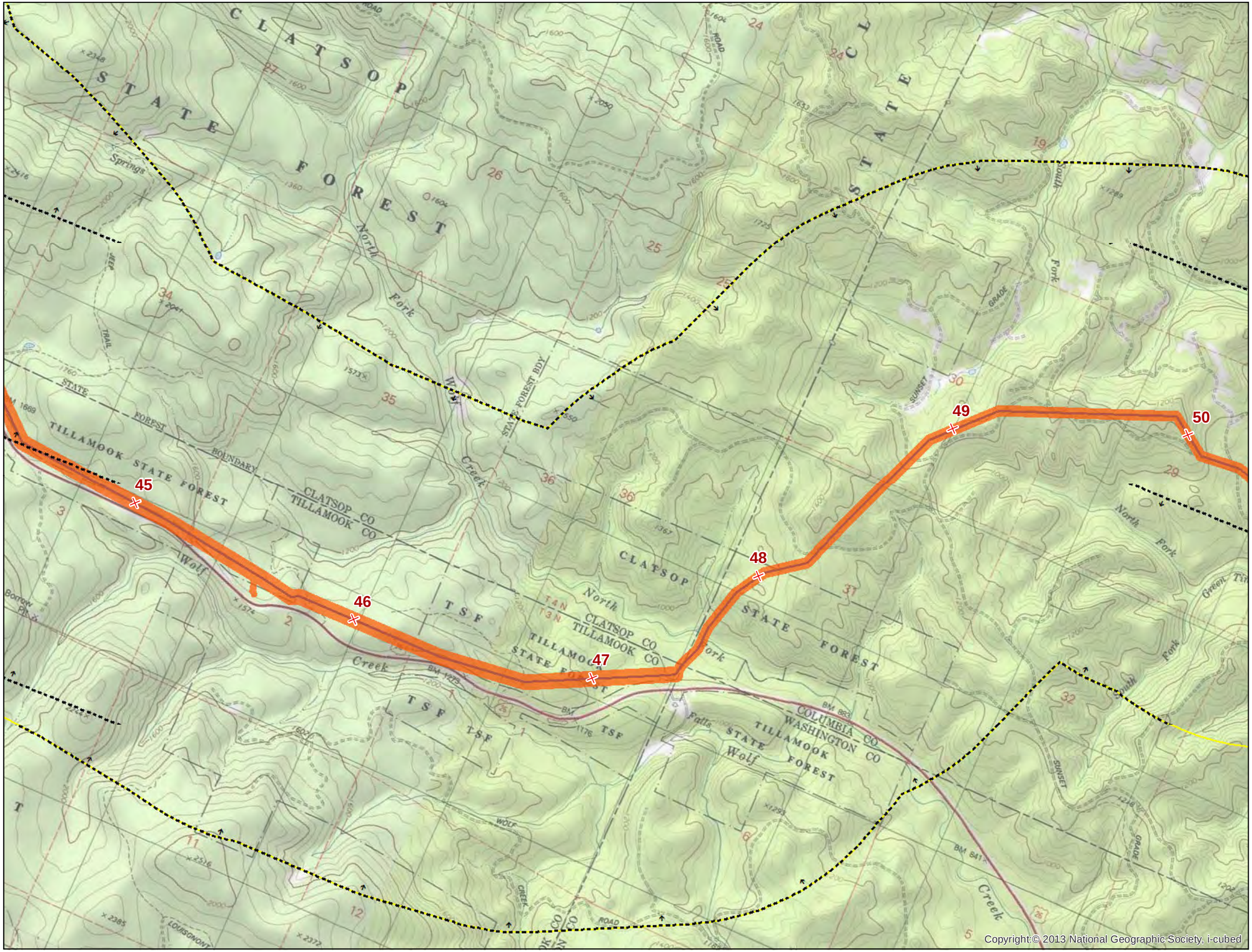
LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

0 0.25 0.5
Miles

CH2MHILL.

PUBLIC



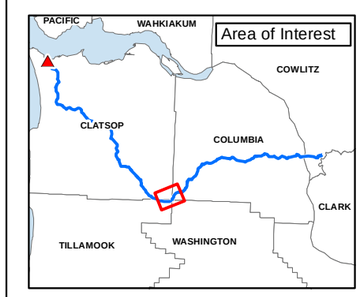
Appendix 4C
Figure 9

Direct and
Indirect Effects and
Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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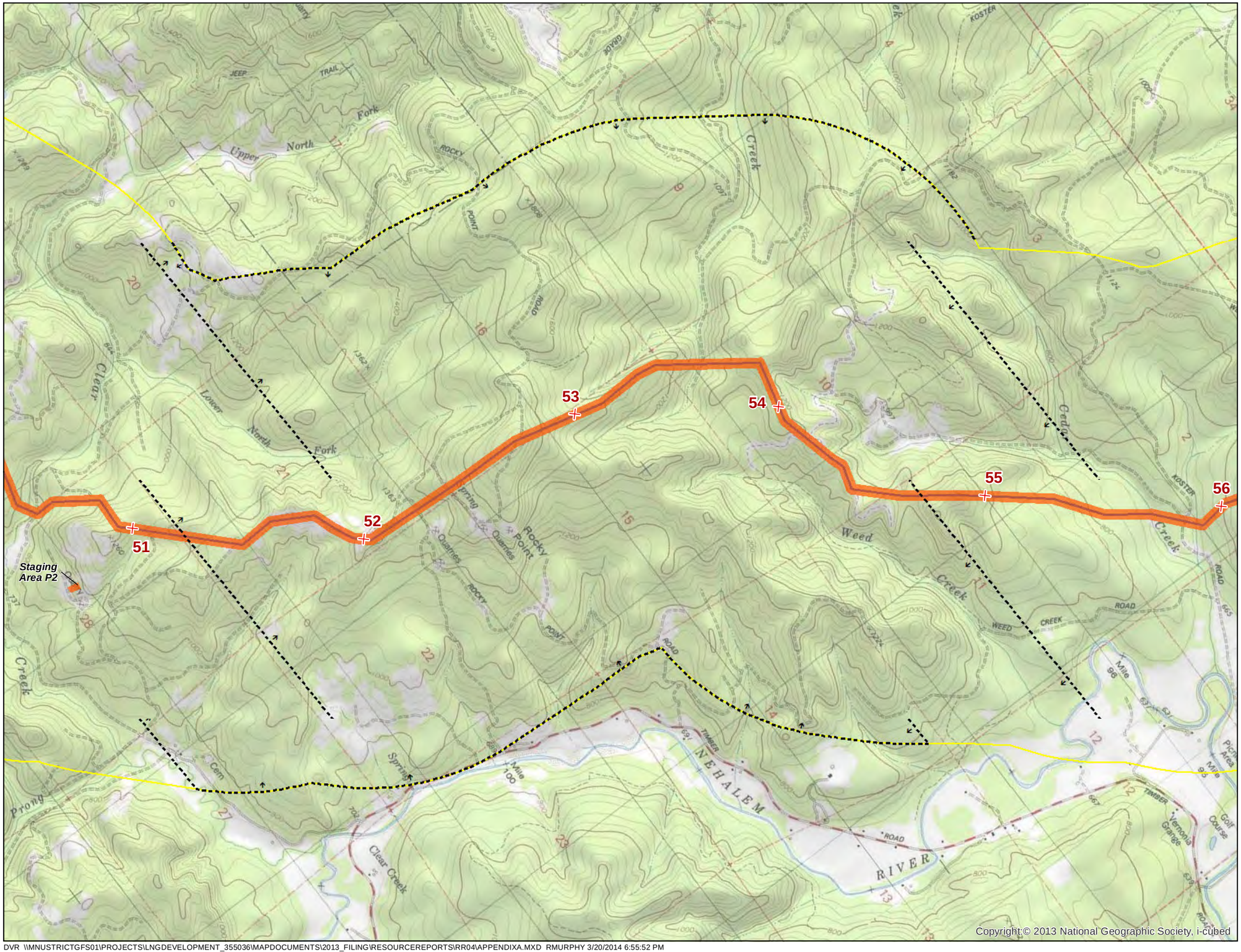

Appendix 4C
Figure 10

Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

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Miles

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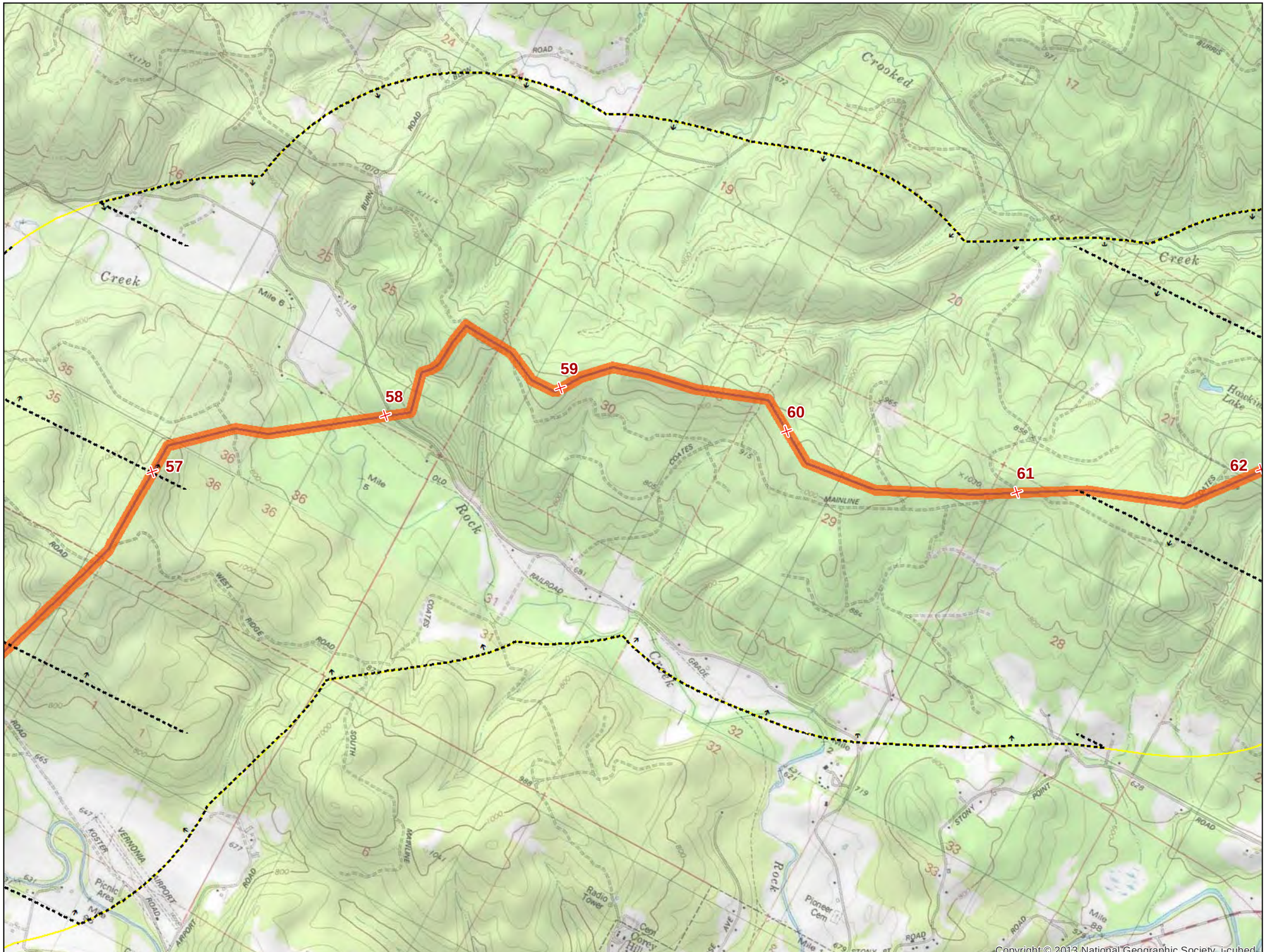
PUBLIC



Appendix 4C
Figure 11
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

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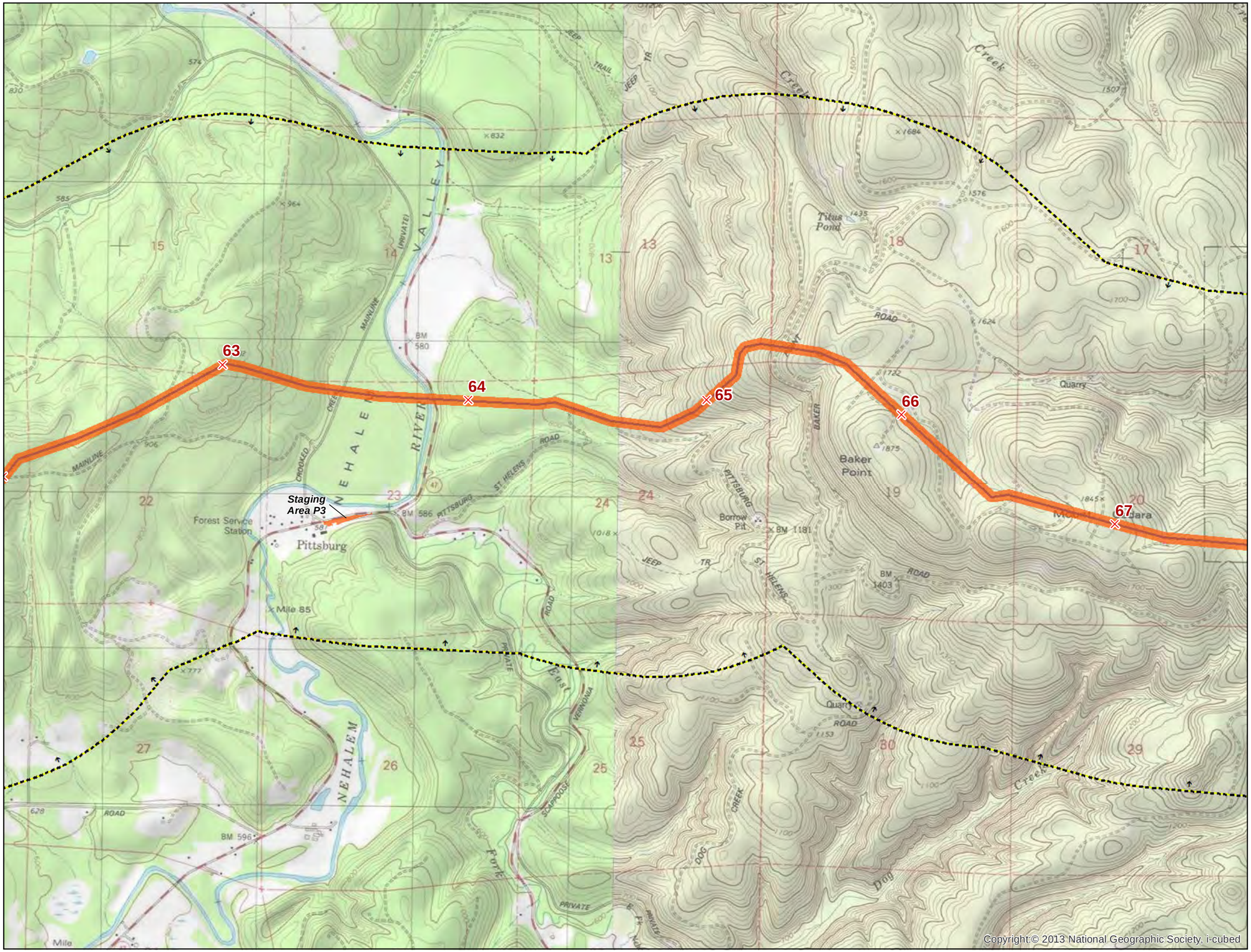
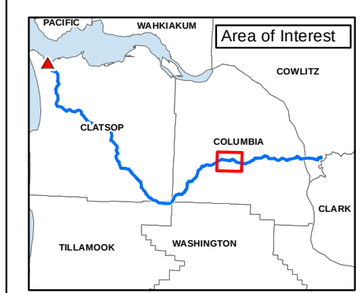


Appendix 4C
Figure 12
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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Miles

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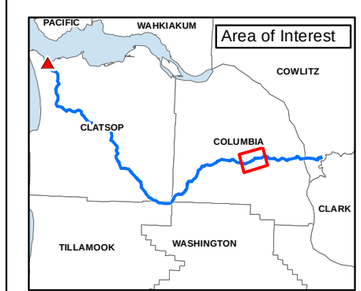
Appendix 4C
Figure 13
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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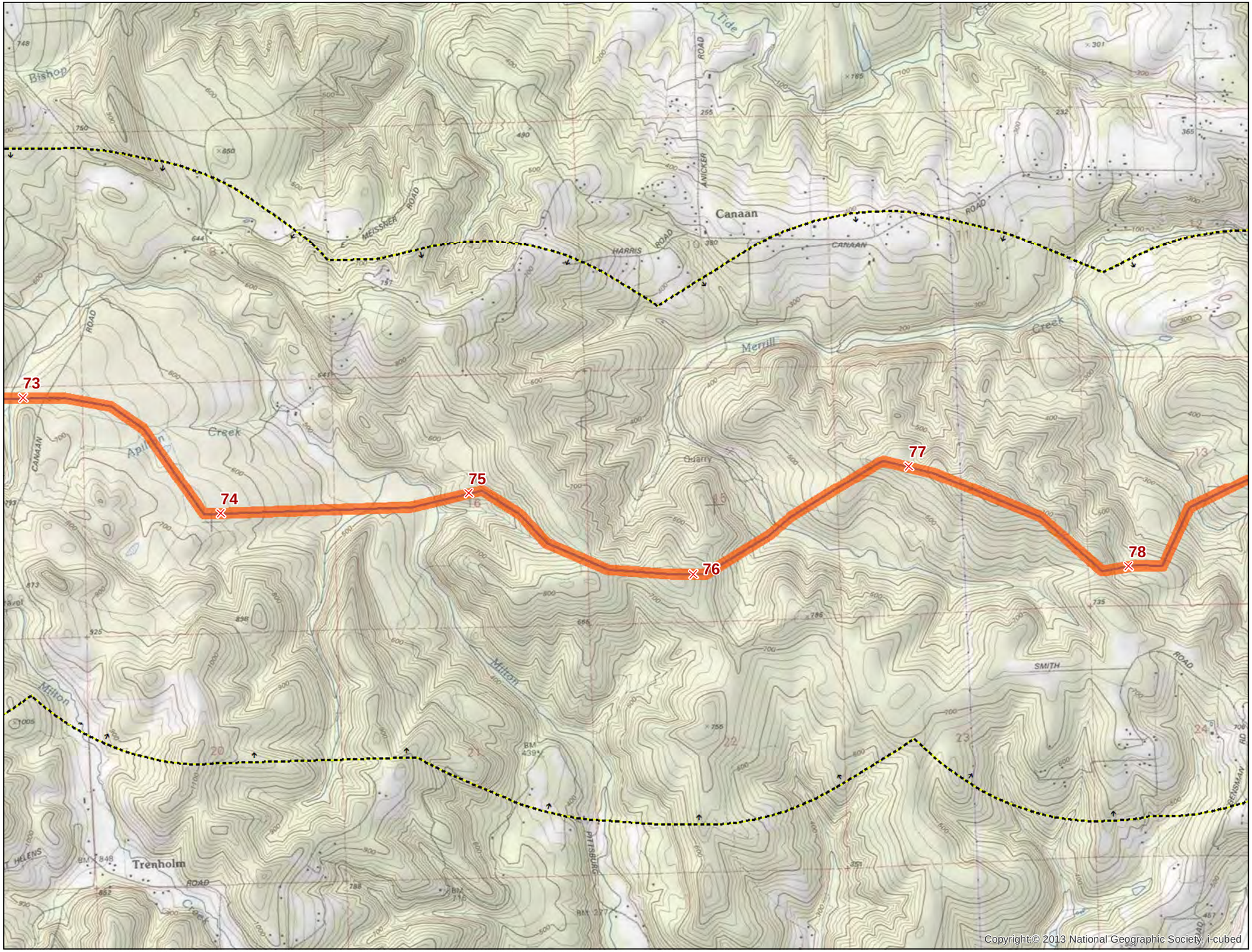
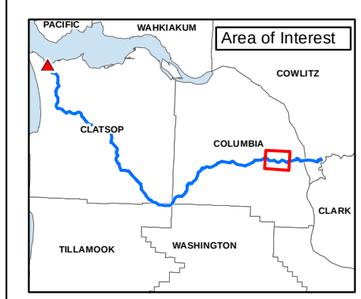


Appendix 4C
Figure 14
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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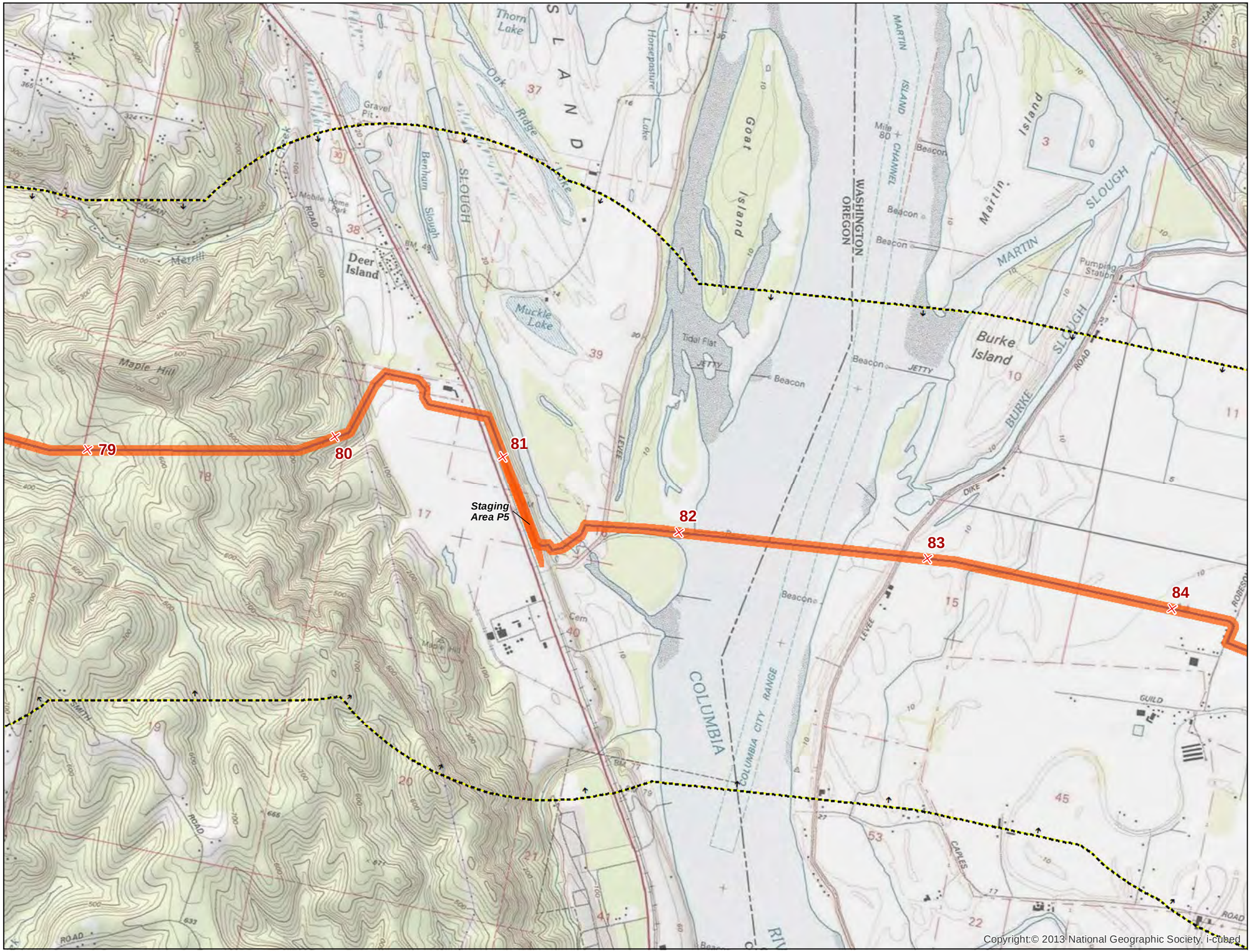

Appendix 4C
Figure 15
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE

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Miles

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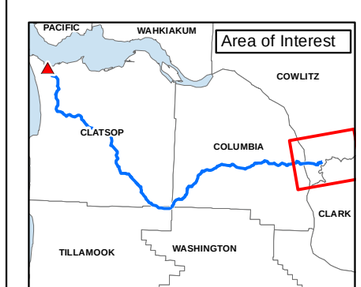
Appendix 4C
Figure 16
Direct and Indirect Effects and Cultural Resources

OregonLNG

LEGEND

- Pipeline Route Milepost
- PipelineRoute
- Direct Effects APE (Footprint Only for Isolated Features)
- Two-Mile-Wide Indirect Effects APE



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Appendix 4E
Legal Description of Pipeline and Terminal

APPENDIX 4E

Legal Description of Pipeline and Terminal

Terminal	Staging Areas	Pipeline		Metering Station	Compressor Sites	Access Roads	
Legal Description	Legal Description	State	Legal Description	Legal Description	Legal Description	State	Legal Description
T8N R10W S0	T5N R1W S0	~~WA~~	~~T5N R1W S11~~	T5N R1E SDC47	T5N R1W S39	~~WA~~	~~T5N R1W S11~~
	T5N R1W S17	WA	T5N R1W S15		T5N R1W S17	~~WA~~	~~T5N R1W S12~~
	~~T5N R1W S17~~	~~WA~~	~~T5N R1W S12~~			WA	T5N R1E SDC47
	~~T5N R1W S23~~	~~WA~~	~~T5N R1W S10~~			WA	T5N R1W SDC47
	T5N R1W S17	WA	T5NR1W S14			WA	T5N R1W S15
	T5N R4W S23	WA	T5N R1W SDC46			OR	T8N R10W S36
	T5N R3W S21	WA	T5N R1E SDC47			OR	T7N R10W S1
	T4N R5W S28	WA	T5N R1W SDC47			OR	T7N R9W S6
		OR	T8N R10W S0			OR	T7N R10W S12
		OR	T8N R10W S22			OR	T7N R10W S13
		OR	T8N R10W S23			OR	T7N R9W S18
		OR	T8N R10W S0			OR	T7N R9W S17
		OR	T8N R10W S0			OR	T7N R10W S24
		OR	T8N R10W S25			OR	T7N R9W S19
		OR	T8N R10W S36			OR	T7N R9W S20
		OR	T7N R10W S1			OR	T7N R9W S30
		OR	T7N R9W S6			OR	T7N R9W S29
		OR	T7N R10W S12			OR	T7N R9W S28
		OR	T7N R10W S12			OR	T7N R9W S27
		OR	T7N R10W S13			OR	T7N R10W S36
		OR	T7N R10W S24			OR	T7N R9W S31
		OR	T7N R10W S25			OR	T7N R9W S32
		OR	T7N R10W S36			OR	T7N R9W S33
		OR	T7N R9W S31			OR	T7N R9W S34
		OR	T7N R9W S32			OR	T7N R9W S35
		OR	T7N R9W S33			OR	T6N R9W S5
		OR	T7N R9W S35			OR	T6N R9W S4
		OR	T6N R9W S5			OR	T6N R9W S3
		OR	T6N R9W S4			OR	T6N R9W S2
		OR	T6N R9W S3			OR	T6N R9W S1
		OR	T6N R9W S2			OR	T6N R9W S12
		OR	T6N R9W S1			OR	T6N R8W S7
		OR	T6N R9W S12			OR	T6N R8W S11
		OR	T6N R8W S7			OR	T6N R8W S12
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		OR	T6N R8W S26			OR	T6N R8W S22
		OR	T6N R8W S25			OR	T6N R8W S23
		OR	T6N R8W S36			OR	T6N R8W S27
		OR	T5N R8W S1			OR	T6N R8W S26
		OR	T5N R7W S6			OR	T6N R8W S25
		OR	T5N R7W S7			OR	T6N R8W S35
		OR	T5N R7W S18			OR	T6N R8W S36
		OR	T5N R1W S0			OR	T5N R8W S2
		OR	T5N R4W S15			OR	T5N R8W S1
		OR	T5N R4W S13			OR	T5N R7W S6
		OR	T5N R3W S18			OR	T5N R3W S1
		OR	T5N R4W S14			OR	T5N R8W S12
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		OR	T5N R3W S13			OR	T5N R3W S12
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		OR	T5N R2W S17			OR	T5N R7W S18
		OR	T5N R7W S19			OR	T5N R2W S10
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		OR	T5N R2W S15			OR	T5N R1W S6
		OR	T5N R2W S14			OR	T5N R1W S7
		OR	T5N R1W S8			OR	T5N R3W S18

APPENDIX 4E

Legal Description of Pipeline and Terminal

Terminal	Staging Areas	Pipeline		Metering Station	Compressor Sites	Access Roads	
Legal Description	Legal Description	State	Legal Description	Legal Description	Legal Description	State	Legal Description
		OR	T5N R2W S13			OR	T5N R3W S14
		OR	T5N R1W S18			OR	T5N R8W S24
		OR	T5N R1W S17			OR	T5N R3W S13
		OR	T5N R1W S16			OR	T5N R2W S18
		OR	T5N R4W S21			OR	T5N R2W S17
		OR	T5N R4W S22			OR	T5N R7W S19
		OR	T5N R1W S17			OR	T5N R2W S16
		OR	T5N R4W S24			OR	T5N R2W S15
		OR	T5N R3W S19			OR	T5N R7W S20
		OR	T5N R4W S23			OR	T5N R2W S14
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		OR	T5N R5W S35			OR	T5N R3W S23
		OR	T5N R5W S36			OR	T5N R8W S25
		OR	T4N R7W S3			OR	T5N R3W S24
		OR	T4N R7W S2			OR	T5N R7W S30
		OR	T4N R5W S2			OR	T5N R7W S29
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		OR	T4N R7W S12			OR	T5N R5W S25
		OR	T4N R5W S10			OR	T5N R4W S30
		OR	T4N R5W S11			OR	T5N R4W S29
		OR	T4N R5W S16			OR	T5N R4W S28
		OR	T4N R7W S13			OR	T5N R3W S30
		OR	T4N R5W S15			OR	T5N R3W S28
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		OR	T4N R5W S21			OR	T5N R3W S25
		OR	T4N R7W S24			OR	T5N R7W S31
		OR	T4N R6W S30			OR	T5N R7W S32
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		OR	T4N R5W S30			OR	T5N R7W S34
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		OR	T4N R5W S28			OR	T5N R5W S35
		OR	T4N R6W S32			OR	T5N R5W S36
		OR	T4N R6W S33			OR	T4N R7W S3
		OR	T4N R5W S31			OR	T4N R7W S2
		OR	T3N R6W S4			OR	T4N R5W S4
		OR	T3N R6W S3			OR	T4N R5W S3
		OR	T3N R6W S2			OR	T4N R5W S2
		OR	T3N R6W S1			OR	T4N R5W S1
						OR	T4N R7W S11
						OR	T4N R7W S12
						OR	T4N R5W S9
						OR	T4N R5W S10
						OR	T4N R5W S11
						OR	T4N R5W S16
						OR	T4N R7W S13
						OR	T4N R5W S15
						OR	T4N R6W S19
						OR	T4N R5W S19
						OR	T4N R5W S20

APPENDIX 4E

Legal Description of Pipeline and Terminal

Terminal	Staging Areas	Pipeline		Metering Station	Compressor Sites	Access Roads	
Legal Description	Legal Description	State	Legal Description	Legal Description	Legal Description	State	Legal Description
						OR	T4N R5W S21
						OR	T4N R7W S24
						OR	T4N R5W S22
						OR	T4N R6W S30
						OR	T4N R6W S29
						OR	T4N R5W S30
						OR	T4N R5W S29
						OR	T4N R5W S28
						OR	T4N R5W S27
						OR	T4N R6W S32
						OR	T4N R6W S33
						OR	T4N R5W S31
						OR	T4N R5W S32
						OR	T3N R6W S4
						OR	T3N R6W S2
						OR	T3N R6W S1

Yellow highlighting indicates a change from the June 2013 submittal version of this table.

Appendix 4F
Cultural Resources Survey Completion Status

APPENDIX 4F

Cultural Resources Survey Completion Status

Survey Status	Access Status	Reason Not Complete	Ownership	County	Start MP	End MP	Length	Sort Order	Location Note
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	1	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	2	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	3	
Survey Pending	Access Permission Pending	2	State	Clatsop	NA	NA	NA	4	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	5	
Survey Pending	Access Permission Pending	2	County	Clatsop	NA	NA	NA	6	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	7	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	8	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	9	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	10	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	11	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	12	
Survey Pending	Access Permission Pending	2	City	Clatsop	NA	NA	NA	13	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	14	
Survey Pending	Access Permission Pending	2	Private	Clatsop	NA	NA	NA	15	
Not Surveyed	Access Given		State	Clatsop	0.00	0.05	0.05	16	
Survey Complete	Access Given		Private	Clatsop	0.05	0.06	0.01	17	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	0.06	0.08	0.02	18	
Survey Complete	Access Given		Private	Clatsop	0.08	0.11	0.03	19	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	0.11	0.13	0.02	20	
Survey Complete	Access Given		Private	Clatsop	0.13	0.17	0.04	21	
Not Surveyed	Outside Original Survey	1	Private	Clatsop	0.17	0.19	0.02	22	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	0.19	0.21	0.02	23	
Not Surveyed	Outside Original Survey		Private	Clatsop	0.21	1.28	1.07	24	
Survey Complete	Access Given		Private	Clatsop	1.28	1.46	0.18	25	
Survey Complete	Access Given		Private	Clatsop	1.46	1.70	0.24	26	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	1.70	1.72	0.02	27	
Survey Complete	Access Given		Private	Clatsop	1.72	1.84	0.13	28	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	1.84	2.08	0.24	29	
Not Surveyed	Access Denied		Private	Clatsop	2.08	2.33	0.25	30	
Not Surveyed	Access Denied		Private	Clatsop	2.33	2.37	0.04	31	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	2.37	2.41	0.04	32	
Not Surveyed	Access Denied		Private	Clatsop	2.41	2.52	0.11	33	
Not Surveyed	Access Given	3	Private	Clatsop	2.52	2.72	0.20	34	
Not Surveyed	Access Denied		Private	Clatsop	2.72	2.93	0.20	35	
Not Required	Water	2	Water	Clatsop	2.93	2.95	0.02	36	
Not Surveyed	Access Denied		Private	Clatsop	2.95	2.96	0.01	37	
Not Required	Water	2	Water	Clatsop	2.96	2.99	0.03	38	
Not Surveyed	Access Denied		Private	Clatsop	2.99	3.01	0.02	39	
Not Required	Water	2	Water	Clatsop	3.01	3.20	0.19	40	
Not Surveyed	Access Denied		Private	Clatsop	3.20	3.39	0.19	41	
Not Surveyed	Access Denied		Private	Clatsop	3.39	3.43	0.05	42	
Not Surveyed	Access Denied		Private	Clatsop	3.43	3.79	0.35	43	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	3.79	3.79	0.00	44	
Not Surveyed	Access Denied		Private	Clatsop	3.79	3.89	0.10	45	
Survey Complete	Access Given		Private	Clatsop	3.89	4.05	0.16	46	
Survey Complete	Access Given		Private	Clatsop	4.05	4.24	0.19	47	
Not Surveyed	Outside Original Survey		Private	Clatsop	4.24	4.53	0.29	48	
Survey Complete	Access Given		Private	Clatsop	4.53	4.67	0.14	49	
Not Surveyed	Outside Original Survey		Private	Clatsop	4.67	4.81	0.14	50	
Survey Complete	Access Given		Private	Clatsop	4.81	4.85	0.04	51	
Not Surveyed	Access Given	3	Private	Clatsop	4.85	5.10	0.26	52	
Survey Complete	Access Given		Private	Clatsop	5.10	5.17	0.06	53	
Not Surveyed	Access Denied		County	Clatsop	5.17	5.18	0.02	54	
Not Surveyed	Access Denied		Private	Clatsop	5.19	5.19	0.00	55	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	5.19	5.19	0.00	56	
Not Surveyed	Access Denied		Private	Clatsop	5.19	5.68	0.49	57	
Not Surveyed	Access Denied		Private	Clatsop	5.68	5.86	0.18	58	
Not Surveyed	Access Denied		Private	Clatsop	5.86	5.92	0.06	59	
Survey Complete	Access Given		Private	Clatsop	5.92	6.22	0.30	60	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	6.22	6.25	0.03	61	
Not Surveyed	Access Denied		Private	Clatsop	6.25	6.51	0.26	62	

APPENDIX 4F

Cultural Resources Survey Completion Status

Survey Status	Access Status	Reason Not Complete	Ownership	County	Start MP	End MP	Length	Sort Order	Location Note
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	6.51	6.51	0.01	63	
Survey Complete	Access Given		Private	Clatsop	6.51	6.77	0.25	64	
Survey Complete	Access Given		Private	Clatsop	6.77	7.17	0.40	65	
Not Surveyed	Access Denied		Private	Clatsop	7.17	7.29	0.12	66	
Not Surveyed	Access Denied		Private	Clatsop	7.29	7.54	0.25	67	
Survey Complete	Access Given		Private	Clatsop	7.54	7.84	0.30	68	
Survey Complete	Access Given		Private	Clatsop	7.84	8.95	1.11	69	
Survey Complete	Access Given		Private	Clatsop	8.95	10.11	1.16	70	
Survey Complete	Access Given		Private	Clatsop	10.11	10.67	0.56	71	
Not Surveyed	Access Given	3	Private	Clatsop	10.67	10.69	0.02	72	
Survey Complete	Access Given		Private	Clatsop	10.69	10.70	0.01	73	
Not Surveyed	Access Denied		Private	Clatsop	10.70	10.94	0.24	74	
Not Surveyed	Access Denied		Private	Clatsop	10.94	10.96	0.02	75	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	10.96	10.97	0.01	76	
Not Surveyed	Access Denied		Private	Clatsop	10.97	11.19	0.22	77	
Not Surveyed	Access Denied		Private	Clatsop	11.19	11.34	0.15	78	
Not Surveyed	Access Given	3	Private	Clatsop	11.34	11.52	0.17	79	
Survey Complete	Access Given		Private	Clatsop	11.52	11.83	0.31	80	
Survey Complete	Access Given		Private	Clatsop	11.83	12.25	0.43	81	
Survey Complete	Access Given		Private	Clatsop	12.25	13.38	1.13	82	
Survey Complete	Access Given		Private	Clatsop	13.38	13.67	0.29	83	
Survey Complete	Access Given		Private	Clatsop	13.67	15.12	1.45	84	
Survey Complete	Access Given		Private	Clatsop	15.12	15.71	0.60	85	
Survey Complete	Access Given		Private	Clatsop	15.71	16.33	0.62	86	
Survey Complete	Access Given		Private	Clatsop	16.33	16.55	0.22	87	
Survey Complete	Access Given		Private	Clatsop	16.55	18.22	1.67	88	
Survey Complete	Access Given		Private	Clatsop	18.22	18.68	0.46	89	
Survey Complete	Access Given		Private	Clatsop	18.68	18.69	0.01	90	
Survey Complete	Access Given		Private	Clatsop	18.69	18.85	0.16	91	
Survey Complete	Access Given		Private	Clatsop	18.85	18.87	0.02	92	
Survey Complete	Access Given		Private	Clatsop	18.87	19.03	0.16	93	
Survey Complete	Access Denied		Private	Clatsop	19.03	19.10	0.06	94	
Survey Complete	Access Given		Private	Clatsop	19.10	19.19	0.10	95	
Survey Complete	Access Given		Private	Clatsop	19.19	19.71	0.51	96	
Survey Complete	Access Given		Private	Clatsop	19.71	20.72	1.02	97	
Survey Complete	Access Given		Private	Clatsop	20.72	20.75	0.03	98	
Survey Complete	Access Given		Private	Clatsop	20.75	21.78	1.03	99	
Survey Complete	Access Given		Private	Clatsop	21.78	21.91	0.13	100	
Survey Complete	Access Given		Private	Clatsop	21.91	21.91	0.00	101	
Survey Complete	Access Given		Private	Clatsop	21.91	22.17	0.25	102	
Survey Complete	Access Given		Private	Clatsop	22.17	23.96	1.80	103	
Survey Complete	Access Given		Private	Clatsop	23.96	26.34	2.38	104	
Survey Complete	Access Given		Private	Clatsop	26.34	27.33	0.99	105	
Survey Complete	Access Given		Private	Clatsop	27.33	27.40	0.07	106	
Survey Complete	Access Given		Private	Clatsop	27.40	32.17	4.76	107	
Survey Complete	Access Given		Private	Clatsop	32.17	32.89	0.72	108	
Survey Complete	Access Given		Private	Clatsop	32.89	33.09	0.20	109	
Not Surveyed	Outside Original Survey		Private	Clatsop	33.09	33.18	0.09	110	
Not Surveyed	Access Denied		Private	Clatsop	33.18	33.30	0.12	111	
Not Surveyed	Access Denied		Private	Clatsop	33.30	33.41	0.11	112	
Not Surveyed	Access Denied		Private	Clatsop	33.41	33.42	0.02	113	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	33.42	33.43	0.01	114	
Not Surveyed	Access Denied		Private	Clatsop	33.43	33.47	0.03	115	
Not Surveyed	Access Denied		Private	Clatsop	33.47	33.57	0.10	116	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	33.57	33.59	0.02	117	
Not Surveyed	Access Denied		Private	Clatsop	33.59	33.64	0.05	118	
Not Surveyed	Access Denied		Private	Clatsop	33.64	33.97	0.33	119	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	33.97	33.98	0.01	120	
Not Surveyed	Access Denied		Private	Clatsop	33.98	34.20	0.22	121	
Survey Complete	Access Given		State	Clatsop	34.20	34.84	0.64	122	
Survey Complete	Access Given		State	Clatsop	34.84	35.05	0.21	123	
Survey Complete	Access Given		State	Clatsop	35.05	35.27	0.22	124	

APPENDIX 4F

Cultural Resources Survey Completion Status

Survey Status	Access Status	Reason Not Complete	Ownership	County	Start MP	End MP	Length	Sort Order	Location Note
Survey Complete	Outside Original Survey		State	Clatsop	35.27	37.13	1.86	125	
Survey Complete	Access Given		State	Clatsop	37.13	37.53	0.40	126	
Survey Complete	Access Given		Private	Clatsop	37.53	37.82	0.29	127	
Survey Complete	Access Given		State	Clatsop	37.82	37.83	0.01	128	
Survey Complete	Access Given		Private	Clatsop	37.83	38.82	0.98	129	
Survey Complete	Access Given		Private	Clatsop	38.82	39.61	0.80	130	
Survey Complete	Access Given		Private	Clatsop	39.61	39.92	0.30	131	
Survey Complete	Access Given		Private	Clatsop	39.92	40.01	0.09	132	
Survey Complete	Access Given		Private	Clatsop	40.01	40.24	0.23	133	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	40.24	40.82	0.58	134	
Survey Complete	Access Given		Private	Clatsop	40.82	40.82	0.00	135	
Survey Complete	Access Given		Private	Clatsop	40.82	41.01	0.19	136	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	41.01	41.21	0.20	137	
Survey Complete	Access Given		State	Clatsop	41.21	41.77	0.56	138	
Survey Complete	Access Given		Private	Clatsop	41.77	42.30	0.53	139	
Survey Complete	Access Given		Private	Clatsop	42.30	42.47	0.17	140	
Survey Complete	Access Given		Private	Clatsop	42.47	43.09	0.62	141	
Survey Complete	Access Given		State	Clatsop	43.09	43.39	0.31	142	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	43.39	43.55	0.16	143	
Survey Complete	Access Given		State	Clatsop	43.55	43.74	0.19	144	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	43.74	43.99	0.25	145	
Survey Complete	Access Given		State	Clatsop	43.99	44.06	0.07	146	
Survey Complete	Access Given		State	Clatsop	44.06	44.06	0.00	147	
Survey Complete	Access Given		State	Clatsop	44.06	44.06	0.00	148	
Survey Complete	Access Given		State	Clatsop	44.06	44.19	0.13	149	
Not Required	Right-of-Way	1	Right-of-Way	Clatsop	44.19	44.27	0.09	150	
Survey Complete	Access Given		State	Clatsop	44.27	44.51	0.23	151	
Survey Complete	Access Given		State	Tillamook	44.51	44.83	0.32	152	
Survey Complete	Access Given		State	Tillamook	44.83	45.31	0.48	153	
Survey Complete	Access Given		State	Tillamook	45.31	45.67	0.36	154	
Survey Complete	Access Given		State	Tillamook	45.67	45.75	0.08	155	
Survey Complete	Access Given		State	Tillamook	45.75	45.76	0.01	156	
Survey Complete	Access Given		Private	Tillamook	45.76	46.26	0.50	157	
Survey Complete	Access Given		State	Tillamook	46.26	46.28	0.02	158	
Survey Complete	Access Given		State	Tillamook	46.28	46.35	0.07	159	
Not Required	Right-of-Way	1	Right-of-Way	Tillamook	46.35	46.47	0.12	160	
Survey Complete	Access Given		State	Tillamook	46.47	46.55	0.08	161	
Survey Complete	Access Given		State	Tillamook	46.55	47.24	0.68	162	
Survey Complete	Access Given		State	Tillamook	47.24	47.33	0.10	163	
Not Required	Right-of-Way	1	Right-of-Way	Tillamook	47.33	47.35	0.02	164	
Survey Complete	Access Given		State	Tillamook	47.35	47.44	0.09	165	
Not Required	Right-of-Way	1	Right-of-Way	Tillamook	47.44	47.45	0.01	166	
Survey Complete	Access Given		State	Tillamook	47.45	47.50	0.05	167	
Survey Complete	Access Given		Right-of-Way	Tillamook	47.50	47.50	0.00	168	
Survey Complete	Access Given		Right-of-Way	Columbia	47.60	47.60	0.00	171	
Survey Complete	Access Given		State	Columbia	47.60	47.60	0.00	172	
Survey Complete	Access Given		State	Columbia	47.60	48.09	0.49	173	
Survey Complete	Access Given		Private	Columbia	48.09	48.66	0.57	174	
Survey Complete	Access Given		Private	Columbia	48.66	50.52	1.86	175	
Survey Complete	Access Given		Private	Columbia	50.52	51.13	0.61	176	
Survey Pending	Access Given	1	Private	Columbia	51.13	52.80	1.67	177	Staging 1
Survey Complete	Access Given		Private	Columbia	52.80	52.88	0.08	178	
Survey Complete	Access Given		Private Right-of-Way	Columbia	52.88	53.41	0.53	179	Access Road
Survey Complete	Access Given		Private	Columbia	53.41	54.45	1.04	180	
Survey Complete	Access Given		Private	Columbia	54.45	54.53	0.08	181	
Survey Complete	Access Given		Private	Columbia	54.53	55.03	0.50	182	
Survey Complete	Access Given		Private	Columbia	55.03	55.38	0.35	183	
Survey Complete	Access Given		Private	Columbia	55.38	55.66	0.28	184	
Survey Complete	Access Given		Private	Columbia	55.66	55.80	0.14	185	
Survey Complete	Access Given		Private	Columbia	55.80	55.85	0.05	186	
Not Surveyed	Outside Original Survey		Private	Columbia	55.85	55.95	0.10	187	
Survey Complete	Access Given		Private	Columbia	55.95	56.28	0.33	188	

APPENDIX 4F

Cultural Resources Survey Completion Status

Survey Status	Access Status	Reason Not Complete	Ownership	County	Start MP	End MP	Length	Sort Order	Location Note
Survey Complete	Access Given		Private	Columbia	56.28	56.59	0.31	189	
Survey Complete	Access Given		Private	Columbia	56.59	56.84	0.25	190	
Survey Complete	Access Given		Private	Columbia	56.84	57.73	0.89	191	
Survey Complete	Access Given		Private	Columbia	57.73	57.92	0.19	192	
Survey Complete	Access Given		Private	Columbia	57.92	58.04	0.12	193	
Survey Complete	Access Given		County	Columbia	58.04	58.23	0.19	194	
Survey Complete	Access Given		Private	Columbia	58.23	58.49	0.26	195	
Survey Complete	Access Given		Private	Columbia	58.49	58.69	0.20	196	
Survey Complete	Access Given		Private	Columbia	58.69	59.03	0.34	197	
Survey Complete	Access Given		Private	Columbia	59.03	59.57	0.54	198	
Survey Complete	Access Given		Private	Columbia	59.57	59.83	0.26	199	
Survey Complete	Access Given		Private	Columbia	59.83	59.98	0.15	200	
Survey Complete	Access Given		Private	Columbia	59.98	60.12	0.14	201	
Survey Complete	Access Given		Private	Columbia	60.12	60.59	0.47	202	
Survey Complete	Access Given		Private	Columbia	60.59	60.94	0.35	203	
Survey Complete	Access Given		Private	Columbia	60.94	60.96	0.02	204	
Survey Complete	Access Given		Private	Columbia	60.96	61.11	0.15	205	
Survey Complete	Access Given		Private	Columbia	61.11	61.48	0.37	206	
Survey Complete	Access Given		Private	Columbia	61.48	62.97	1.49	207	
Survey Complete	Access Given		Private	Columbia	62.97	63.15	0.18	208	
Survey Complete	Access Given		Private	Columbia	63.15	63.27	0.12	209	
Survey Complete	Access Given		Private	Columbia	63.27	63.74	0.47	210	
Survey Complete	Access Given		Private	Columbia	63.74	63.84	0.10	211	Staging 2
Survey Complete	Access Given		Private	Columbia	63.84	63.85	0.01	212	
Survey Complete	Access Given		Private	Columbia	63.85	63.85	0.00	213	
Survey Complete	Access Given		County	Columbia	63.85	63.86	0.01	214	
Survey Complete	Access Given		Private	Columbia	63.86	64.25	0.39	215	
Survey Complete	Access Given		Private	Columbia	64.25	65.38	1.13	216	
Survey Complete	Access Given		Private	Columbia	65.38	65.69	0.31	217	
Survey Complete	Access Given		Private	Columbia	65.69	66.56	0.87	218	
Survey Complete	Access Given		Private	Columbia	66.56	66.64	0.08	219	
Survey Complete	Access Given		Private	Columbia	66.64	66.83	0.19	220	
Survey Complete	Access Given		Private	Columbia	66.83	67.34	0.51	221	
Survey Complete	Access Given		State	Columbia	67.34	67.59	0.25	222	
Survey Complete	Access Given		State	Columbia	67.59	68.63	1.04	223	
Survey Complete	Access Given		State	Columbia	68.63	69.11	0.48	224	
Survey Complete	Access Given		State	Columbia	69.11	69.12	0.01	225	
Survey Complete	Access Given		State	Columbia	69.12	69.16	0.04	226	
Survey Complete	Access Given		Private	Columbia	69.16	69.73	0.57	227	
Survey Complete	Access Given		State	Columbia	69.73	70.02	0.29	228	
Survey Complete	Access Given		Private	Columbia	70.02	70.05	0.03	229	
Survey Complete	Access Given		Private	Columbia	70.05	70.38	0.33	230	
Not Surveyed	Outside Original Survey		Private	Columbia	70.38	71.01	0.63	231	
Survey Complete	Access Given		Private	Columbia	71.01	71.06	0.05	232	
Survey Complete	Access Given		Private	Columbia	71.06	72.08	1.02	233	
Survey Complete	Access Given		Private	Columbia	72.08	72.73	0.65	234	
Survey Complete	Access Given		Private	Columbia	72.73	73.07	0.34	235	
Survey Complete	Access Given		Private	Columbia	73.07	73.08	0.01	236	
Survey Complete	Access Given		Private	Columbia	73.08	73.24	0.16	237	
Survey Complete	Access Given		Private	Columbia	73.24	74.22	0.98	238	
Survey Complete	Access Given		City	Columbia	74.22	74.48	0.26	239	
Survey Complete	Access Given		Private	Columbia	74.48	75.56	1.08	240	
Survey Complete	Access Given		Private	Columbia	75.56	76.67	1.11	241	
Survey Complete	Access Given		Private	Columbia	76.67	77.79	1.12	242	
Survey Complete	Access Given		Private	Columbia	77.79	78.99	1.20	243	
Survey Complete	Access Given		Right-of-Way	Columbia	78.99	79.33	0.34	244	
Survey Complete	Access Given		Private	Columbia	79.33	79.68	0.35	245	
Survey Complete	Access Given		Private	Columbia	79.68	79.98	0.30	246	
Survey Complete	Access Given		Private	Columbia	79.98	79.99	0.01	247	
Survey Complete	Access Given		Private	Columbia	79.99	80.01	0.02	248	
Survey Pending	Access Permission Pending	2	Private	Columbia	80.01	80.22	0.21	249	
Survey Complete	Access Given		Private	Columbia	80.22	80.76	0.54	250	

APPENDIX 4F

Cultural Resources Survey Completion Status

Survey Status	Access Status	Reason Not Complete	Ownership	County	Start MP	End MP	Length	Sort Order	Location Note
Survey Complete	Access Given		State	Columbia	80.76	80.79	0.03	251	
Survey Complete	Access Given		State	Columbia	80.79	80.81	0.02	252	
Survey Complete	Access Given		Private	Columbia	80.81	81.48	0.67	253	
Survey Complete	Access Given		Private	Columbia	81.48	82.05	0.57	254	
NA	NA	Survey	County	Columbia	82.05	82.68	0.63	255	
Survey Pending	Access Permission Pending	2	City	Cowlitz	82.68	82.84	0.16	256	
Survey Pending	Access Permission Pending	2	County	Cowlitz	82.84	82.86	0.02	257	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	82.86	83.30	0.44	258	
Survey Pending	Access Permission Pending	2	Right-of-Way	Cowlitz	83.30	83.31	0.01	259	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	83.31	83.36	0.05	260	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	83.36	84.24	0.88	261	
Survey Pending	Access Permission Pending	2	Right-of-Way	Cowlitz	84.24	84.25	0.01	262	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	84.25	84.34	0.09	263	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	84.34	84.59	0.25	264	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	84.59	84.80	0.21	265	
Survey Pending	Access Permission Pending	2	Right-of-Way	Cowlitz	84.80	84.81	0.01	266	Staging 5
Survey Pending	Access Permission Pending	2	Private	Cowlitz	84.81	85.15	0.34	267	Staging 5
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.15	85.20	0.05	268	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.20	85.23	0.03	269	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.23	85.33	0.10	270	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.33	85.63	0.30	271	
Survey Pending	Access Permission Pending	2	State	Cowlitz	85.63	85.72	0.09	272	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.72	85.83	0.11	273	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.83	85.86	0.03	274	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.86	85.90	0.04	275	
Survey Pending	Access Permission Pending	2	Right-of-Way	Cowlitz	85.90	85.91	0.01	276	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.91	85.92	0.01	277	
Survey Pending	Access Permission Pending	2	Right-of-Way	Cowlitz	85.92	85.93	0.01	278	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	85.93	86.02	0.09	279	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	86.02	86.11	0.09	280	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	86.11	86.49	0.38	281	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	86.49	86.70	0.21	282	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	86.70	86.81	0.11	283	
Survey Pending	Access Permission Pending	2	Private	Cowlitz	86.81	86.83	0.02	284	

Notes:

1 = Survey to be completed before construction.

2 = Access permission not yet granted; anticipated before construction.

3 = Survey to be completed before construction because route modifications occurred after fieldwork.

NA = Terminal does not have applicable mileposts.

Yellow highlighting indicates a change from the June 2013 submittal version of this table.

Appendix 6B
Geologic Units Underlying the Project

APPENDIX 6B

Geologic Units Underlying the Project

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
Terminal							
0.00	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Unconsolidated sediment	Unconsolidated floodplain deposits of clay, silt, sand, and basalt gravel	DOGAMI, 2009
Pipeline							
0.00 – 0.37	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
0.37 – 0.48	Clatsop	Coast Range	Water	N/A	N/A	N/A	DOGAMI, 2009
0.48 – 1.84	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
1.84 – 1.94	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
1.94 – 3.01	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
3.01 – 3.24	Clatsop	Coast Range	Water	N/A	N/A	N/A	DOGAMI, 2009
3.24 – 4.50	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
4.50 – 4.80	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
4.80 – 4.84	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
4.84 – 5.17	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
5.17 – 5.23	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
5.23 – 5.29	Clatsop	Coast Range	Water	N/A	N/A	N/A	DOGAMI, 2009
5.29 – 5.65	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
5.65 – 5.74	Clatsop	Coast Range	Water	N/A	N/A	N/A	DOGAMI, 2009
5.74 – 5.98	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
5.98 – 6.25	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
6.25 – 9.25	Clatsop	Coast Range	Smuggler Cove Formation (Tsc2)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
9.25 – 10.06	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac1)	Miocene	Marine Sedimentary Rock	Slope channel sandstone	DOGAMI, 2009
10.06 – 10.77	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
10.77 – 10.88	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac)	Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
10.88 – 10.94	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
10.94 – 11.23	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
11.23 – 11.34	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac)	Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
11.34 – 11.48	Clatsop	Coast Range	Columbia River Basalt Group, Intrusive Grande Ronde Basalt (Tgri)	Miocene	Igneous Rock	Invasive Extrusive Basalt	DOGAMI, 2009
11.48 – 12.04	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac)	Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
12.04 – 12.47	Clatsop	Coast Range	Columbia River Basalt Group, Intrusive Grande Ronde Basalt (Tgri)	Miocene	Igneous Rock	Invasive Extrusive Basalt	DOGAMI, 2009
12.47 – 13.45	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac)	Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
13.45 – 14.41	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac1)	Miocene	Marine Sedimentary Rock	Slope channel sandstone	DOGAMI, 2009
14.41 – 14.76	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac)	Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
14.76 – 14.96	Clatsop	Coast Range	Astoria Formation, Canon Beach Member (Tac1)	Miocene	Marine Sedimentary Rock	Slope channel sandstone	DOGAMI, 2009
14.96 – 15.01	Clatsop	Coast Range	Astoria Formation, Wickiup Mountain Member (Taw)	Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
15.01 – 15.49	Clatsop	Coast Range	Smuggler Cove Formation (Tsc)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
15.49 – 16.49	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
16.49 – 17.33	Clatsop	Coast Range	Smuggler Cove Formation (Tsc)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
17.33 – 17.93	Clatsop	Coast Range	Astoria Formation, Wickiup Mountain Member (Taw)	Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
17.93 – 18.43	Clatsop	Coast Range	Smuggler Cove Formation (Tsc)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
18.43 – 18.62	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
18.62 – 19.00	Clatsop	Coast Range	Smuggler Cove Formation (Tsc)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
19.00 – 19.59	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
19.59 – 20.05	Clatsop	Coast Range	Northrup Creek Formation (Tn)	Oligocene / Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
20.05 – 20.11	Clatsop	Coast Range	Quaternary Alluvium (Qal)	Quaternary	Sediment	Alluvial deposits of mixed grained sediments	DOGAMI, 2009
20.11 – 20.26	Clatsop	Coast Range	Northrup Creek Formation (Tn)	Oligocene / Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
20.26 – 23.44	Clatsop	Coast Range	Smuggler Cove Formation (Tsc)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
23.44 – 25.70	Clatsop	Coast Range	Northrup Creek Formation (Tn)	Oligocene / Miocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
25.70 – 27.10	Clatsop	Coast Range	Pittsburg Bluff Formation (Tpb)	Oligocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
27.10 – 29.24	Clatsop	Coast Range	Smuggler Cove Formation, Lower Member (Tsc1)	Oligocene / Miocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
29.24 – 30.46	Clatsop	Coast Range	Sager Creek Formation (Ts)	Oligocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
30.46 – 30.54	Clatsop	Coast Range	Columbia River Basalt Group, Intrusive Grande Ronde Basalt (Tgri)	Miocene	Igneous Rock	Invasive Extrusive Basalt	DOGAMI, 2009
30.54 – 31.58	Clatsop	Coast Range	Sager Creek Formation (Ts)	Oligocene	Marine Sedimentary Rock	Turbidite	DOGAMI, 2009
31.58 – 33.40	Clatsop	Coast Range	Keasey Formation, Jewel Member (Tkj)	Eocene	Marine Sedimentary Rock	Slope Mudstone	DOGAMI, 2009
33.40 – 34.16	Clatsop	Coast Range	Quaternary Terraces (Qt)	Quaternary	Sediment	Terrace deposits of mixed grained sediments	DOGAMI, 2009
34.16 – 35.57	Clatsop	Coast Range	Hamlet Formation (Th)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
35.57 – 38.81	Clatsop	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
38.81 – 40.09	Clatsop	Coast Range	Hamlet Formation (Th)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
40.09 – 40.35	Clatsop	Coast Range	Cole Mountain Basalt (Tcm)	Eocene	Igneous Rock	Invasive extrusive basalt	DOGAMI, 2009
40.35 – 40.43	Clatsop	Coast Range	Hamlet Formation (Th)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
40.43 – 40.93	Clatsop	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
40.93 – 40.97	Clatsop	Coast Range	Tillamook Volcanics (Ttv)	Eocene	Igneous Rock	Volcanic Rock (Basalt)	DOGAMI, 2009
40.97 – 42.30	Clatsop	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
42.30 – 43.08	Clatsop	Coast Range	Hamlet Formation (Thr)	Eocene	Marine Sedimentary Rock	Basaltic sandstone	DOGAMI, 2009
43.08 – 45.24	Clatsop / Tillamook	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
45.24 – 45.36	Tillamook	Coast Range	Tillamook Volcanics (Ttv)	Eocene	Igneous Rock	Volcanic Rock (Basalt)	DOGAMI, 2009
45.36 – 46.07	Tillamook	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
46.07 – 46.24	Tillamook	Coast Range	Hamlet Formation (Thr)	Eocene	Marine Sedimentary Rock	Basaltic sandstone	DOGAMI, 2009
46.24 – 46.50	Tillamook	Coast Range	Tillamook Volcanics (Ttv)	Eocene	Igneous Rock	Volcanic Rock (Basalt)	DOGAMI, 2009
46.50 – 46.55	Tillamook	Coast Range	Hamlet Formation (Ths)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
46.55 – 48.29	Tillamook / Clatsop / Columbia	Coast Range	Hamlet Formation, Sweet Home Creek Member (Thsw)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
48.29 – 48.48	Columbia	Coast Range	Cowlitz Formation, Clark and Wilson Sandstone Member (Tccw)	Eocene	Marine Sedimentary Rock	Deltaic sandstone	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
48.48 – 48.95	Columbia	Coast Range	Hamlet Formation, Sweet Home Creek Member (Thsw)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
48.95 – 50.40	Columbia	Coast Range	Keasey Formation (Tk)	Eocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
50.40 – 50.48	Columbia	Coast Range	Cowlitz Formation, Upper Mudstone Member (Tcum)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
50.48 – 51.46	Columbia	Coast Range	Cowlitz Formation, Clark and Wilson Sandstone Member (Tccw)	Eocene	Marine Sedimentary Rock	Deltaic sandstone	DOGAMI, 2009
51.46 – 52.11	Columbia	Coast Range	Hamlet Formation, Sweet Home Creek Member (Thsw)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
52.11 – 52.27	Columbia	Coast Range	Hamlet Formation, Sunset Highway Sandstone Member (Thsh)	Eocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
52.27 – 52.90	Columbia	Coast Range	Tillamook Volcanics (Ttv)	Eocene	Igneous Rock	Volcanic Rock (Basalt)	DOGAMI, 2009
52.90 – 53.00	Columbia	Coast Range	Hamlet Formation, Sweet Home Creek Member (Thsw)	Eocene	Marine Sedimentary Rock	Slope mudstone	DOGAMI, 2009
53.00 – 53.61	Columbia	Coast Range	Cowlitz Formation, Clark and Wilson Sandstone Member (Tccw)	Eocene	Marine Sedimentary Rock	Deltaic sandstone	DOGAMI, 2009
53.61 – 61.08	Columbia	Coast Range	Keasey Formation (Tk)	Eocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
61.08 – 61.14	Columbia	Coast Range	Pittsburgh Bluff Formation (Tps)	Oligocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009
61.14 – 61.20	Columbia	Coast Range	Keasey Formation (Tk)	Eocene	Marine Sedimentary Rock	Tuffaceous sedimentary rocks	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
61.20 – 64.77	Columbia	Coast Range	Pittsburgh Bluff Formation (Tps)	Oligocene	Marine Sedimentary Rock	Shelf sandstone / tuffaceous sedimentary rocks	DOGAMI, 2009
64.77 – 65.44	Columbia	Coast Range	Scappoose Formation (Ts)	Oligocene / Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
65.44 – 70.46	Columbia	Coast Range	Columbia River Basalt Group (Tcrb)	Miocene	Igneous Rock	Basalt	DOGAMI, 2009
70.46 – 70.86	Columbia	Coast Range	Scappoose Formation (Ts)	Oligocene / Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
70.86 – 70.99	Columbia	Coast Range	Columbia River Basalt Group (Tcrb)	Miocene	Igneous Rock	Basalt	DOGAMI, 2009
70.99 – 71.18	Columbia	Coast Range	Scappoose Formation (Ts)	Oligocene / Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
71.18 – 71.60	Columbia	Coast Range	Columbia River Basalt Group (Tcrb)	Miocene	Igneous Rock	Basalt	DOGAMI, 2009
71.60 – 74.04	Columbia	Coast Range	Columbia River Basalt Group (Tcr)	Miocene	Igneous Rock	Basalt	DOGAMI, 2009
74.04 – 74.93	Columbia	Coast Range	Scappoose Formation, Oligocene Sediment (Tos)	Oligocene / Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
74.93 – 78.12	Columbia	Coast Range	Columbia River Basalt Group (Tcr)	Miocene	Igneous Rock	Basalt	DOGAMI, 2009
78.12 – 78.50	Columbia	Coast Range	Scappoose Formation, Oligocene Sediment (Tos)	Oligocene / Miocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
78.50 – 79.18	Columbia	Coast Range	Landslide Deposits (Qls)	Quaternary	Sediments	Mixed grained sediments	DOGAMI, 2009
79.18 – 79.90	Columbia	Coast Range	Pittsburgh Bluff Formation (Tpb)	Oligocene	Marine Sedimentary Rock	Shelf sandstone	DOGAMI, 2009
79.90 – 80.21	Columbia	Coast Range	Cataclysmic Flood Deposits (Qfs)	Quaternary	Sediments	Fine grained sediments. Silt and sand facies.	DOGAMI, 2009

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
80.21 – 80.32	Columbia	Coast Range	Alluvium (Qa)	Quaternary	Sediments	Fine grained sediments	DOGAMI, 2009
80.32 – 80.36	Columbia	Coast Range	Conglomerate (Qtc)	Quaternary	Sediments	Mixed grained sediments	DOGAMI, 2009
80.36 – 81.39	Columbia	Coast Range	Cataclysmic Flood Deposits (Qfg)	Quaternary	Sediments	Coarse grained sediments. Gravel facies.	DOGAMI, 2009
81.39 – 81.45	Columbia	Coast Range	Conglomerate (Qtc)	Quaternary	Sediments	Mixed grained sediments	DOGAMI, 2009
81.45 – 81.49	Columbia	Coast Range	Alluvium (Qa)	Quaternary	Sediments	Fine grained sediments	DOGAMI, 2009
81.49 – 81.51	Columbia	Coast Range	Artificial Fill (af)	Recent	Sediments	Mixed grained sediments	DOGAMI, 2009
81.51 – 81.54	Columbia	Coast Range	Alluvium (Qa)	Quaternary	Sediments	Fine grained sediments	DOGAMI, 2009
81.54 – 81.54	Columbia	Coast Range	Artificial Fill (af)	Recent	Sediments	Mixed grained sediments	DOGAMI, 2009
81.54 – 81.56	Columbia	Coast Range	Alluvium (Qa)	Quaternary	Sediments	Fine grained sediments	DOGAMI, 2009
81.56 – 81.73	Columbia	Coast Range	Artificial Fill (af)	Recent	Sediments	Mixed grained sediments	DOGAMI, 2009
81.73 – 82.05	Columbia	Coast Range	Alluvium (Qa)	Quaternary	Sediments	Fine grained sediments	DOGAMI, 2009
82.05 – 82.~~66~~64	Columbia/ Cowlitz	Coast Range / Portland Basin	Water	N/A	N/A	Columbia River	DNR, 2010
82.~~66~~ 64 – ~~85.08~~86.02	Cowlitz	Portland Basin	Alluvium (Qa)	Quaternary~~Present~~	Sediments~~s~~	Alluvium ~~Sediments~~	DNR, 2010
~~85.08~~86.02 – ~~85.08~~86.55	Cowlitz	Portland Basin	~~Troutdale Formation~~Flood Deposits ~~[PLMc(t)]~~(Qfs)	~~Pliocene / Miocene~~Pleistocene	Sediments~~ / Rocks~~	~~Continental sedimentary deposits or rocks~~Glacial Lake Missoula ~~O~~outburst flood deposits, sand and silt	DNR, 2010

Milepost	County	Physiographic Province	Geologic Unit	Age (Epoch)	Rock Type	Lithology	Reference
~~85.08~~86.55 – ~~85.10~~86.57	Cowlitz	Portland Basin	Alluvium (Qa)~~Volcanic Breccia of Troutdale Formation [QMvb(t)]~~	Quaternary~~Pleistocene / Miocene~~	Sediments~~Igneous Rock~~	Alluvium ~~Basalt flows~~	DNR, 2010
~~85.10~~86.57 – ~~85.23~~86.8~~1~~0	Cowlitz	Portland Basin	Flood Deposits~~Alluvium~~ (~~Qfa~~Qfs)	Pleistocene~~Quaternary~~	Sediments~~ / Rocks~~~~Sediments~~	Glacial Lake Missoula outburst flood deposits, sand and silt~~Outburst flood deposits, sand and silt, late Wisconsinan~~~~Sediments~~	DNR, 2010
~~85.23~~86.81 – ~~85.80~~86.85	~~Cowlitz~~	~~Portland Basin~~	~~Alluvium (Qa)Volcanic Breccia of Troutdale Formation [QMvb(t)]~~	~~Quaternary~~Pleistocene / Miocene	~~Sediments~~Igneous Rock	~~Alluvium~~Basalt flows	~~DNR, 2010~~
~~85.80 – 86.09~~	~~Cowlitz~~	~~Portland Basin~~	~~Troutdale Formation [PLMc(t)]~~	~~Pliocene / Miocene~~	~~Sediment / Rocks~~	~~Continental sedimentary deposits or rocks~~	~~DNR, 2010~~
~~86.09 – 86.27~~	~~Cowlitz~~	~~Portland Basin~~	~~Alluvium (Qa)~~	~~Quaternary~~	~~Sediments~~	~~Sediments~~	~~DNR, 2010~~
~~86.27 – 86.80~~	~~Cowlitz~~	~~Portland Basin~~	~~Flood Deposits (Qfs)~~	~~Pleistocene~~	~~Sediments~~	~~Sediments~~	~~DNR, 2010~~
~~86.80 – 86.84~~	~~Cowlitz~~	~~Portland Basin~~	~~Alluvium (Qa)~~	~~Quaternary~~	~~Sediments~~	~~Sediments~~	~~DNR, 2010~~

Note:

N/A = not applicable

References:

Oregon Department of Geology and Mineral Industries (DOGAMI). 2009. *Oregon Geologic Data Compilation (OGDC) Release 5*. OGDC-5. Compiled by Lina Ma, Ian P. Madin, Keith V. Olson, and Rudie J. Watzig.

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Appendix 6D
Addendum to Horizontal Directional Drilling Feasibility Evaluation Report for Oregon LNG Bidirectional Project

Report

Addendum to Horizontal Directional Drilling Feasibility Evaluation Report for Oregon LNG Bidirectional Project

Prepared for

LNG Development Company, LLC
(d/b/a Oregon LNG)
and
Oregon Pipeline Company, LLC

April 2014

Prepared by

CH2MHILL®

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Acronyms and Abbreviations

bgs	below ground surface
bpf	blows per foot
d/b/a	doing business as
DOGAMI	Department of Geology and Mineral Industries (Oregon)
ESA	Endangered Species Act
HDD	horizontal directional drill/drilling
ID	Identification
LNG	liquefied natural gas
MP	milepost
Oregon LNG	LNG Development Company, LLC, and Oregon Pipeline Company, LLC
Project	Oregon LNG Terminal and Oregon Pipeline
SP-SM	poorly graded sand with silt, gravel, and cobbles
SPT	standard penetration test
U.S.	United States
USACE	U.S. Army Corps of Engineers

Executive Summary

Installations of pipeline using the horizontal directional drilling (HDD) technology associated with the approximate 86.8-mile liquefied natural gas (LNG) pipeline (Pipeline) alignment proposed by LNG Development Company, LLC, and Oregon Pipeline Company, LLC (collectively, Oregon LNG) between Warrenton, Oregon, and Woodland, Washington, are discussed in the *Horizontal Directional Drilling Feasibility Evaluation Report for Oregon LNG Bidirectional Project* (HDD Report) (CH2M HILL, 2013). This addendum to the HDD Report has been prepared to describe minor modifications to two of the proposed HDD crossings addressed in the HDD Report and to document one additional HDD crossing added to the alignment, as summarized in the subsection below and in Table ES-1.

Summary of Crossings

The HDD crossing that has been added to the Pipeline alignment is located at milepost (MP) 0.3 in the City of Warrenton, Oregon. The HDD will cross beneath the flood control dike located south of Youngs Bay. The HDD has been added following guidance provided by the U.S. Army Corps of Engineers (USACE). The HDD method prevents the crossing from harming the integrity of the existing dike and ensures compliance with various federal authorizations, including 33 *United States Code* 408 for dike crossings.

Minor modifications have been made to the proposed HDD crossing of Highway 101 and Adairs Slough at MP 1 and at the crossing of the Columbia River at MP 82.5. The modification for the Highway 101 and Adairs Slough HDD consists of lengthening this HDD from approximately 1,210 feet to about 1,500 feet. The HDD entry and exit lengths will be increased to provide additional cover over the pipeline alignment as it crosses Highway 101 and Adairs Slough. No other changes to this HDD are anticipated.

The modification to the Columbia River HDD involves a minor modification to the alignment and a reduction to the length of the HDD from approximately 6,100 feet to about 5,030 feet. The reduction in the length of the HDD is based on guidance on requirements for crossing the flood control dike east of the Columbia River provided by the USACE and subsequent conversations with an HDD installation contractor. The alignment change results in the east end of the HDD shifting to the north approximately 300 feet.

Summary of Feasibility

This report documents the preliminary HDD feasibility assessment of the additional HDD crossing of the flood control dike at MP 0.3 and the modified HDD crossings of Highway 101 and Adairs Slough and the Columbia River. This includes describing the preliminary geotechnical field exploration program performed and site conditions along each of these crossing alignments. Conclusions about the feasibility of successfully completing these HDD installations, along with an assessment of the risk of inadvertent release of drilling fluids, is provided based on information available at the time of this report preparation.

Based on existing information, it appears that the additional proposed HDD crossing of the flood control dike at approximate MP 0.3 is feasible. Modifications to the HDD crossings of Highway 101 and Adairs Slough and the Columbia River result in an overall improvement to the evaluated feasibility of successful completion of the crossings and a reduction in the anticipated risk of inadvertent release of drilling fluids for each of these two locations.

TABLE ES-1
Summary of Proposed Additional and Modified Horizontal Directional Drilling Crossings

HDD ID Number	HDD Location (Main Obstacle being Crossed)	MP		Approximate Crossing Length (feet)	Crosses Streams with ESA Listed Fish?	IDs of ESA Streams Crossed	Geotechnical Borings Advanced Near Alignment (Number)
		Begin	End				
1	Flood Control Dike at Pipeline MP 0.3	0.3	0.6	1,450	No	NA	Yes (2)
2	Highway 101 and Adairs Slough at Pipeline MP 1	0.9	1.2	1,480	Yes	S5BCL081B	Yes (2)
12	Columbia River at Pipeline MP 82.5	81.9	82.8	5,030	Yes	S99BCO014	Yes (2)

ESA = Endangered Species Act

NA = Not Applicable

SECTION 1

Introduction

LNG Development Company, LLC, and Oregon Pipeline Company, LLC (collectively, Oregon LNG) seeks to supplement its application to the Federal Energy Regulatory Commission to reflect modifications to the proposed route of the Pipeline resulting from consultations with various local, state, and federal agencies. The modifications consist of an additional proposed horizontal directional drilling (HDD) crossing of a flood control dike at milepost (MP) 0.3 and minor modifications to the previously discussed HDD crossings of Highway 101 and Adairs Slough at MP 1.0 and of the Columbia River at MP 82.5.

1.1 Purpose

Evaluations of the feasibility of utilizing HDD techniques to install portions of the Pipeline at 12 locations associated with the Project are provided in the *Horizontal Directional Drilling Feasibility Evaluation Report for Oregon LNG Bidirectional Project* (HDD Report) (CH2M HILL, 2013). The purpose of this addendum to the HDD Report is to discuss the feasibility of using HDD technique to install the pipeline at a new location, not previously evaluated, and two locations where minor modifications to the previously proposed alignments have been made. Specifically this supplemental report addresses HDD installation of pipeline at the following locations:

- Flood control dike at Pipeline MP 0.3 (not previously evaluated)
- Highway 101 and Adairs Slough at MP 1.0 (minor modification)
- Columbia River at MP 82.5 (minor modification)

A discussion of the conditions and feasibility of completing installation of pipe at other HDD locations along the Pipeline, including project information, information on the HDD installation technique, a summary of the locations where this technique is being considered, pipeline safety standards, and mitigation methods to be used to limit the potential for inadvertent release of drilling fluids is provided in the HDD Report (CH2M HILL, 2013).

This report contains a discussion of subsurface and site conditions for the additional and modified HDD crossings. An assessment of the feasibility of successfully completing the three HDD installations discussed in this report is provided based on all available information.

1.2 Modifications to Horizontal Directional Drilling Locations

The Project proposes HDD crossings at 12 separate locations along the Pipeline alignment. In addition, one HDD crossing of the Skipanon River is proposed to carry utility services from the City of Warrenton to the Terminal. The proposed HDD locations are shown on Project overview maps in Figures 1-1 and 1-2. Table 1-1 presents the HDD crossing locations addressed in this document. The first column in Table 1-1 contains the HDD identification (ID) number that correlates with the HDD ID shown in the tables in Figures 1-1 and 1-2.

TABLE 1-1
New and Modified Horizontal Directional Drilling Locations

HDD ID Number	HDD Location (Main Obstacle being Crossed)	MP		Approximate Crossing Length (feet)	Crosses Streams with ESA-Listed Fish?	Crosses USACE Flood Control Dike?
		Begin	End			
1	Flood Control Dike at Pipeline MP 0.3	0.3	0.6	1,450	No	Yes
2	Highway 101 and Adairs Slough at Pipeline MP 1	0.9	1.2	1,480	Yes	Yes
12	Columbia River at Pipeline MP 82.5	81.9	82.8	5,030	Yes	Yes

ESA = Endangered Species Act

1.3 Limitations

This report has been prepared for specific application to the Oregon LNG Project in Oregon and Washington. It has been prepared in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The geotechnical data contained in this report are based on the soil and rock borings performed during the 2008, 2009, and 2012 geotechnical exploration programs. Exploration data indicate soil conditions and water levels only at specific locations and times, and only to the depths penetrated. Subsurface conditions and water levels at other locations may differ from conditions occurring at these explored locations. The passage of time may result in a change in conditions at these locations.

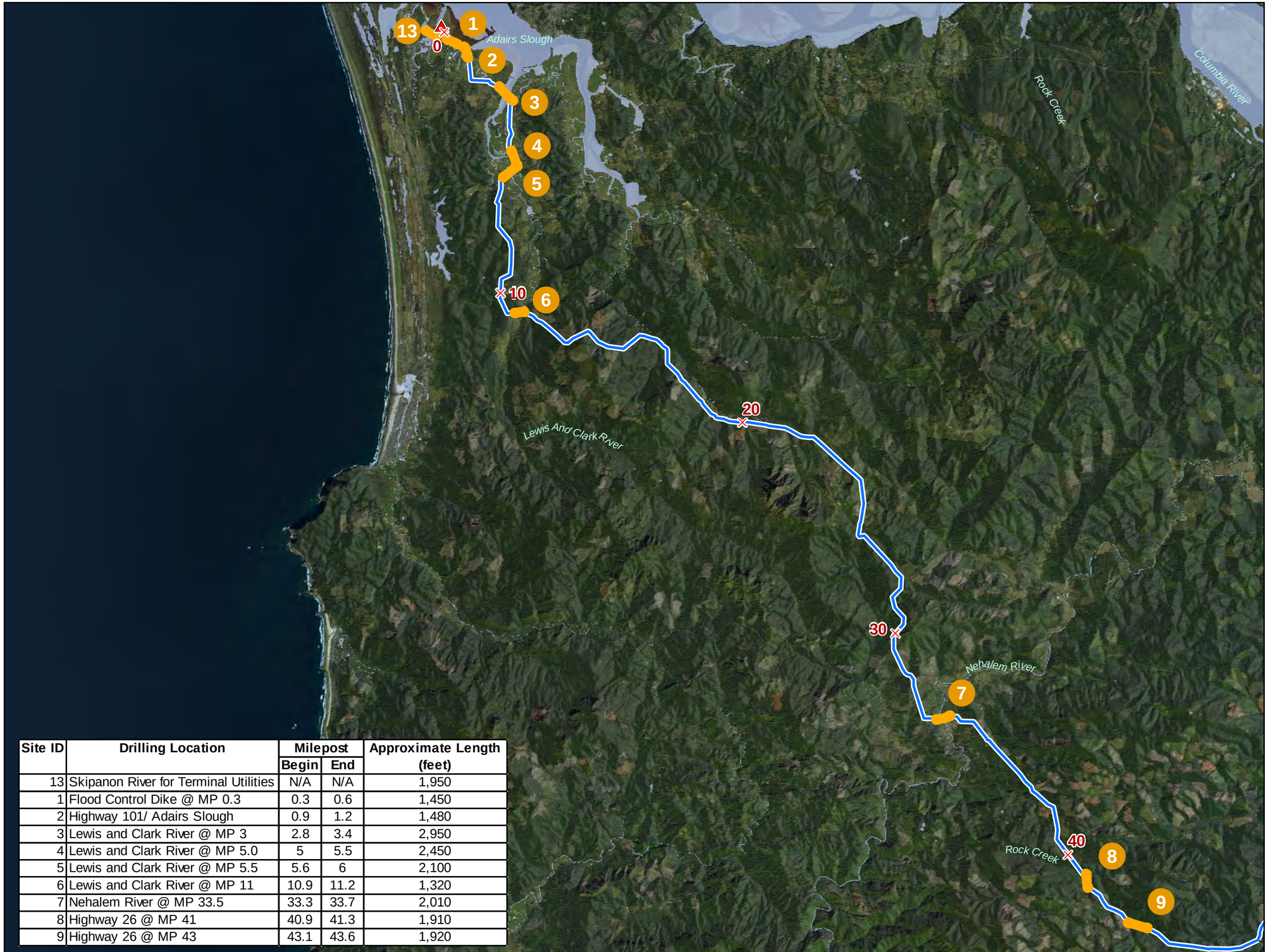
The opinions related to feasibility of HDD success and risk of inadvertent release of drilling fluid to the surface are provided based on the following:

- Topographic, geologic, and subsurface information available at the time of the report preparation
- Discussions with HDD contractors familiar with the ground conditions in northwest Oregon and southwest Washington
- Capabilities of the HDD technology

Recommendations are provided for obtaining additional site and geotechnical information that will allow for a more thorough evaluation of the feasibility of the proposed HDDs.

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.

Figure 1-1
HDD Location Overview
(MP 0.0 - 47.5)



Site ID	Drilling Location	Milepost		Approximate Length (feet)
		Begin	End	
13	Skipanon River for Terminal Utilities	N/A	N/A	1,950
1	Flood Control Dike @ MP 0.3	0.3	0.6	1,450
2	Highway 101/ Adairs Slough	0.9	1.2	1,480
3	Lewis and Clark River @ MP 3	2.8	3.4	2,950
4	Lewis and Clark River @ MP 5.0	5	5.5	2,450
5	Lewis and Clark River @ MP 5.5	5.6	6	2,100
6	Lewis and Clark River @ MP 11	10.9	11.2	1,320
7	Nehalem River @ MP 33.5	33.3	33.7	2,010
8	Highway 26 @ MP 41	40.9	41.3	1,910
9	Highway 26 @ MP 43	43.1	43.6	1,920

OregonLNG

LEGEND

- Pipeline Route Milepost
- Oregon LNG Terminal Location
- Pipeline Route
- Proposed HDD Location
- HDD ID Number
- Highway

N

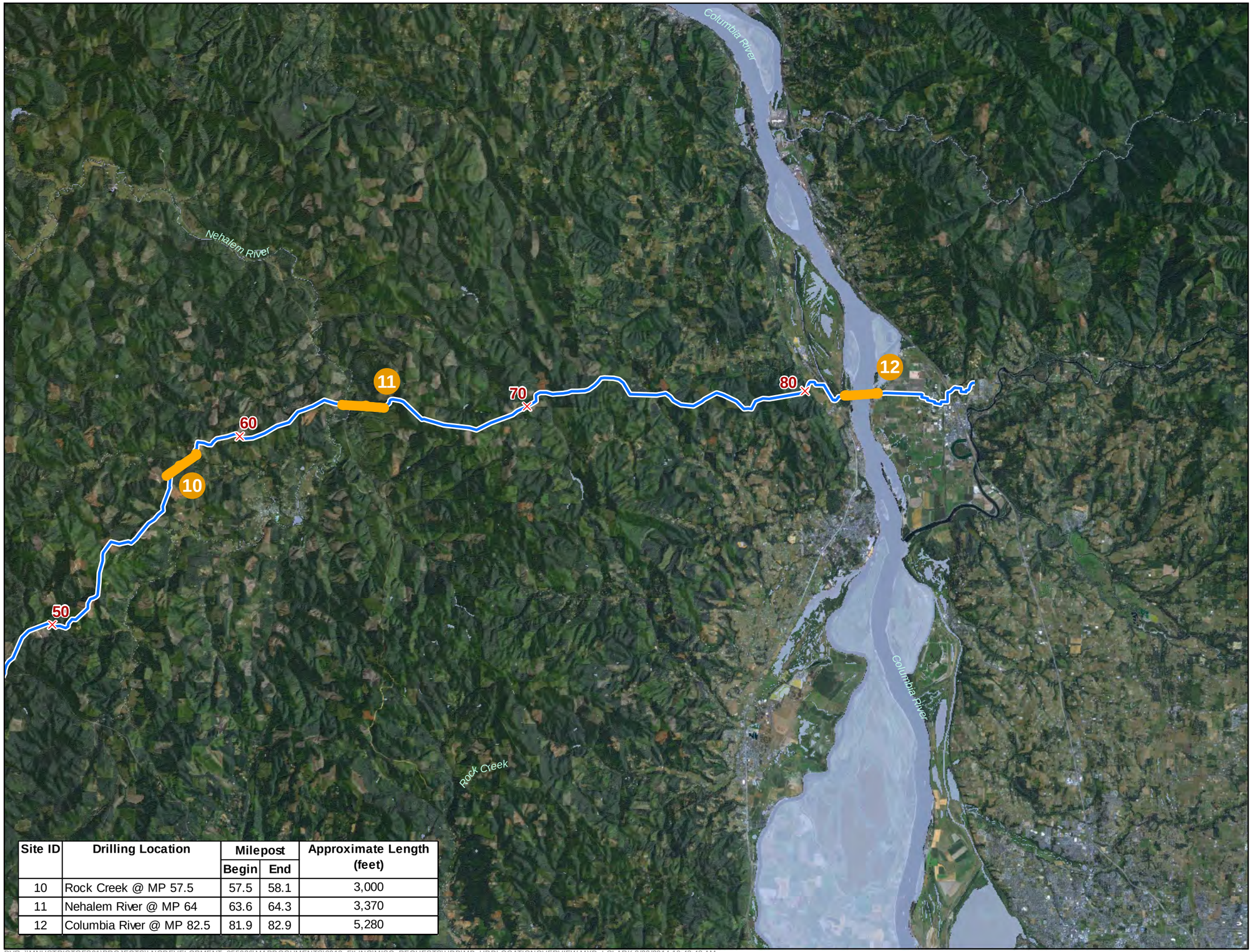
0 2 4
Miles

CH2MHILL.

DVR \\MNUSTRICTGFS01\PROJECTS\LNGDEVELOPMENT_355036\MAPDOCUMENTS\2013_FILING\MISC_REQUESTS\HDD\MB_HDDLOCATIONOVERVIEW.MXD LCLARK 3/20/2014 10:37:16 AM

Figure 1-2
HDD Location Overview
(MP 47.5 - 86.8)

OregonLNG



Site ID	Drilling Location	Milepost		Approximate Length (feet)
		Begin	End	
10	Rock Creek @ MP 57.5	57.5	58.1	3,000
11	Nehalem River @ MP 64	63.6	64.3	3,370
12	Columbia River @ MP 82.5	81.9	82.9	5,280

LEGEND

- Pipeline Route Milepost
- Pipeline Route
- Proposed HDD Location
- HDD ID Number
- Highway

N

0 2 4
Miles

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DVR \\MNUSTRICTGFS01\PROJECTS\LNGDEVELOPMENT_355036\MAPDOCUMENTS\2013_FILING\MISC_REQUESTS\HDD\MB_HDDLOCATIONOVERVIEW.MXD LCLARK 3/20/2014 10:43:48 AM

SECTION 2

Preliminary Geotechnical Exploration

The preliminary geotechnical field exploration program for the proposed Project was conducted between October 2008 and March 2009 and February and April 2012. The explorations consisted of advancing a total of 21 borings in the vicinity of proposed HDD locations. Geotechnical borings were advanced where access to private land was granted by property owners or where borings could be advanced from public highways or roads. Details of the preliminary geotechnical field exploration program are provided in the HDD Report (CH2M HILL, 2013). Subsurface conditions encountered in the borings advanced in the vicinity of the three HDD crossings are discussed in Section 3 of this document.

SECTION 3

Horizontal Directional Drilling Crossing Conditions

Surface and subsurface conditions at the added HDD crossing of the flood control dike at MP 0.3 and the modified HDD crossing locations of Highway 101 and Adairs Slough at MP 1.0, and the Columbia River at MP 82.5 are provided in this section. Discussions of subsurface conditions include information from published geologic mapping, groundwater observations, and conditions observed in geotechnical borings when those borings were advanced in the vicinity of the crossings. Based on this information, interpretations of the geologic conditions at these crossing locations are provided.

The horizontal and vertical HDD alignments discussed in the following sections are preliminary based on the current Pipeline route and existing geologic and geotechnical subsurface information. Figures A-1 through A-3 in the Appendix show the preliminary vertical alignments of the proposed HDD crossings discussed in this document. These figures show the preliminary entry and exit angles that have been established for the HDD alignments, along with the depth of cover that will exist between the HDD installed pipeline and existing ground surface or water features. Assessments of the feasibility of successfully completing HDD at each of the proposed locations are provided in Section 5 of this document.

Geotechnical borings were advanced in the vicinity of the added HDD location and both of the modified HDD locations. This is documented in the HDD Report (CH2M HILL, 2013); specifically, logs of each boring are provided in Appendix A, photographs taken at select boring locations are provided in Appendix B, and laboratory test results are provided in Appendix C.

3.1 Flood Control Dike Crossing at Milepost 0.3

The proposed HDD crossing discussed in this memorandum will extend between approximate MP 0.3 and 0.6 along the Pipeline alignment and will have a length of approximately 1,450 feet. It is in the City of Warrenton, Oregon, in Clatsop County. The HDD will travel beneath wetlands and the flood control dike at approximate MP 0.3 as shown in Figure 3-1. The west end of the HDD alignment is located southeast of the Oregon LNG Terminal and the east end is located on the water side of the flood control dike on the south side of Youngs Bay. Based on the preliminary alignment and HDD profile, this HDD traverse is expected to cross about 40 to 50 feet beneath the dike. The preliminary horizontal and vertical profile of the flood control dike at MP 0.3 HDD is shown in the Appendix, Figure A-1.

3.1.1 Surface Conditions

The property along the HDD alignment consists primarily of undeveloped land maintained by the Port of Astoria that is covered with dune grasses, shrubs, and bushes. The ground surface along the HDD alignment is generally flat to slightly sloping with the elevations on the water side of the dike ranging from about 5 to 7 feet and the elevations inside the dike ranging from 10 to 13 feet.

At this time it is expected that the relatively short HDD will originate on the east end of the alignment on the water side of the dike and will proceed to the west. This could change, however, if it is determined that high tides would pose a risk to the HDD equipment located outside the dike.

3.1.2 Subsurface Conditions

3.1.2.1 Geologic Mapping

According to surficial geologic mapping of the flood control dike crossing location (DOGAMI, 1985), Quaternary alluvium (Holocene) is present at the ground surface. This consists of unconsolidated floodplain deposits of clay, silt, sand, and basalt gravel along and in major rivers and streams.

Geotechnical Borings. One geotechnical boring was drilled in the vicinity of the dike crossing location in October 2008 to obtain information on the subsurface conditions. The boring, designated ASBH-A, was advanced from the

top of the flood control dike approximately 600 feet to the southeast of the proposed HDD alignment. The location of the boring is presented in Figure 3-1.

Boring ASBH-A was drilled to a depth of 86.5 feet depth. A log of the boring and results of laboratory testing conducted on representative samples collected from the boring are provided in Appendixes A and C, respectively, of the HDD Report (CH2M HILL, 2013). Beginning from the ground surface downward, the generalized soil profile for this boring consisted of the following:

- Sandy silt (ML) to elastic silt (MH)—This layer extended to a depth of 24 feet below ground surface (bgs). The sandy silt is generally light brown in color and the elastic silt is gray in color. The material in this upper zone was generally moist to slightly wet, contains varying amounts of organics throughout and an estimated 5 to 40 percent fine-grained sand. The uncorrected field standard penetration test (SPT) N-values were all 0 blows per foot (bpf), indicating a very soft soil consistency.
- Alternating layers of silty sand (SM), sand (SP), and sand with silt (SP-SM)—The material encountered beneath the upper layer to a depth of approximately 57 feet consisted predominantly of poorly graded sand with silty sand at the top and bottom of the zone. The material was generally gray, wet, contained fine- to coarse-grained sand, and up to approximately 25 percent fines. The uncorrected field SPT N-values ranged from 11 to 47 bpf (average of 34) in the sand and sand with silt, indicating medium dense to dense consistency. N-values in the silty sand were 15 and 26, indicating medium dense consistency. The material encountered from 57 to 81 feet bgs consisted of alternating layers of sand and silt (the silt had low to high plasticity), then dense clean sand from 81 feet bgs to the bottom of the hole at 86.5 feet bgs. The uncorrected field SPT N-values typically ranged from 11 to 48 bpf in the sand material and 0 to 5 in the silt material.

Based on the ASBH-A boring and other borings drilled at the Terminal location and closer to Highway 101, there appears to be a surficial layer of soft silt approximately 20 to 25 feet thick throughout the HDD crossing alignment. Beneath this layer, there appears to be alternating layers of silt and sand.

Groundwater Conditions. The groundwater level along the proposed HDD alignment is expected to be shallow and closely tied to the water levels in Youngs Bay. Tidal fluctuations will likely have an impact on groundwater levels.

Geologic Interpretation. The subsurface profile along the HDD crossing likely contains several hundred feet of unconsolidated alluvium deposited by the Columbia, Youngs, Lewis and Clark, and Skipanon Rivers as a result of the Missoula flood events and later deposition of sediments from erosion throughout the Cascade and Coast Ranges. It is expected that shallow groundwater will be encountered along this HDD alignment. An additional geotechnical boring should be drilled at the proposed entry point near MP 0.2 and from the top of the flood control dike near MP 0.4 to gather site-specific information that can be used to confirm the subsurface conditions encountered in boring ASBH-A and in the HDD crossing design.

3.2 Highway 101 and Adairs Slough Crossing at Milepost 1.0

This proposed HDD crossing of Highway 101 and Adairs Slough will extend between approximately Pipeline MP 0.9 and 1.2 and will have a length of approximately 1,480 feet. The HDD will travel beneath Highway 101 and Adairs Slough, as shown in Figure 3-2. The southeast end of the HDD alignment is near the west end of the Astoria Regional Airport. The current alignment includes a minor modification to the original alignment that was discussed in the HDD Report (CH2M HILL, 2013). The modification was made to move the HDD exit approximately 270 feet further to the southeast. This modification increased the total length of the HDD and allowed the HDD alignment to extend further below the ground surface.

Because of layout constraints associated with the airport, this HDD traverse will originate from the north end and be drilled towards the south. Based on the preliminary alignment, this HDD traverse is expected to cross about 60 to 70 feet beneath Adairs Slough. The preliminary horizontal and vertical profile of the Highway 101/Adairs Slough HDD is shown in the Appendix, Figure A-2.

3.2.1 Surface Conditions

The property along the Highway 101/Adairs Slough HDD alignment consists primarily of undeveloped land maintained by the Port of Astoria that is covered with dune grasses, shrubs, and bushes. Except for the west approach embankment to the New Youngs Bay Bridge and the slopes near Adairs Slough, the ground surface along the HDD alignment is generally flat with ground elevation typically at about 10 feet, but ranging from a high of 15 to 17 feet at Highway 101 and the west approach embankment to the New Youngs Bay Bridge to a low of just slightly above sea level at the water bodies that are crossed. The HDD entry and exit points are located at elevation of approximately 10 feet. Adairs Slough is thought to be approximately 10 feet deep, making it the lowest point along the alignment.

The HDD will originate on the south shore of Youngs Bay and northwest of the west approach embankment to the New Youngs Bay Bridge, and will proceed to the southeast. The HDD alignment will proceed beneath Highway 101 and Adairs Slough before being directed toward the surface where it will terminate as shown in Figure 3-2.

3.2.2 Subsurface Conditions

3.2.2.1 Geologic Mapping

The proposed Highway 101/Adairs Slough crossing is located in the Coast Range physiographic province.

According to surficial geologic mapping of the Highway 101/Adairs Slough crossing location (DOGAMI, 1985), Quaternary alluvium (Holocene) is present at the ground surface. This consists of unconsolidated floodplain deposits of clay, silt, sand, and basalt gravel along and in major rivers and streams.

3.2.2.2 Geotechnical Borings

Two geotechnical borings were drilled in the vicinity of the Highway 101/Adairs Slough crossing location in October 2008 to obtain information on the subsurface conditions. These borings were designated ASBH-B and ASBH-C. Boring ASBH-A was also advanced in October 2008 at the northwest end of a previously proposed crossing, but is considered too far from the realigned entry point. Boring ASBH-B was drilled approximately 1,600 feet to the west of the proposed realigned entry point, and ASBH-C were drilled approximately 1,200 feet to the south off the proposed realigned exit point. The locations of the borings are presented in Figure 3-2.

Boring ASBH-B was drilled on top of a constructed flood control dike that was approximately 10 to 15 feet above water connected to Youngs Bay. Boring ASBH-C was drilled in a grassy field adjacent to the westernmost runway at the Port of Astoria airport. Beginning from the ground surface downward, the generalized soil profile for these two borings consisted of the following:

- Silt (ML) to elastic silt (MH)—This material was observed in both borings. This layer extended to respective depths of 18 and 20 feet bgs in borings ASBH-B and ASBH-C. The silt is generally light brown or gray in color, moist to wet, low to high plasticity, contains varying amounts of organics, and an estimated 5 to 20 percent fine-grained sand. The uncorrected field SPT N-values ranged from 0 to 2 bpf, indicating a very soft to soft soil consistency.
- Alternating layers of silt (ML), sand (SP), and sand with silt (SP-SM)—Beneath the upper silt layer, the two borings contained varying amounts of silt and sand. The material encountered was generally gray, wet, contained fine-grained sand and contained low to medium plasticity fines. Boring ASBH-B was advanced inland from Youngs Bay and encountered alternating layers of silt and sand from 18 feet bgs to the bottom of the hole at 86.5 feet bgs. The silt had low to high plasticity. The uncorrected field SPT N-values typically ranged from 1 to 12 bpf (occasionally as high as 41 bpf) in the sand material and 0 to 9 bpf in the silt material. The soil layers appear to alternate every 2 to 5 feet. Boring ASBH-C was located farther inland from Youngs Bay and encountered the least amount of sand. This boring contained predominantly alternating layers of silt and silt with sand. Very occasional thin lenses of sand were encountered. The uncorrected field SPT N-values typically ranged from 0 to 9 bpf.

Based on these two borings, there appears to be a surficial layer of soft silt approximately 20 feet thick throughout the Highway 101/Adairs Slough crossing area. Beneath this layer, there appears to be alternating

layers of silt and sand, with the portion of the crossing closest to Youngs Bay containing predominantly sand and transitioning to predominantly silt at the farthest portion of the crossing from Youngs Bay.

Subsurface information developed during design of the Youngs Bay Bridge on Highway 101 between Warrenton and Astoria, Oregon, was obtained from the Oregon Department of Transportation. This information included simplified logs for a number of borings advanced in 1962, the closest of which was located approximately 5,400 feet north of the proposed HDD crossing. The soil profile on the foundation datasheet shows similar conditions to what was encountered in the borings advanced as part of this project. The foundation datasheet for the Youngs Bay Bridge is included in Appendix E of the HDD Report (CH2M HILL, 2013).

3.2.2.3 Groundwater Conditions

The groundwater level along the proposed HDD alignment is expected to be shallow and closely tied to the water levels in Adairs Slough and Youngs Bay. Tidal fluctuations will likely have an impact on groundwater levels. At ASBH-C, visual observation of the soil samples during drilling indicated that the groundwater level was approximately 15 to 20 feet bgs.

3.2.2.4 Geologic Interpretation

The subsurface profile along Highway 101/Adairs Slough HDD crossing likely contains several hundred feet of unconsolidated alluvium deposited by the Columbia, Youngs, Lewis and Clark, and Skipanon Rivers as a result of the Missoula flood events and later deposition of sediments from erosion throughout the Cascade and Coast Ranges. It is expected that shallow groundwater will be encountered along this HDD alignment. An additional geotechnical boring should be drilled at the proposed entry point at MP 0.9 to gather site-specific information that can be used to confirm the subsurface conditions encountered in boring ASBH-B and in the HDD crossing design.

3.3 Columbia River Crossing at Milepost 82.5

The proposed Columbia River crossing is located at the southern end of Deer Island, about 1 mile north of Columbia City, Oregon, in Columbia County, and about 2.5 miles northwest of Woodland, Washington, in Cowlitz County. The proposed HDD crossing is approximately 5,030 feet long and extends from approximately MP 81.9 to 82.8. The current alignment (shown in Figure 3-3) includes a modification to the original alignment that was discussed in the HDD Report (CH2M HILL, 2013). The modification was made to shorten the length of the HDD from about 6,100 feet to about 5,030 feet. The west end of the original alignment is shifted about 180 feet to the east. The larger change occurs on the east end and consists of moving the east end approximately 650 feet toward the west. This change will result in the east end of the alignment being located west of Dike Access Road. Dike Access Road is located on the crest of the flood control dike. The east end of the alignment has also been shifted slightly to the north. This will result in less impact to trees located east of the Dike Access Road.

Locating the east end of the HDD west of the Dike Access Road will require that the undercrossing of the Dike Access Road (and flood control dike) be accomplished using a auger-bore or other trenchless installation method. The decision to shorten the length of the HDD was made based on guidance on requirements for crossing the flood control dike east of the Columbia River provided by the USACE and subsequent conversations with an HDD installation contractor. The HDD installation contractor, Laney Directional Drilling, suggested that it would be easier to meet USACE requirements for the crossing of the dike if it were not included with the HDD crossing of the Columbia River (Snider, 2014, personal communication). The contractor indicated that the HDD crossing of the Columbia River was feasible and that the reduction in the overall length would decrease the potential for inadvertent release of drilling fluid associated with the crossing. The contractor also indicated that it would be possible to locate the HDD pullback area for constructing and testing the pipeline prior to installation, east of the Dike Access Road. The pullback process would require a short closure of the Dike Access Road, or cranes would be used to suspend the pipeline over the road during the pullback to prevent interruption of traffic on the road.

The HDD will originate on the west side of the river, on Deer Island. The pipe layout area is on the eastern, or Washington, side of the Columbia River. The maximum depth would likely be approximately 80 to 85 feet beneath

the main Columbia channel. The proposed HDD is shown in Figure 3-3 and the preliminary horizontal and vertical profile is shown in the Appendix, Figure A-3.

3.3.1 Surface Conditions

The western end of the HDD on Deer Island is adjacent to the Deer Island Dike access road. The area is relatively flat and vegetated with grass and deciduous trees. The dike access road and Pipeline are adjacent to the Deer Island Stock Ranch Trust to the north.

The Columbia River banks in this location consist of sand and silt, gently sloping upward from the channel bottom to the shore. The area has been extensively altered for sand and gravel mining, as well as a variety of small channels for agricultural drainage and industrial outlets. The east side laydown area consists of level agricultural fields cut through by a drainage ditch.

3.3.2 Subsurface Conditions

3.3.2.1 Geologic Mapping

According to surficial geologic mapping (Evarts, 2002), the crossing area is underlain by recent alluvium consisting of unconsolidated, poorly sorted to well-sorted, massive to laminated, commonly cross-stratified sand, silt, and minor gravel of the Columbia River floodplain and local accumulations of poorly to moderately sorted, crudely stratified sand and gravel. Locally, this may include fine grained lacustrine and organic-rich marsh deposits as well as unmapped deposits of artificial fill. The modern alluvial deposits are underlain by older (late Miocene and Pliocene) alluvial deposits of the ancestral Columbia River. The fluvial sediments were deposited on top of a really extensive lava flows of the Columbia River Basalt Group. The basalt flows overlie marine sedimentary rocks. Exposures of deeply weathered, massive, friable, well-bedded, fine- to coarse-grained tuffaceous, arkosic and lithic sandstone, siltstone, mudstone, tuff, and conglomerate are mapped at the ground surface on the slopes west of the crossing and appear to be present at depth.

3.3.2.2 Geotechnical Borings

Two geotechnical borings were drilled at the Columbia River MP 82.5 crossing location, CR-1 and CR-4. Boring CR-1 was drilled on Deer Island, on the west shore of the main Columbia River channel, while CR-4 was drilled on the eastern bank of the main channel.

The borings indicate that the upper 85 feet (above elevation -85) consists of loose to medium dense poorly graded sand (SP) and poorly graded sand with silt (SP-SM), with limited layers of poorly graded gravel with silt and sand (GP-GM). The sand is primarily dark brown and dark gray becoming light gray with depth, predominantly fine-grained sand with occasional coarse grains, and sub-round gravels up to 1.5 inches in size. Occasional wood fragments and weakly cemented sand pieces up to 1 inch in size are also present.

Between depths of 85 feet and 110 feet (elevations -73 and -98) on the west bank, the alluvium becomes medium dense to dense with more gravel and slightly more coarse sand. On the east bank, between depths of 80 and 90 (elevations -73 and -83) the material transitions to soft to very stiff silt (ML) and lean clay (CL).

A fractured basalt layer was encountered at a depth of 110 feet (elevation -98) on the west bank and 90 feet (elevation -83) on the east bank, that may dip to the west. Coring of the basalt was not possible because of hole collapse and risk of sand lock through the overlying alluvium, so the borings were advanced into the basalt with a 4-7/8 inch tricone bit and mud rotary drilling techniques. The boring on the west bank (CR-1) was terminated without penetrating the bottom of the basalt at a depth of 120 feet (elevation -108). At a depth of 104 feet (elevation -97) on the east bank (boring CR-4) the basalt ended and was underlain by very dense or hard silty sand (SM) to lean clay (CL), greenish gray and reddish brown, with medium to high plasticity.

Figure 3-3 shows the boring locations at the proposed crossing location.

3.3.2.3 Groundwater Conditions

Groundwater at the proposed entry and exit points is anticipated to be near the ground surface and is influenced by the water level in the adjacent Columbia River, which will fluctuate seasonally. The alluvium penetrated by the bore is anticipated to be of moderate to high permeability. Because of the fractured character of the basalt, it is likely to be of moderate to high permeability. The underlying silty sand and lean clay with sand is likely to have low permeability.

Groundwater levels typically fluctuate throughout the year. Therefore, groundwater levels at the Project site during construction may be different than what was noted during this field exploration program, and are expected to be directly related to the river level.

3.3.2.4 Geologic Interpretation

The subsurface conditions are interpreted to be alluvial sediments, underlain by Columbia River basalt, underlain by marine sedimentary rock. The coarser sediments observed just above the top of the basalt in boring CR-1 are likely to be glacial flood deposits. The very soft silt to stiff silt and clay encountered above the basalt in CR-4 are likely to be marsh deposits. At least two additional borings in the river and one additional boring at the west bank are needed that penetrate at least 50 feet below the bottom of the basalt to confirm the suitability of conditions for an HDD crossing at this location.

PUBLIC

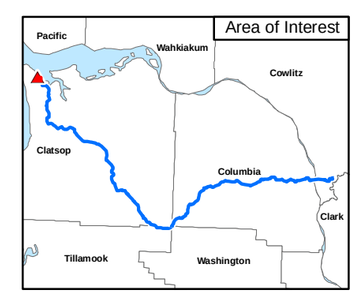
Figure 3-1

HDD Feasibility Assessment - Flood Control Dike at MP 0.3

OregonLNG

LEGEND

- Completed Boring Location
- Pipeline Route Milepost (Qtr Mile)
- Pipeline Route
- Stream
- Proposed Limits of Horizontal Directional Drill



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PUBLIC

Figure 3-2

HDD Feasibility Assessment - Highway 101/Adairs Slough at MP 1.0

OregonLNG

LEGEND

- Completed Boring Location
- Pipeline Route Milepost (Qtr Mile)
- Pipeline Route
- Stream
- Proposed Limits of Horizontal Directional Drill

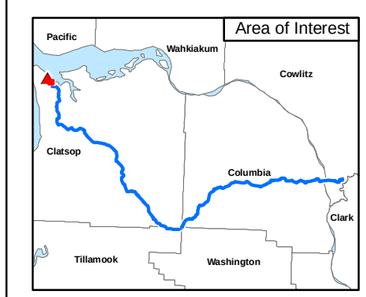

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Figure 3-3

HDD Feasibility Assessment - Columbia River at MP 82.5

OregonLNG

LEGEND

- Completed Boring Location
- Pipeline Route Milepost (Qtr Mile)
- Pipeline Route
- Proposed Limits of Horizontal Directional Drill

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SECTION 4

Horizontal Directional Drilling Feasibility Assessment

This section discusses the feasibility of completing HDD at each of the proposed HDD crossing locations. Feasibility is evaluated for the following conditions:

- Successfully completing the crossing to allow for installation of the Pipeline using the HDD technology
- Successfully completing the crossing without an inadvertent release of drilling fluid

Conditions that may make successful completion of HDD installation more difficult, or that may require special drilling equipment, materials, or techniques are described where these conditions are known or anticipated.

Assessment of HDD feasibility and the risk of inadvertent release of drilling fluid are being made using surface and subsurface information available at the time of this report preparation as described here-in. Additional geotechnical and geologic investigation and evaluation should be performed at all of the proposed HDD locations prior to final assessment of feasibility. Utility investigations need to be performed at each site to avoid conflicts between existing utilities and the final HDD alignments. More thorough and detailed site surveys and field reconnaissance should be performed for each of the proposed HDD locations to develop more accurate surface topography and to look for signs of other possible subsurface obstructions such as steel or timber piles. A site survey should include bathymetric mapping of significant water bodies where they are to be crossed by the HDD installation. Completion of Phase I environmental site assessments should be considered for proposed HDD locations to help identify subsurface contamination that may be encountered along the proposed alignments.

Based on existing information, it appears that each of the proposed HDDs is feasible. Additionally, it appears that the proposed HDD installations can be completed with low risk of inadvertent release of drilling fluid to streams or rivers with Endangered Species Act (ESA) listed fish. The risk of inadvertent release to other non-ESA streams is also considered to be low. The risk of inadvertent release of drilling fluid is considered to be low to moderate at this site.

The following general activities are suggested at each HDD location to manage and minimize the risk of drilling fluid release:

- Performing additional geologic and geotechnical explorations at each of the proposed HDD crossings
- Performing additional laboratory testing of soil and rock samples to further define strength and engineering properties of subsurface materials
- Performing additional evaluation of subsurface conditions and associated HDD alignments, including checks for inadvertent release at suspect locations
- Prequalifying HDD contractors and placing more stringent qualifications on HDD crossings judged to be more challenging or requiring special construction techniques
- Requiring the HDD contractor to prepare and submit fluid monitoring programs and inadvertent release prevention plans on each of the HDD crossings
- Requiring the use of special HDD equipment for drilling where the equipment will result in the higher likelihood of installation success or a lower risk of inadvertent release

4.1 Flood Control Dike Crossing at Milepost 0.3

Based on available site and subsurface information, the proposed HDD crossing of flood control dike at MP 0.3 appears to be feasible. The soil encountered in the boring advanced in the vicinity of this crossing is generally soft and will be easy to drill. The relatively short length of the HDD will improve the potential for successful completion of the project. The risk of encountering subsurface soil that varies significantly from what was encountered during drilling is considered low.

Additional information about the ground surface elevations on the water side of the flood control dike and tidal fluctuations that could impact the construction of the HDD is needed. Additional subsurface information should also be collected and analyzed as part of final design to confirm that subsurface conditions do not vary significantly and to confirm that the HDD is drilled at sufficient depth to minimize the risk of inadvertent release of drilling fluids into water bodies. The risk of liquefaction at this location, although not a hindrance to successful completion of the HDD installation, is considered high and will need to be further evaluated in the Pipeline design phase.

4.2 Highway 101 and Adairs Slough Crossing at Milepost 1.0

Based on available site and subsurface information, the proposed HDD crossing of Highway 101 and Adairs Slough appears to be feasible. The soil encountered in the two borings advanced along this crossing is generally soft and will be easy to drill. However, the soft and unconsolidated nature of the soil material also necessitates that the vertical alignment of this HDD traverse be set relatively deep to achieve additional confinement to reduce the risk of inadvertent release of drilling fluids. The modification to lengthen the alignment allows for the pipeline to be installed at a deeper depth, which also reduces the risk of an inadvertent release of drilling fluid. The risk of encountering subsurface soil that varies significantly from what was encountered during drilling is considered low.

The preliminary vertical alignment of this traverse has been established to result in about 60 to 70 feet of confinement between the bottom of Adairs Slough and the HDD bore. Site conditions appear to allow for a deeper depth of installation if future analyses suggest that added confinement is warranted; however, the relatively short length of the proposed crossing and minimum pipeline radius may prevent a deeper depth. Additional information and understanding of the bathymetry of Adairs Slough is needed. Additional subsurface information should be collected and analyzed, particularly at the proposed entry point on the south shore of Youngs Bay, as part of final design to confirm that subsurface conditions do not vary significantly and to confirm that the HDD is drilled at sufficient depth to minimize the risk of inadvertent release of drilling fluids into water bodies. The risk of liquefaction at this location, although not a hindrance to successful completion of the HDD installation, is considered high and will need to be further evaluated in the Pipeline design phase.

4.3 Columbia River Crossing at Milepost 82.5

The proposed HDD Columbia River crossing at MP 82.5 will be challenging, but appears to be feasible. The basalt layer present from approximately elevation -98 to below -108 at the west bank and elevation -83 to -97 at the east bank poses an obstacle to shallow angle penetration by the HDD bore. Detailed bathymetry has not been collected for the crossing, but the maintained channel depth in this area is 43 feet. An HDD bore set above the basalt might only have 30 to 40 feet of cover if the channel migrates to the east side of the river. Therefore, the bore will have to penetrate below the basalt, where it would be at least 135 feet below the normal river surface and roughly 90 feet below the maintained channel bottom. The bore length would be on the order of 5,030 feet.

The proposed pipe profile is shown in the Appendix, Figure A-3. This profile involves the difficulty of penetrating the basalt and possible grade control issues during reaming, but is preferred because of the high risk of inadvertent release of drilling fluids in the river with a pipe profile completely above the basalt layer. At least two additional borings in the river and one additional boring at the west bank are needed that penetrate at least 50 feet below the bottom of the basalt to confirm the suitability of conditions for an HDD crossing at this location.

The risk of encountering subsurface soil that varies significantly from what was encountered during drilling is considered moderate. Liquefaction of the upper portions of the alluvial soils is likely during a seismic event. The liquefaction would induce lateral spreading toward the river channel. The pipe could be exposed to lateral loading in the transition zone between the shallow-burial open trench and the deep HDD bore.

Based on available site, subsurface information, and discussions with HDD installation contractors, the proposed HDD crossing of the Columbia River appears to be feasible.

SECTION 5

References

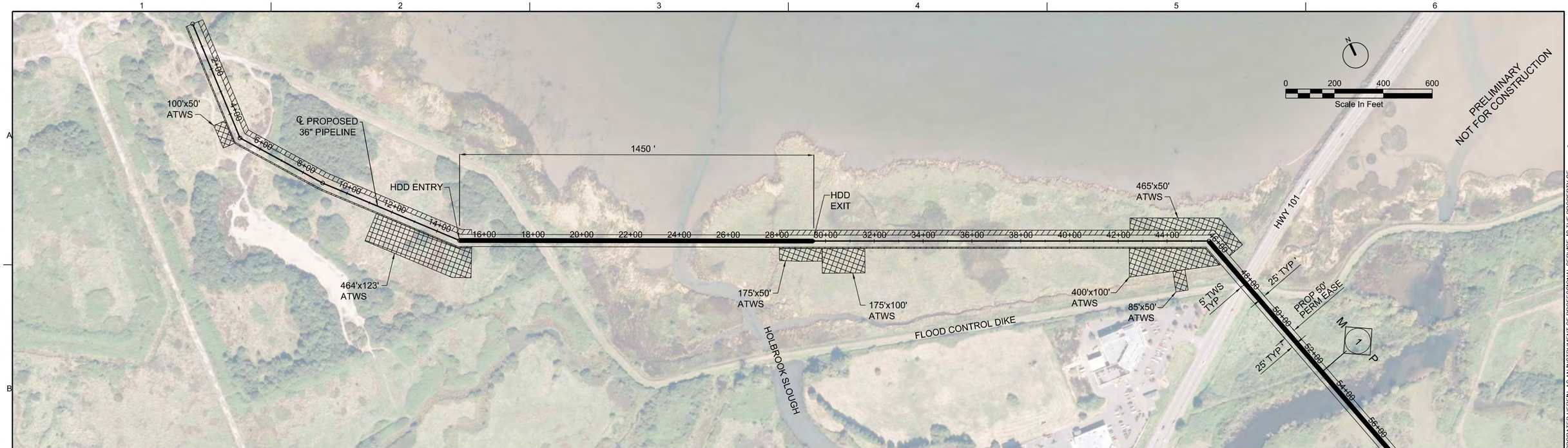
CH2M HILL. 2013. *Horizontal Directional Drilling Feasibility Evaluation Report for Oregon LNG Bidirectional Project*. Prepared for LNG Development Company, LLC, and Oregon Pipeline Company, LLC. June.

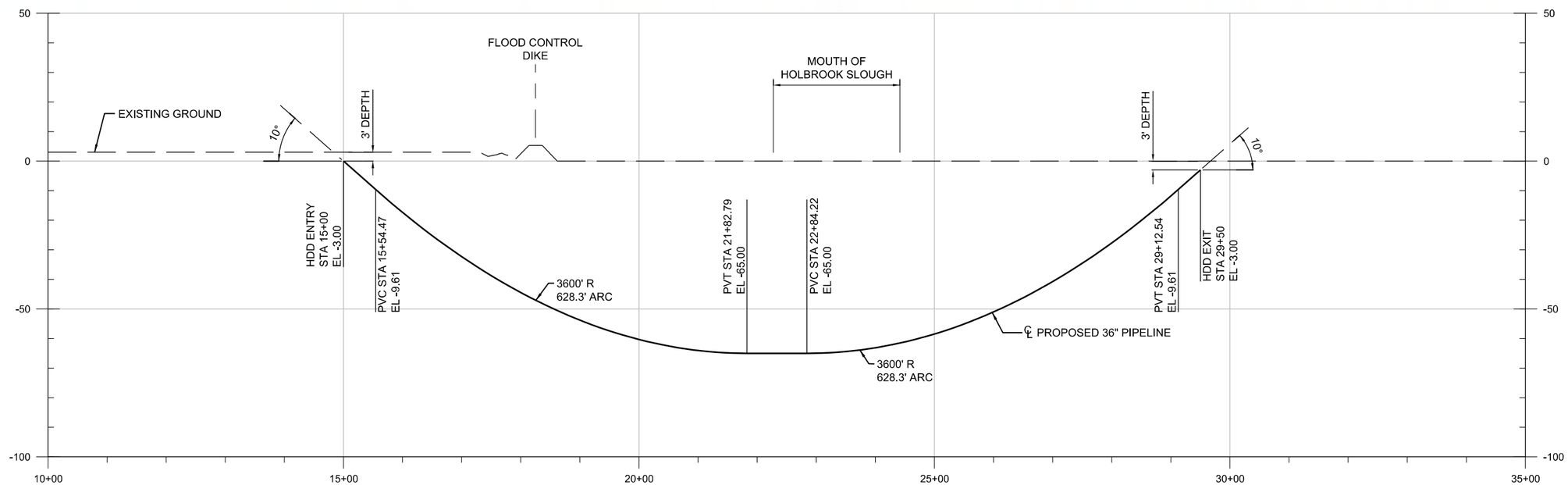
Evarts, Russell C. 2002. *Geologic Map of the Deer Island 7.5' Quadrangle, Columbia County, Oregon and Cowlitz County, Washington.* U.S. Geological Survey. Miscellaneous Field Studies 2392. Scale 1:24,000.

Oregon Department of Geology and Mineral Industries (DOGAMI). 1985. *Oil and Gas Investigation of the Astoria Basin, Clatsop and Northernmost Tillamook Counties, Northwest Oregon*. Publication Oil and Gas Investigations 14. Map Scale 1:100,000. Prepared by Alan R. Niem and Wendy A. Niem.

Snider, Alan. 2014. Laney Directional Drilling Company, Inc. Personal Communication with Todd Cotten, CH2M HILL on February 28.

Appendix
Preliminary HDD Profile Drawings





PROFILE

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

Figure A-1

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

HDD Exhibit
Flood Control Levee at MP 0.3

		from STA: 2+00	to STA: 56+00
LOC:	CLATSOP COUNTY, OREGON	from MP: 0.04	to MP: 1.06
PROJ: 199863	DATE: DECEMBER, 2013	DWG: FIGURE 6A-3	REVISION:

FILENAME: HDD Sheets.dgn PLOT DATE: 2014\03\20 PLOT TIME: 3:28:05 PM

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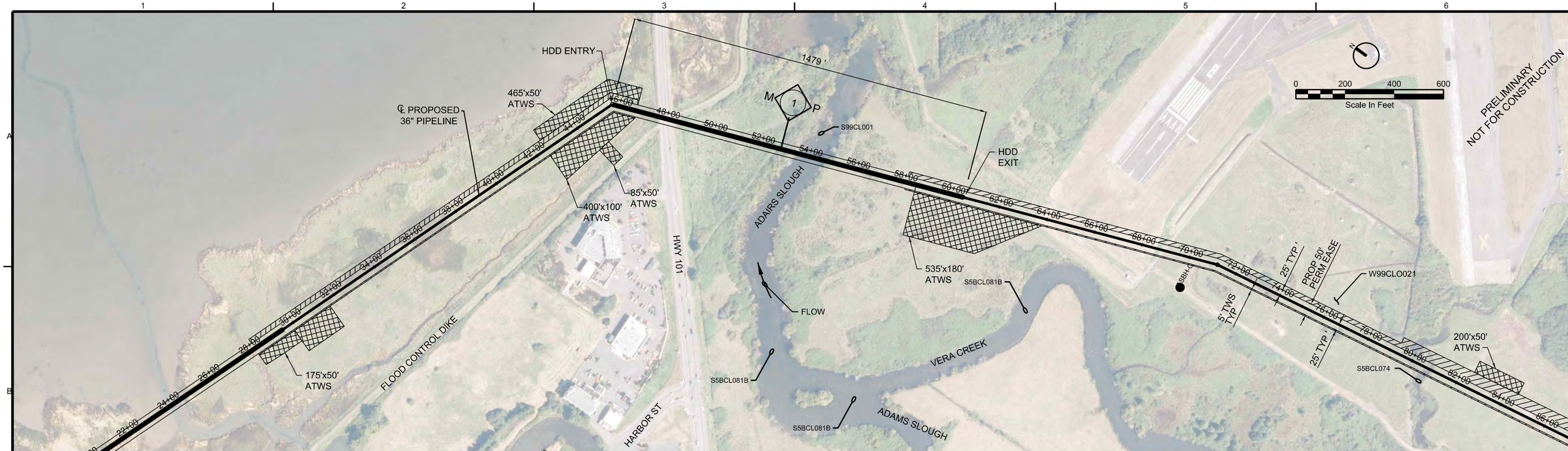

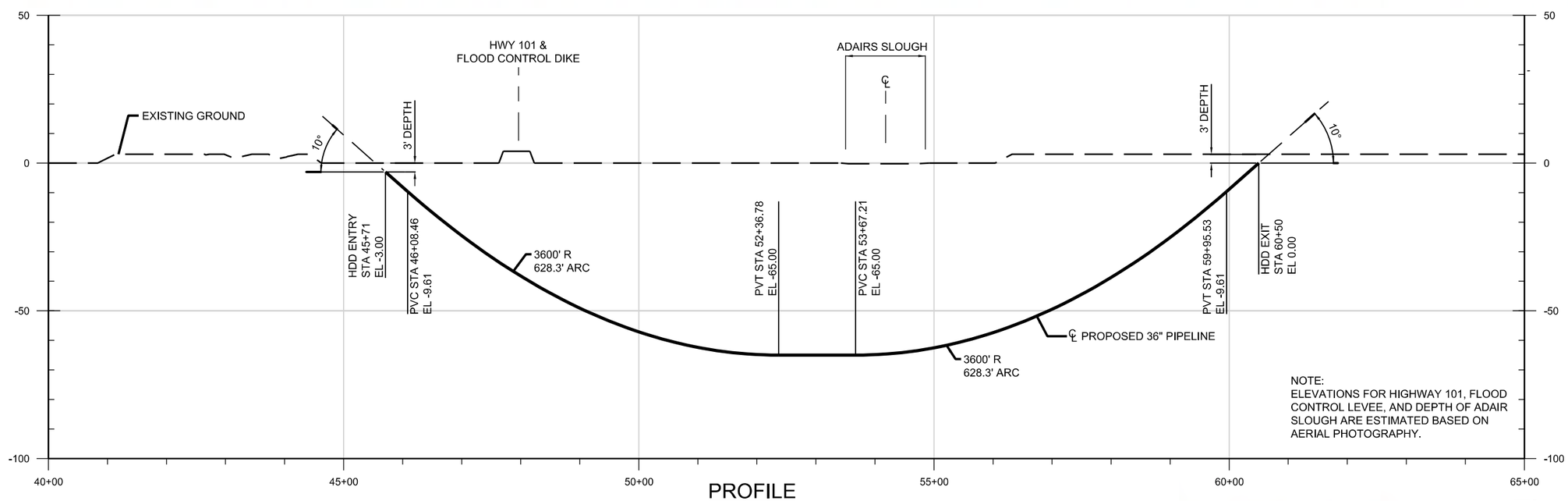

PROFILE

HORIZ: 1"=200'
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Figure A-2

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T. COTTEN	K. KONG	M. BRICKER	XXXX

MATERIAL

SCALE: 1"=400'

VERIFY SCALE

LEGEND

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- 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
Hwy 101 & Adairs Slough at MP 1.0

from STA: 22+00	to STA: 86+00
from MP: 0.42	to MP: 1.63
DWG: FIGURE C-2	REVISION:

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

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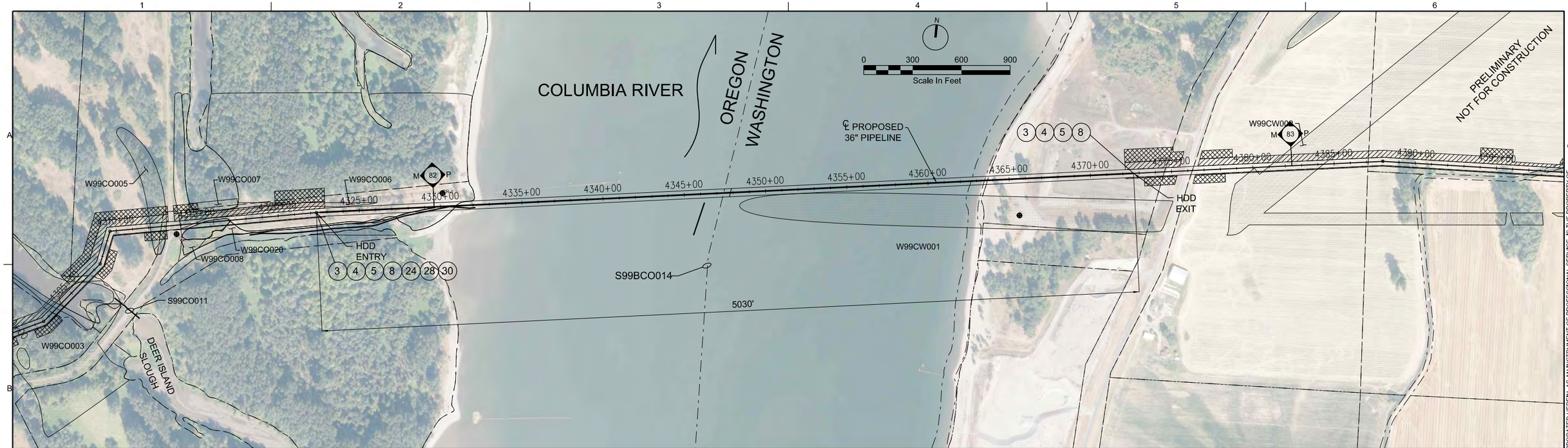
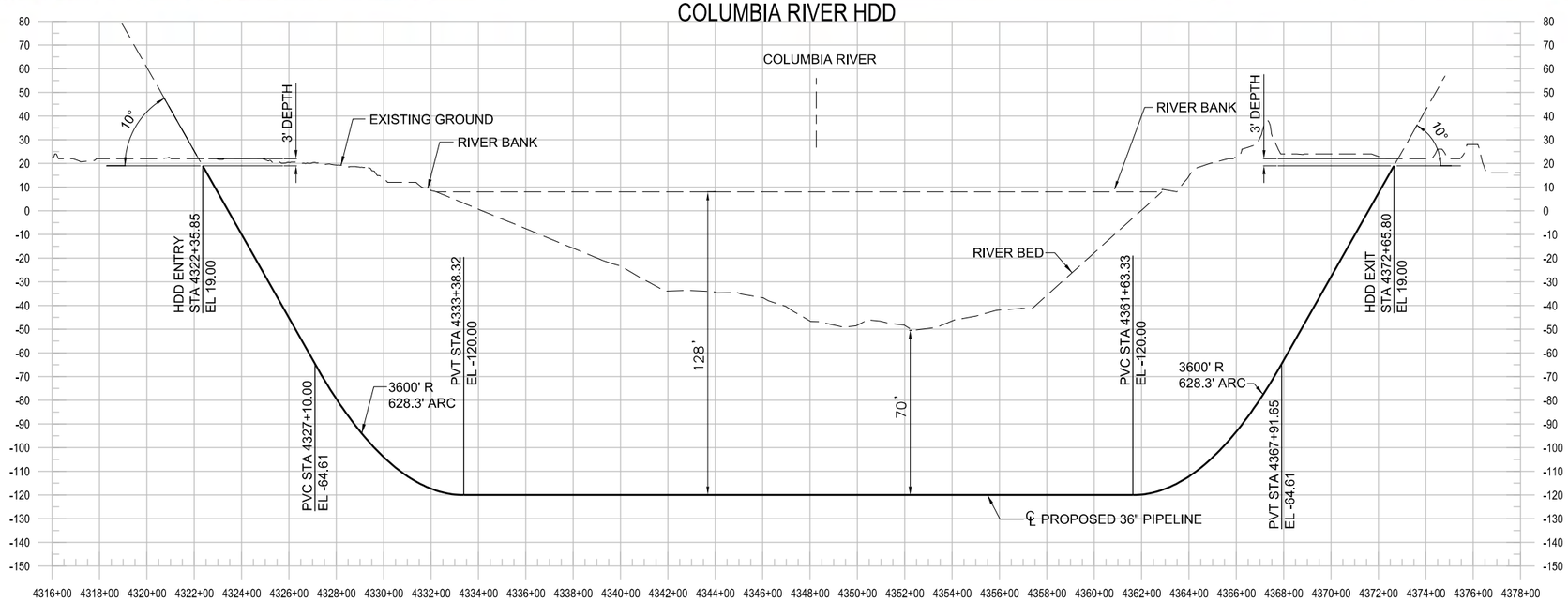


COLUMBIA RIVER HDD



PROFILE

HORIZ: 1"=600'
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NOTE:
BOTTOM OF COLUMBIA RIVER CHANNEL INFORMATION FROM "CHANNEL STAUS COLUMBIA RIVER", USACE FEB, 2000

Figure A-3

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T. COTTEN	K. KONG	M. BRICKER	XXXX

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- 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

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Appendix 7A
Soil Map

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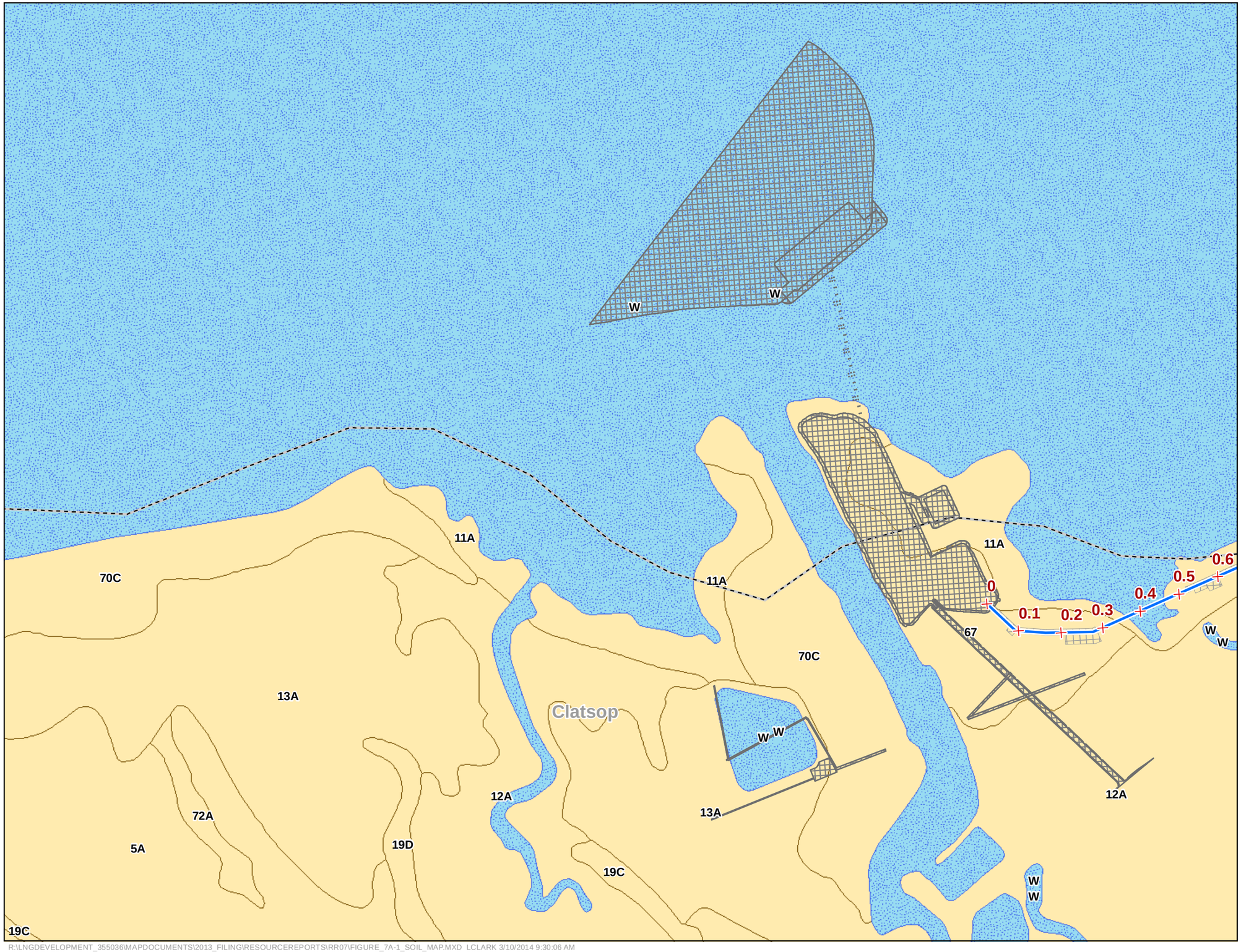

Figure 7A-1

Soil Map

OregonLNG

LEGEND

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- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water

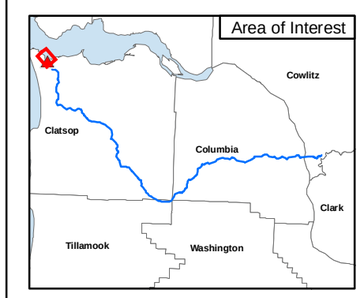

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Figure 7A-2

Soil Map

OregonLNG

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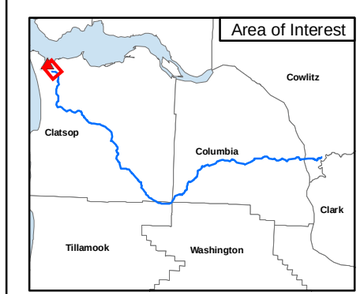
- Soil Mapping Unit
- Water



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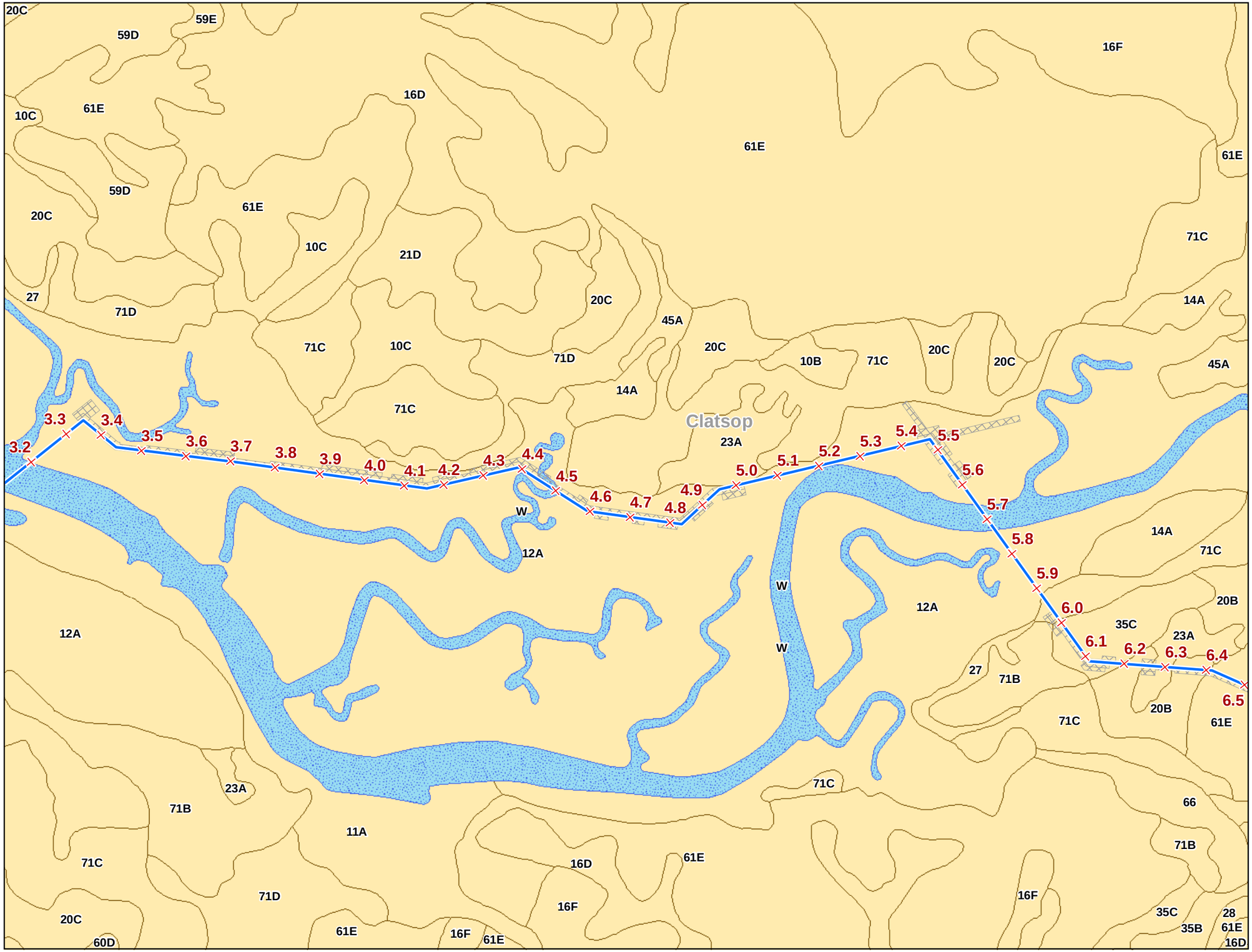

Figure 7A-3

Soil Map

OregonLNG

LEGEND

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- Soil Mapping Unit
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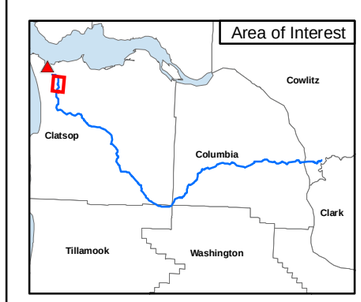

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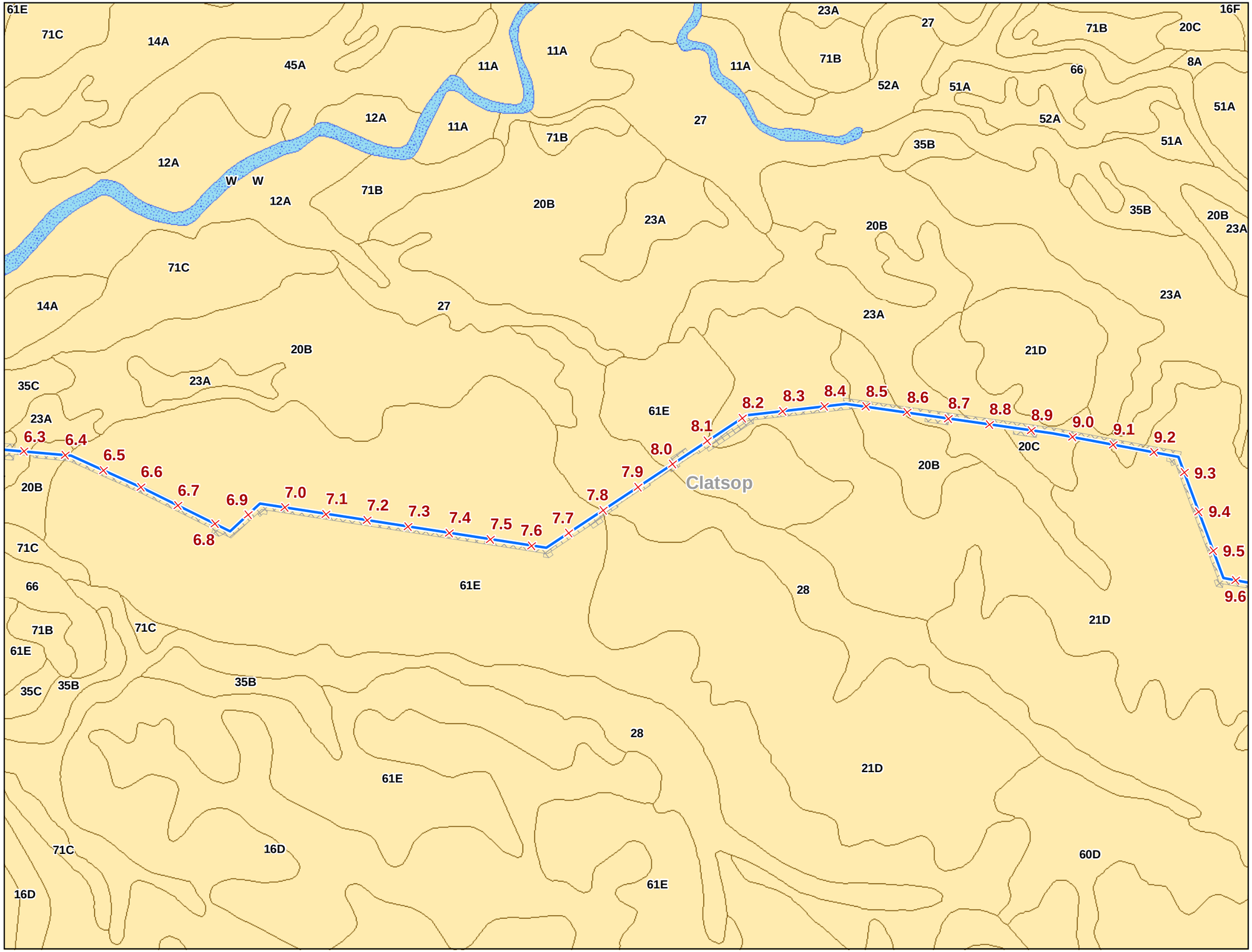

Figure 7A-4

Soil Map

OregonLNG

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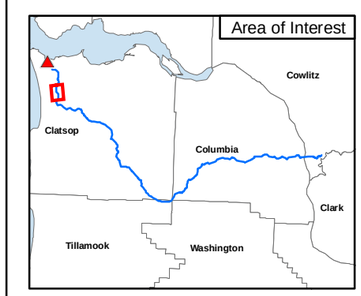
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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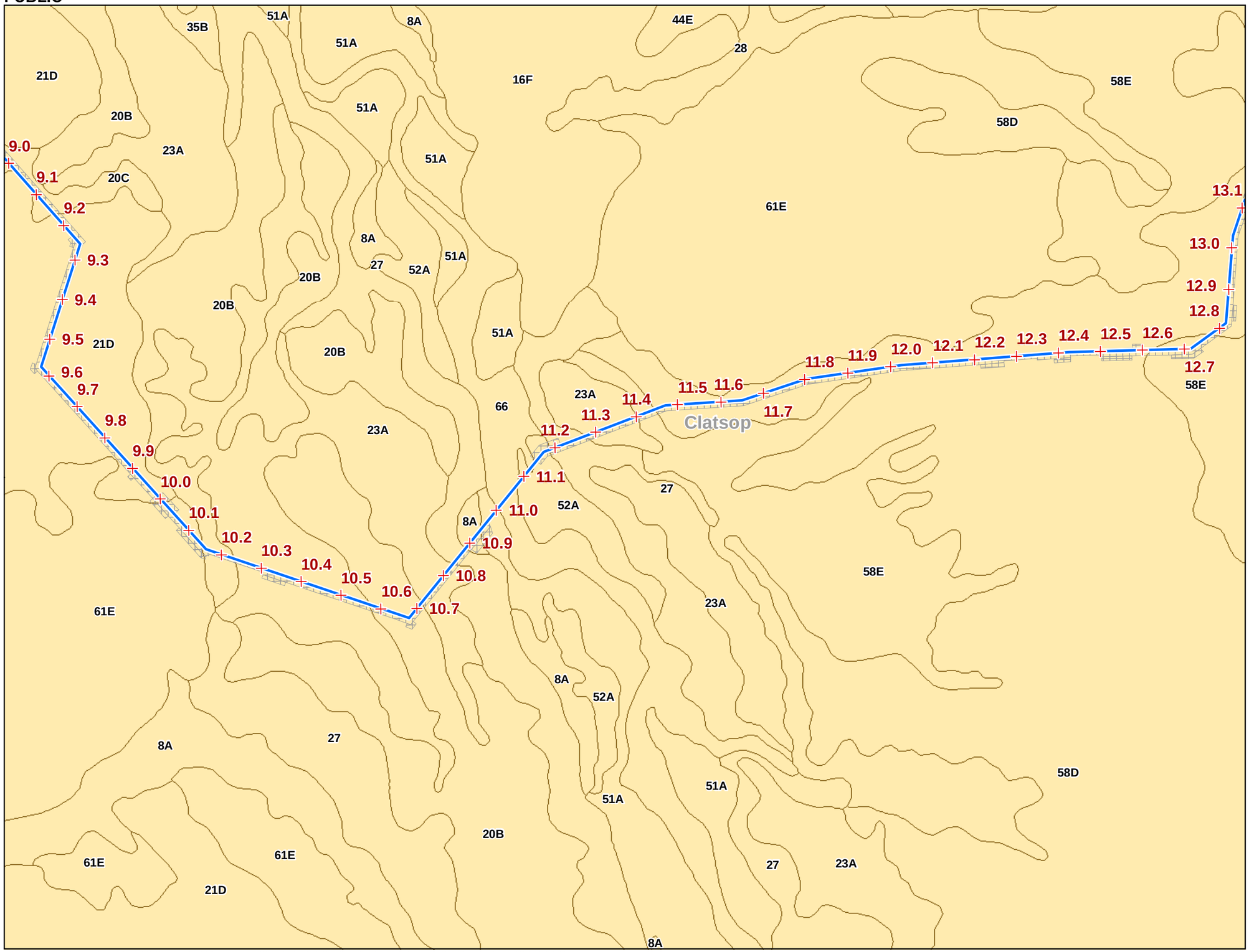


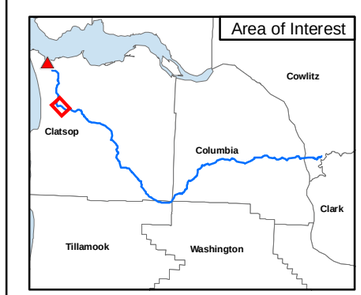
Figure 7A-5

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400

Feet

CH2MHILL.

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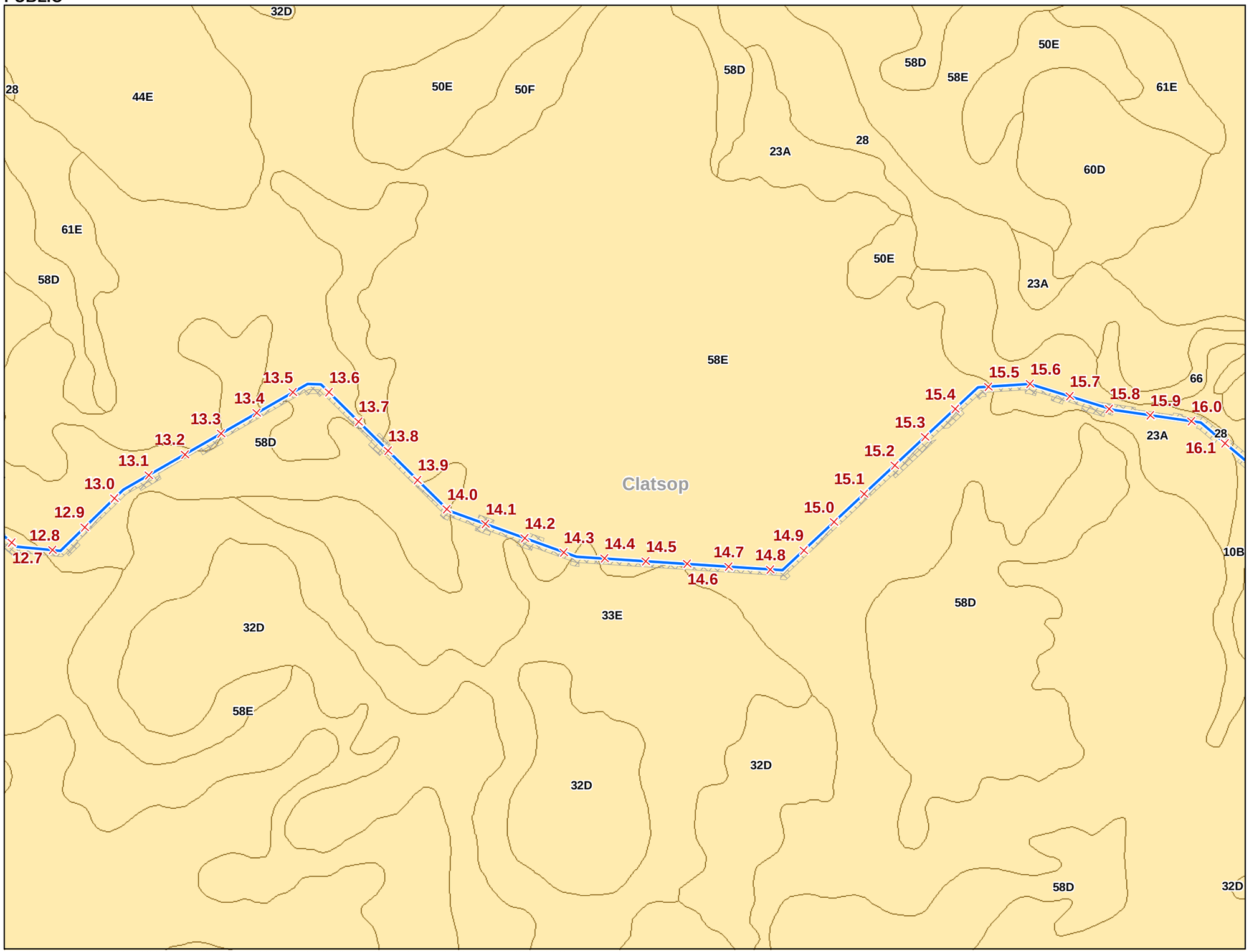


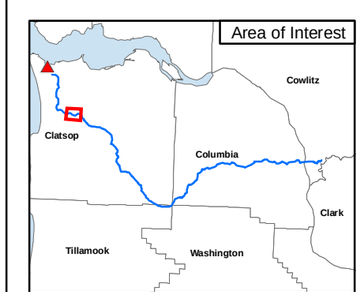
Figure 7A-6

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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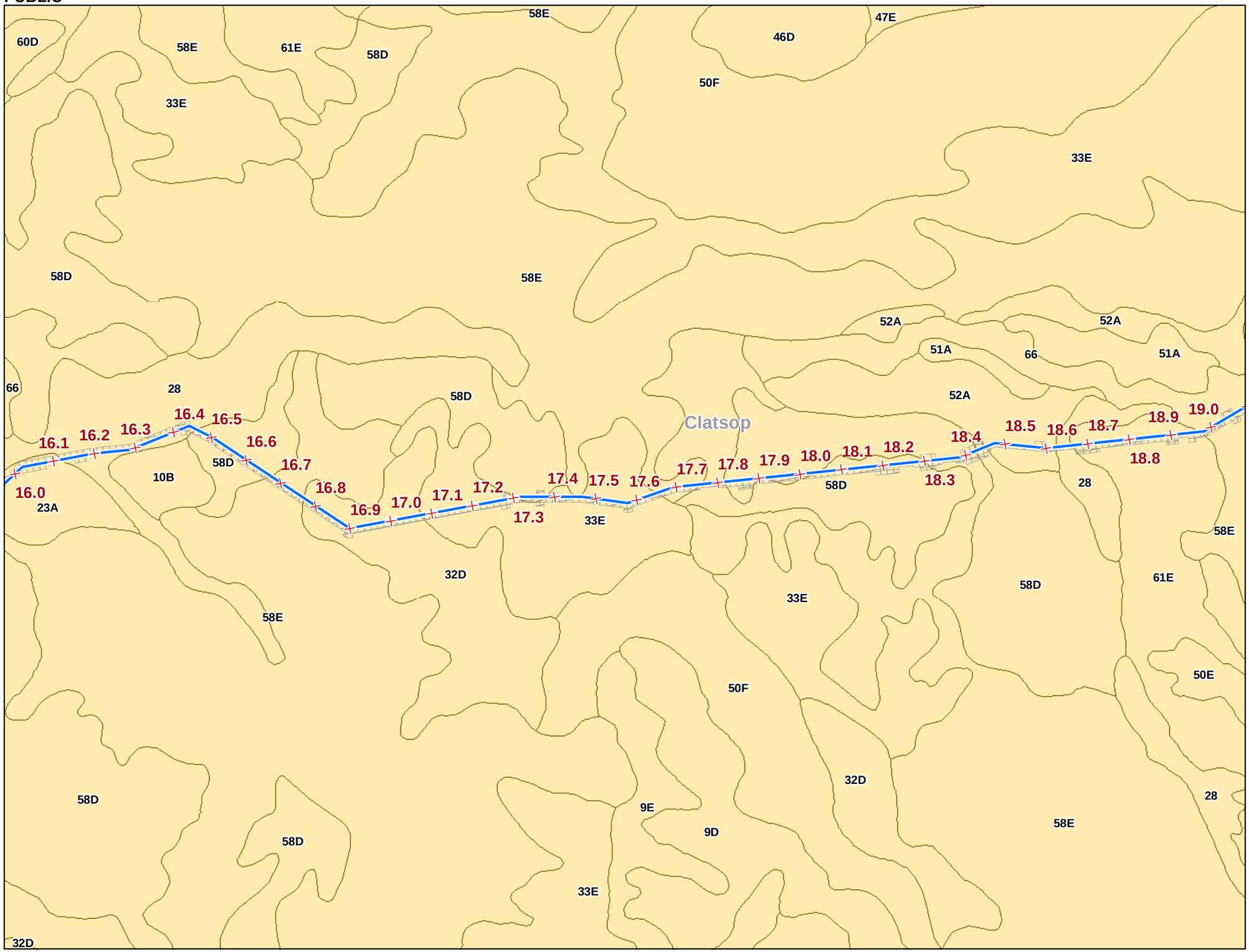


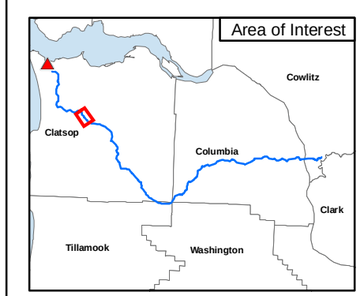
Figure 7A-7

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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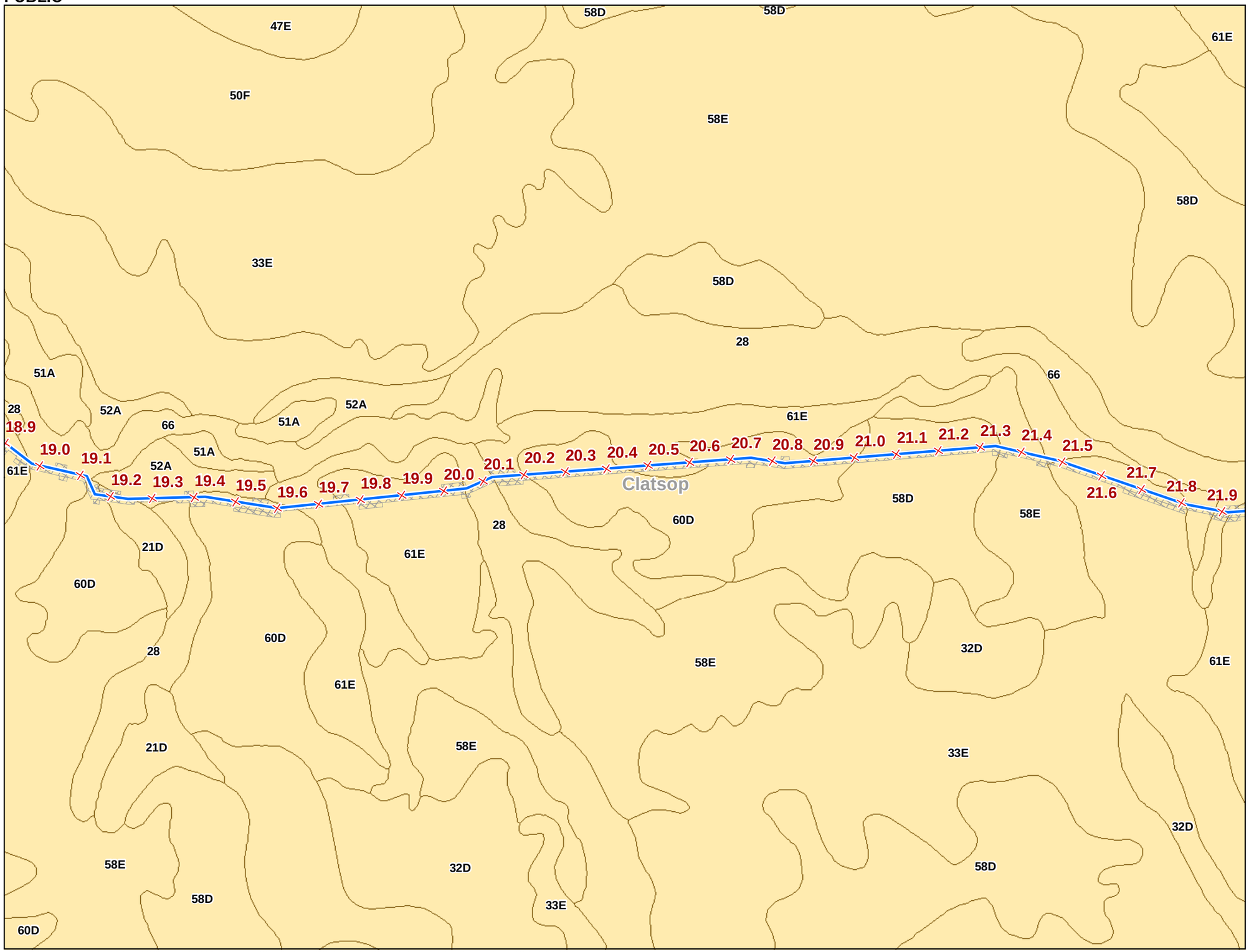


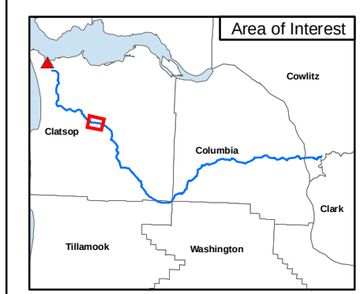
Figure 7A-8

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

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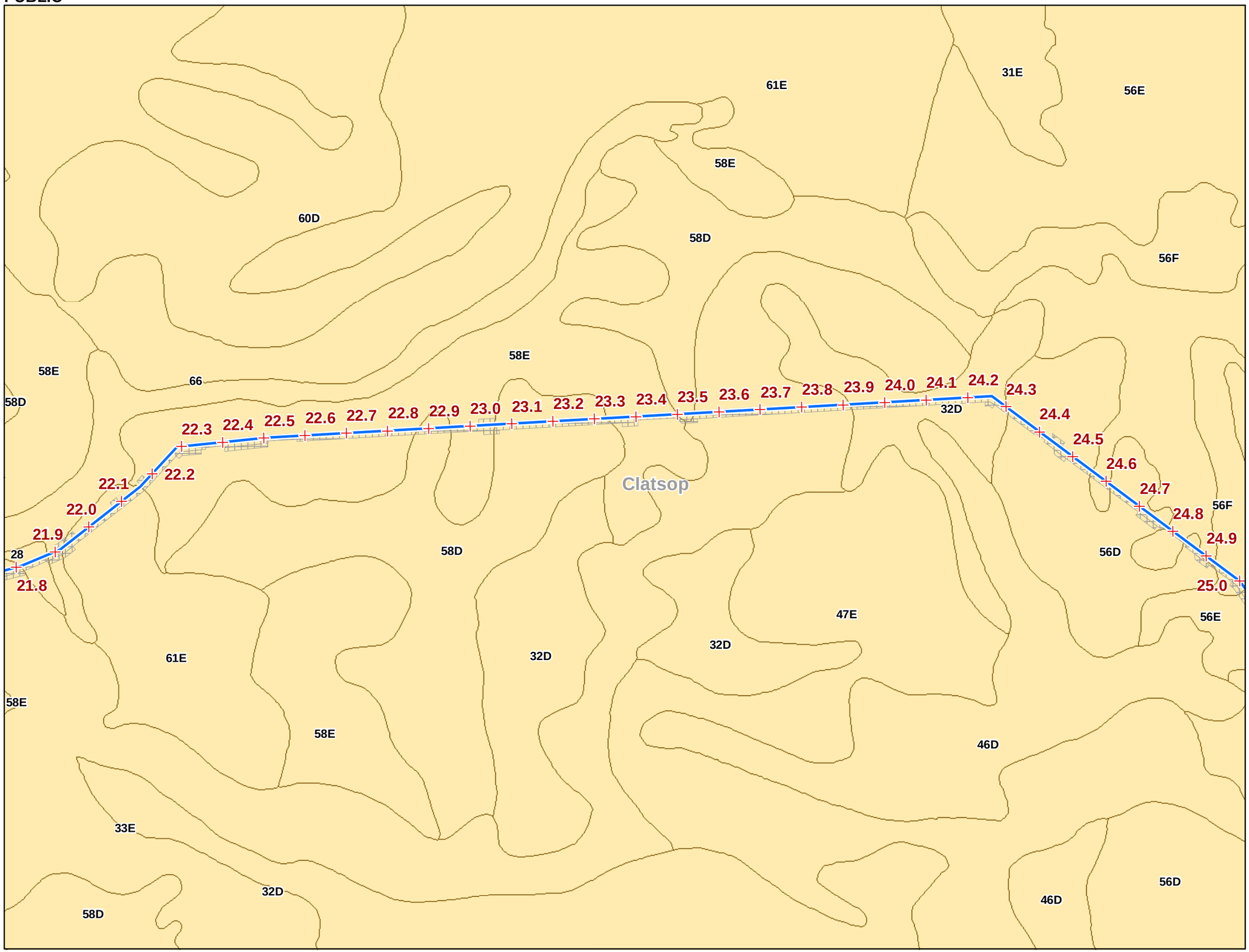


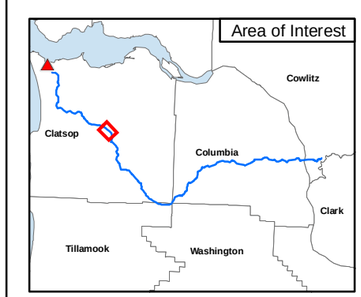
Figure 7A-9

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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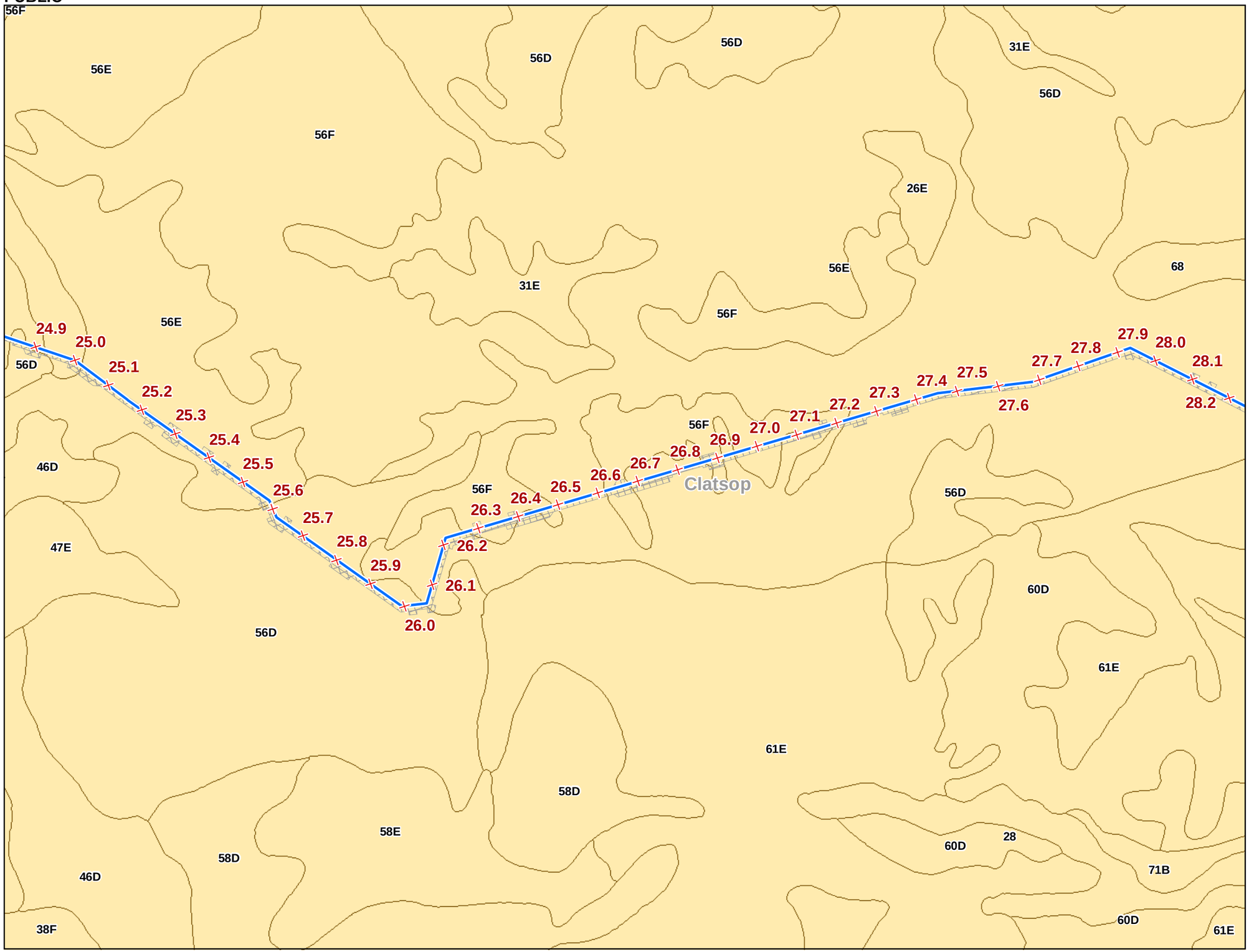


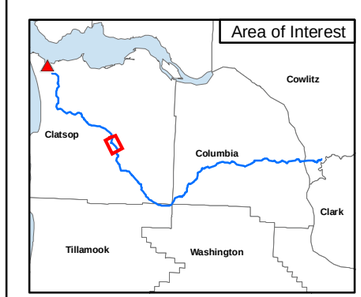
Figure 7A-10

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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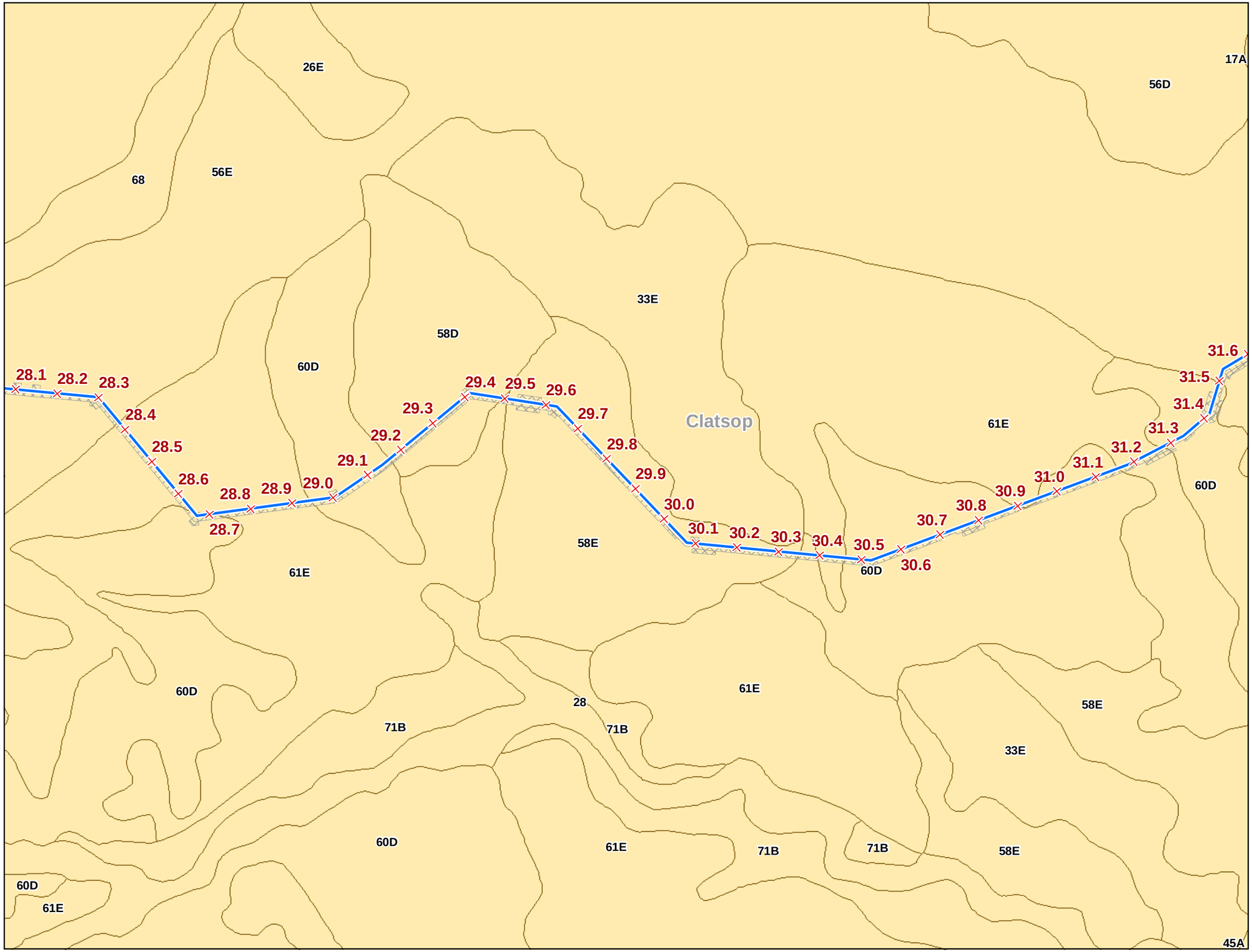


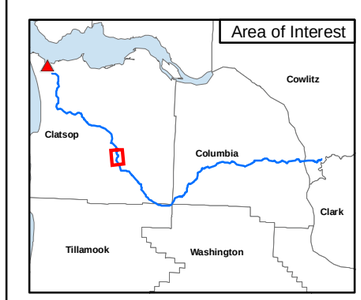
Figure 7A-11

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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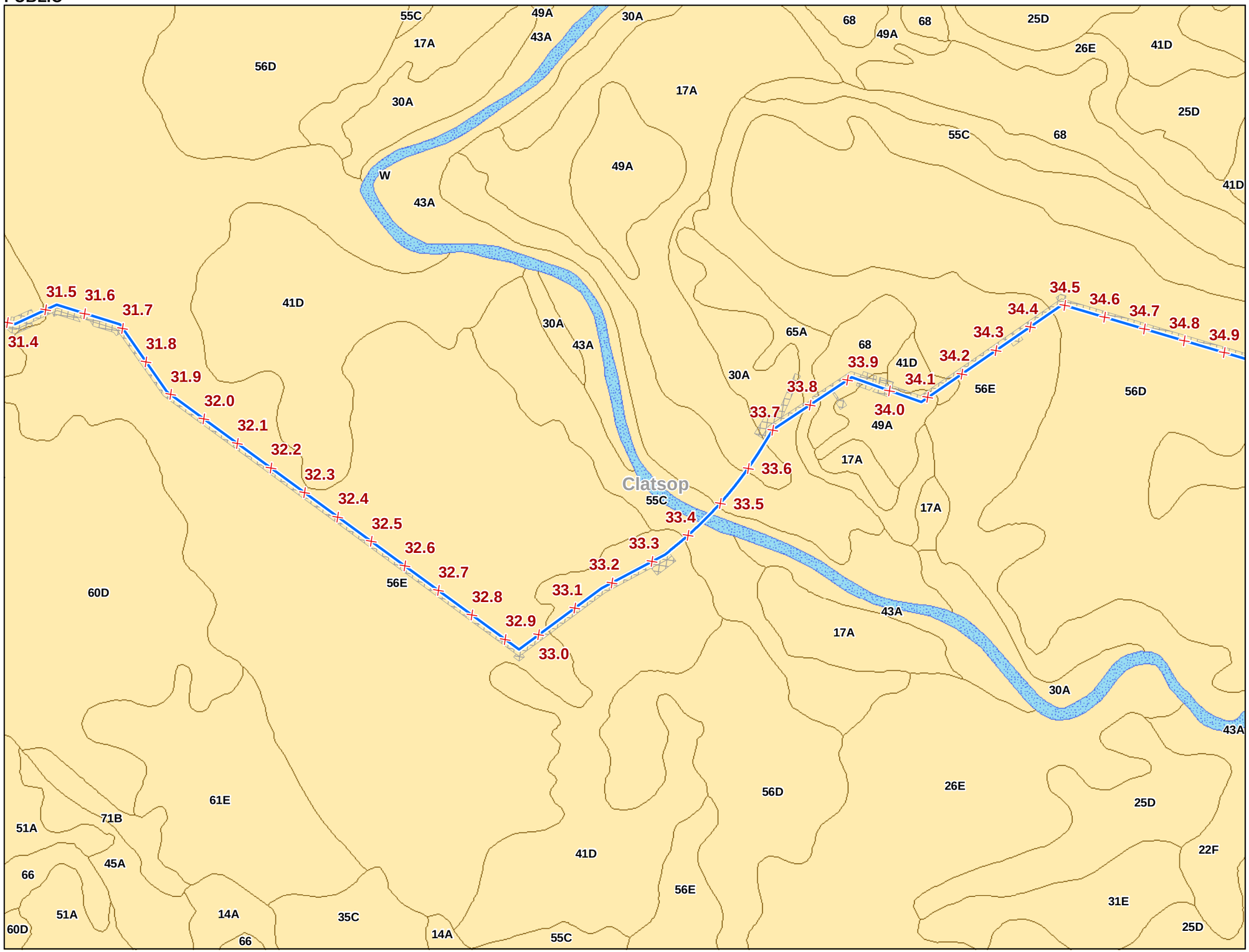


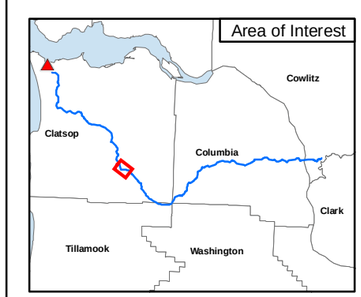
Figure 7A-12

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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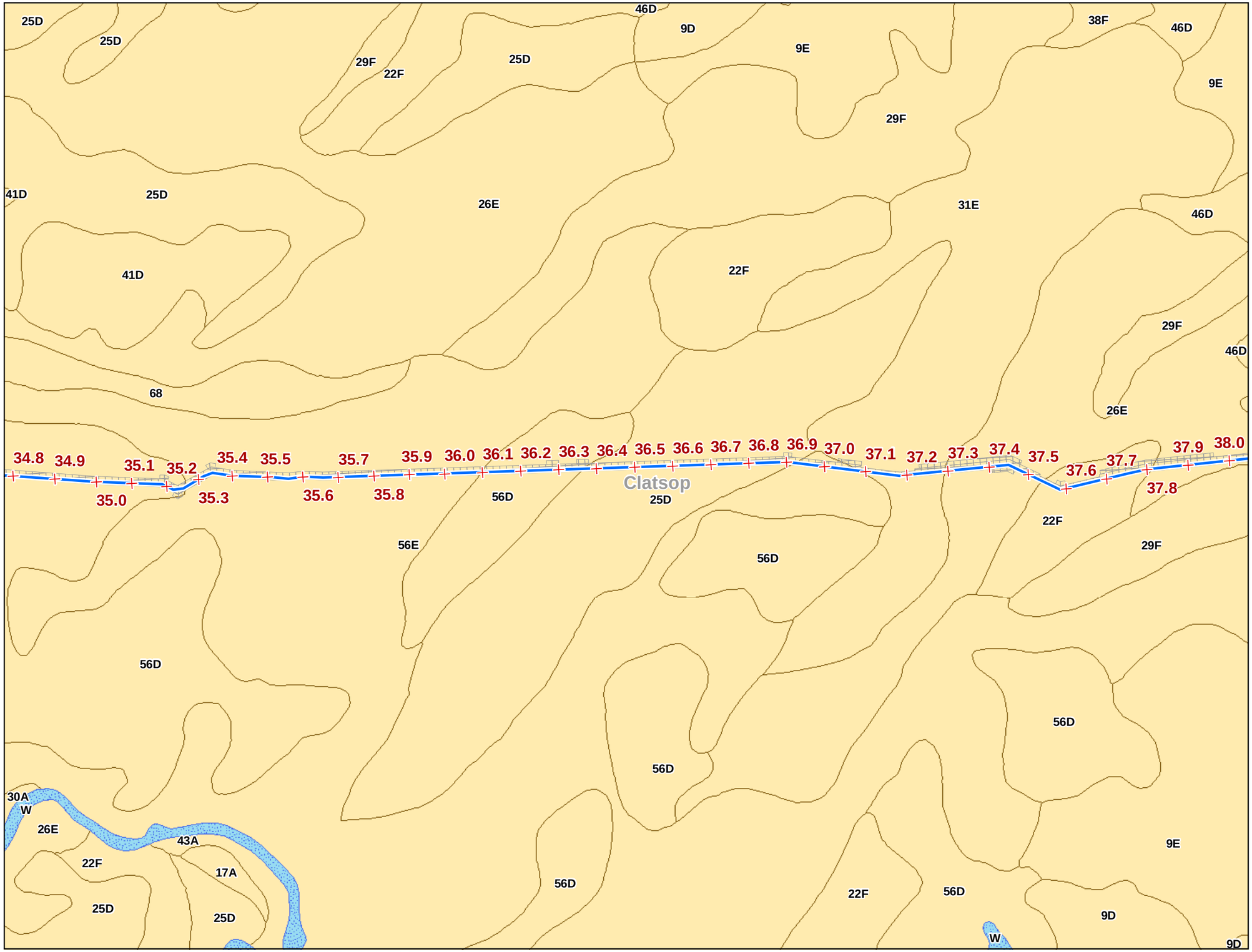


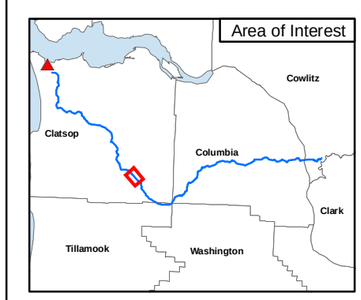
Figure 7A-13

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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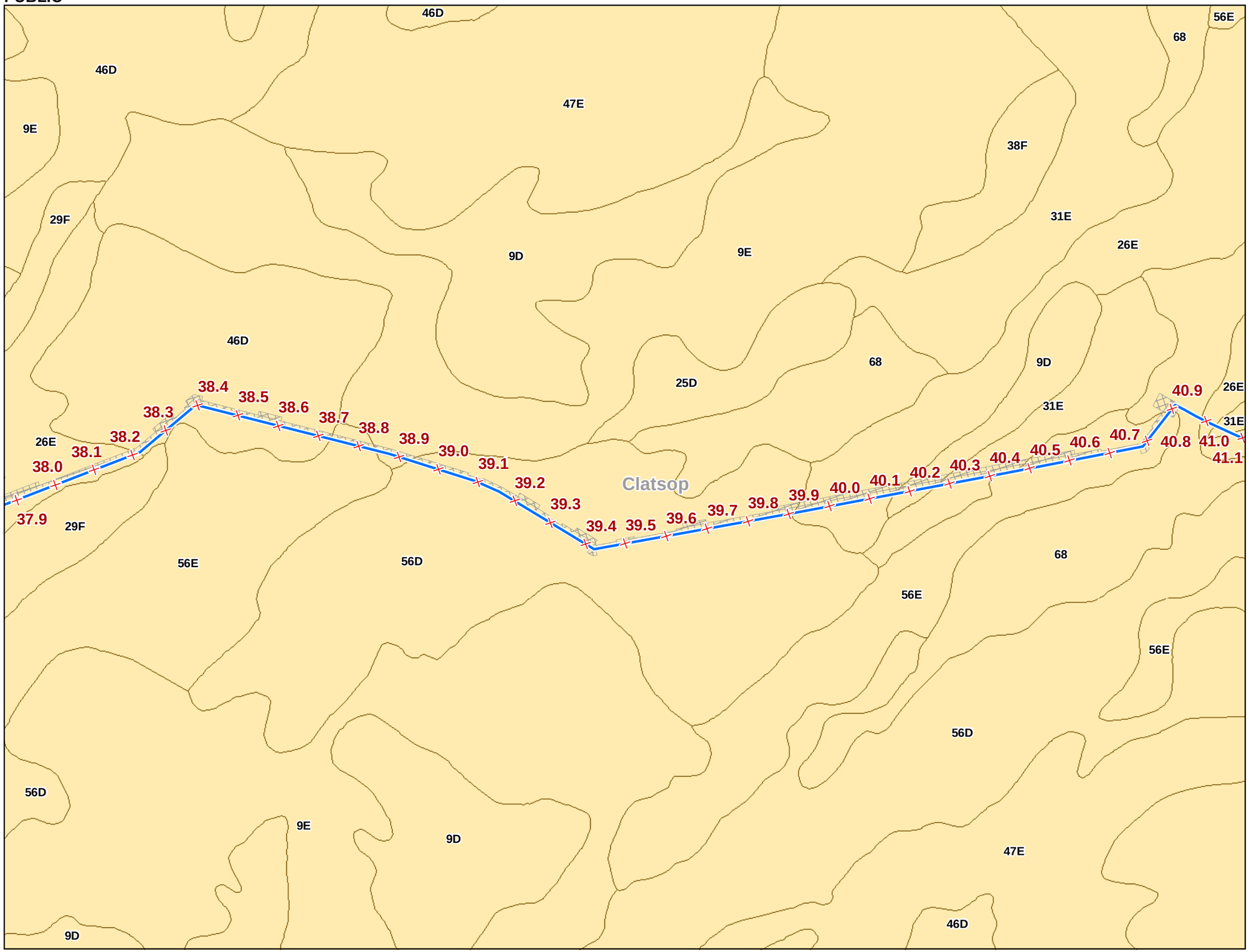


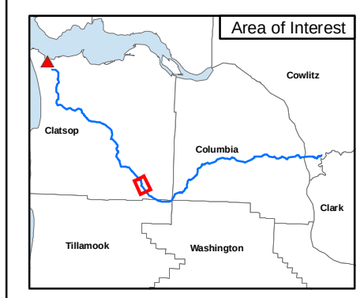
Figure 7A-14

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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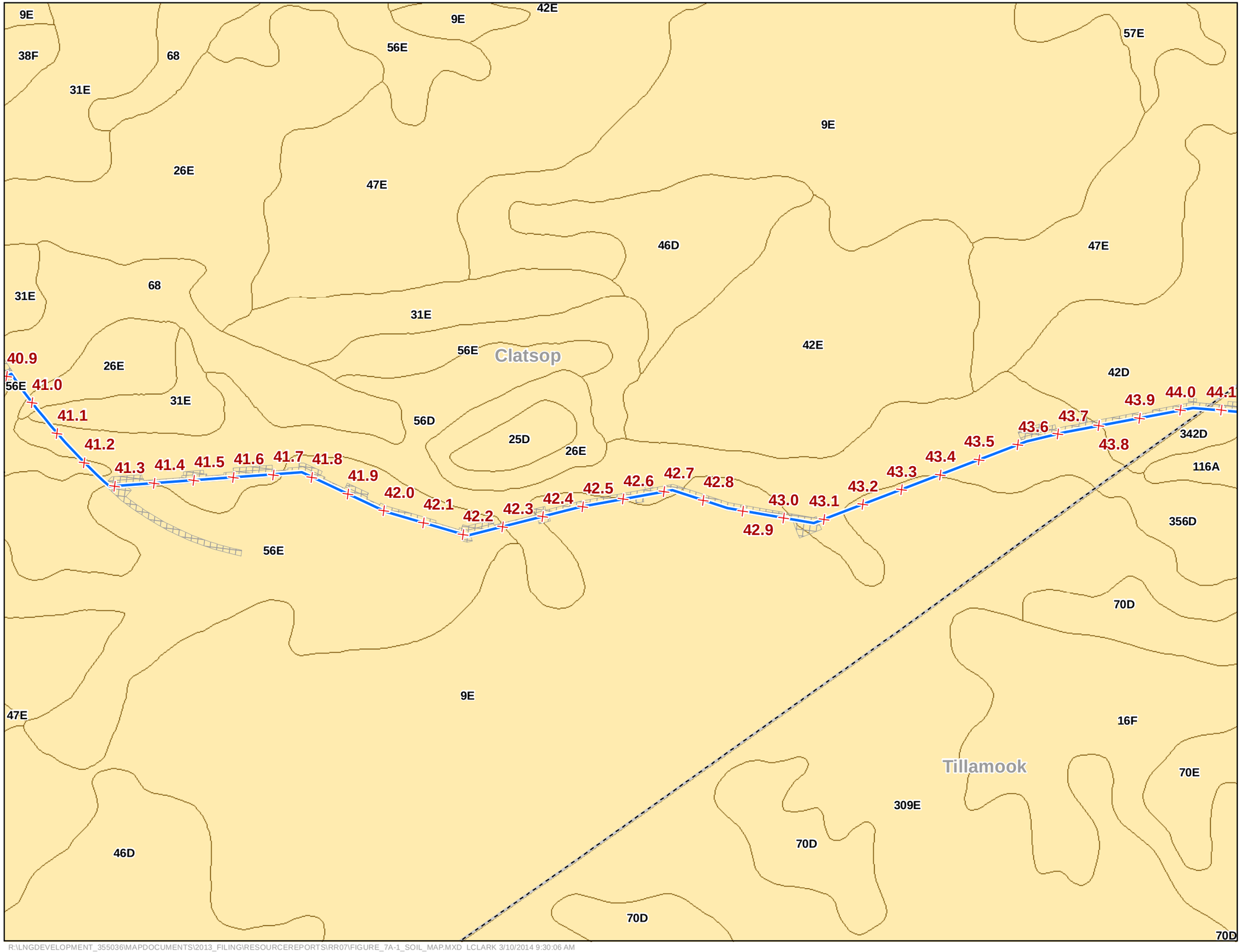


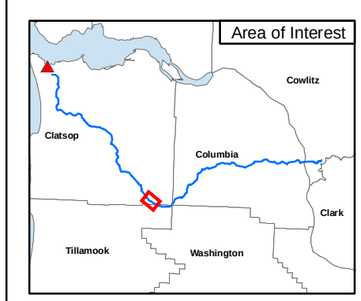
Figure 7A-15

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Feet

CH2MHILL.

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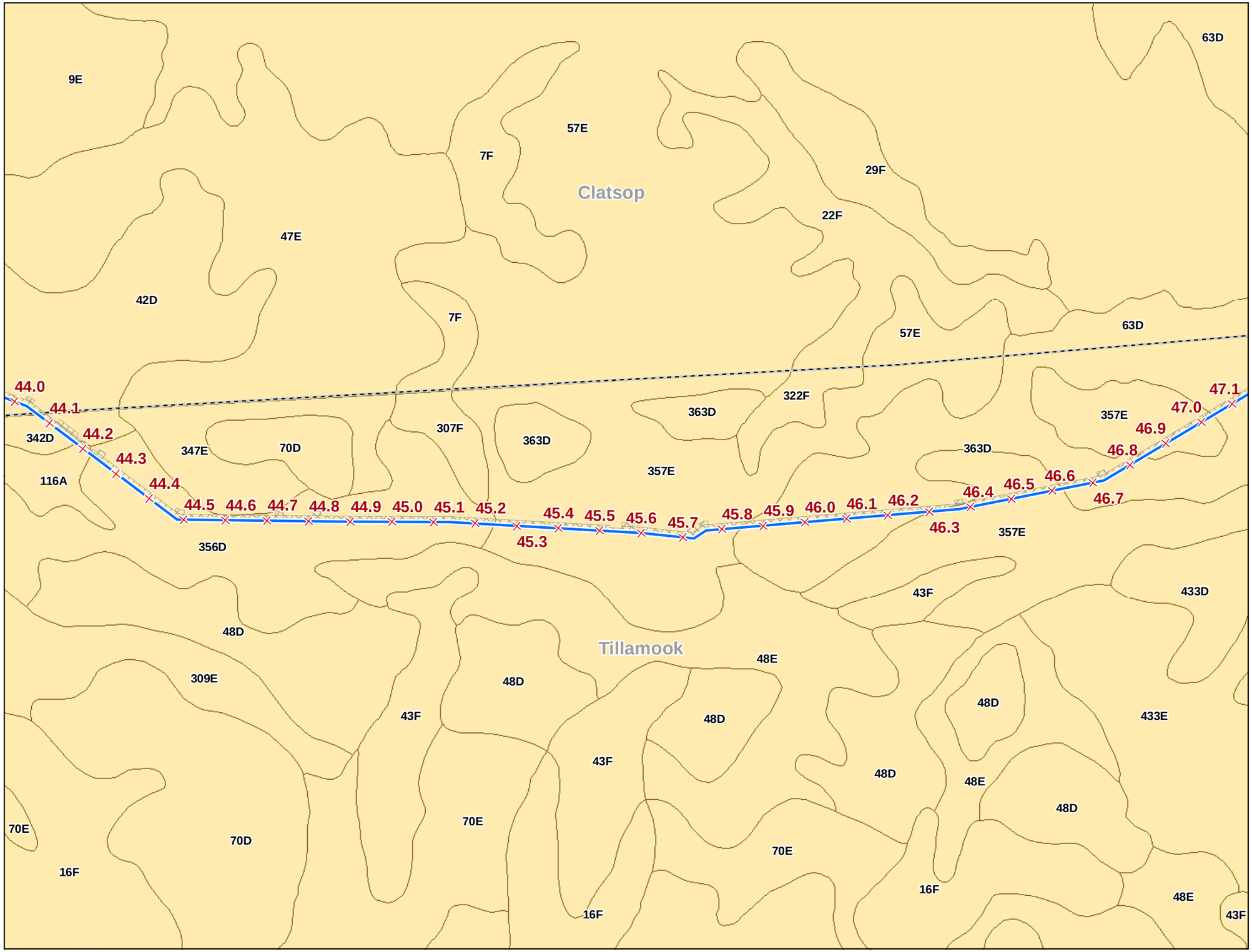


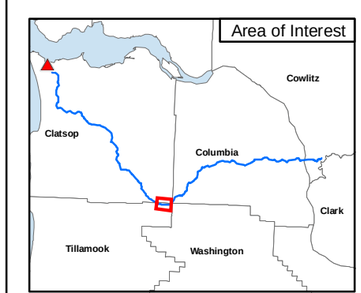
Figure 7A-16

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

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Feet

CH2MHILL.

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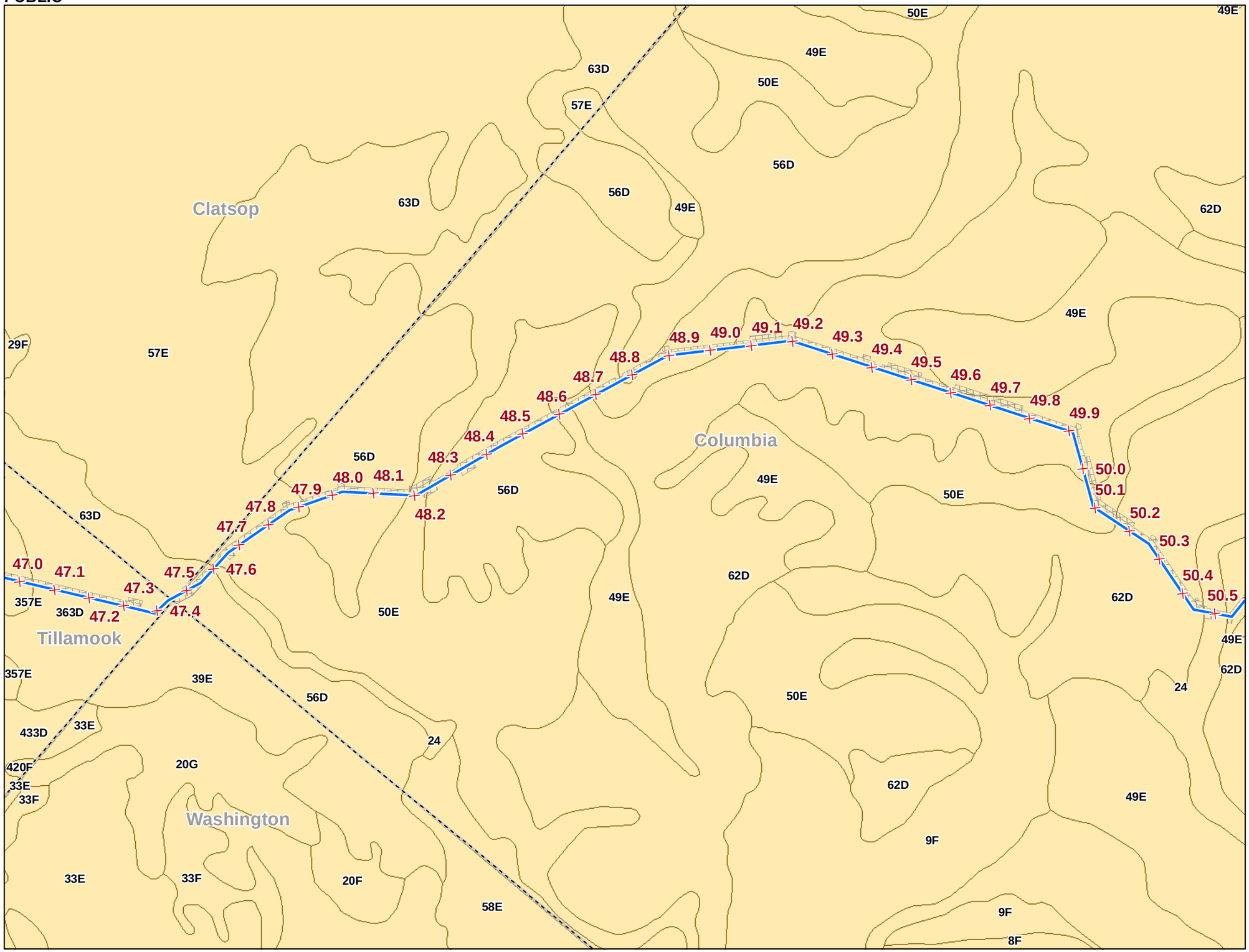

Figure 7A-17

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water

N

0 1,200 2,400
Feet

CH2MHILL

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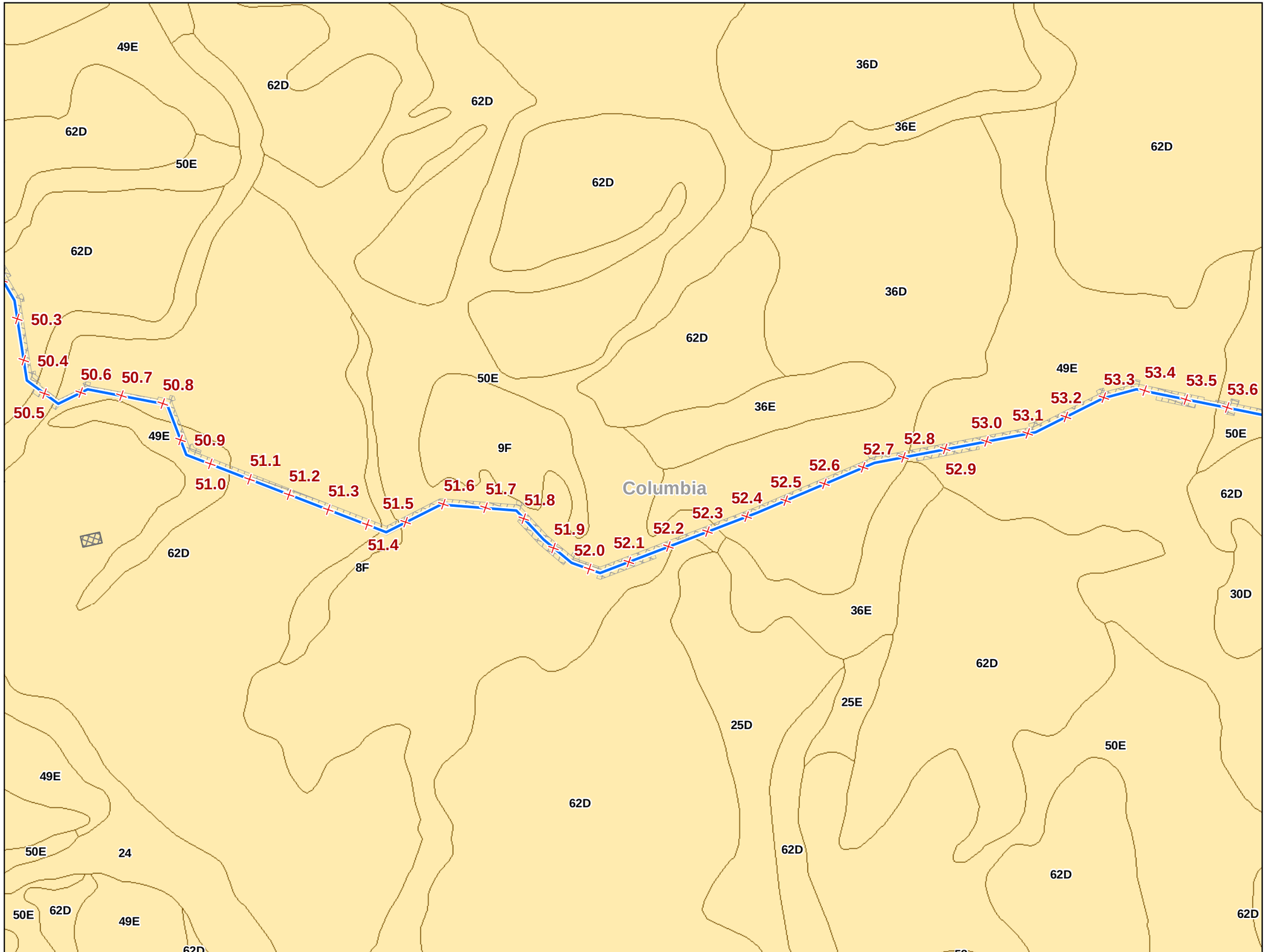


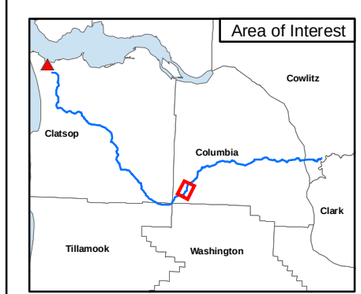
Figure 7A-18

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

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Feet

CH2MHILL.

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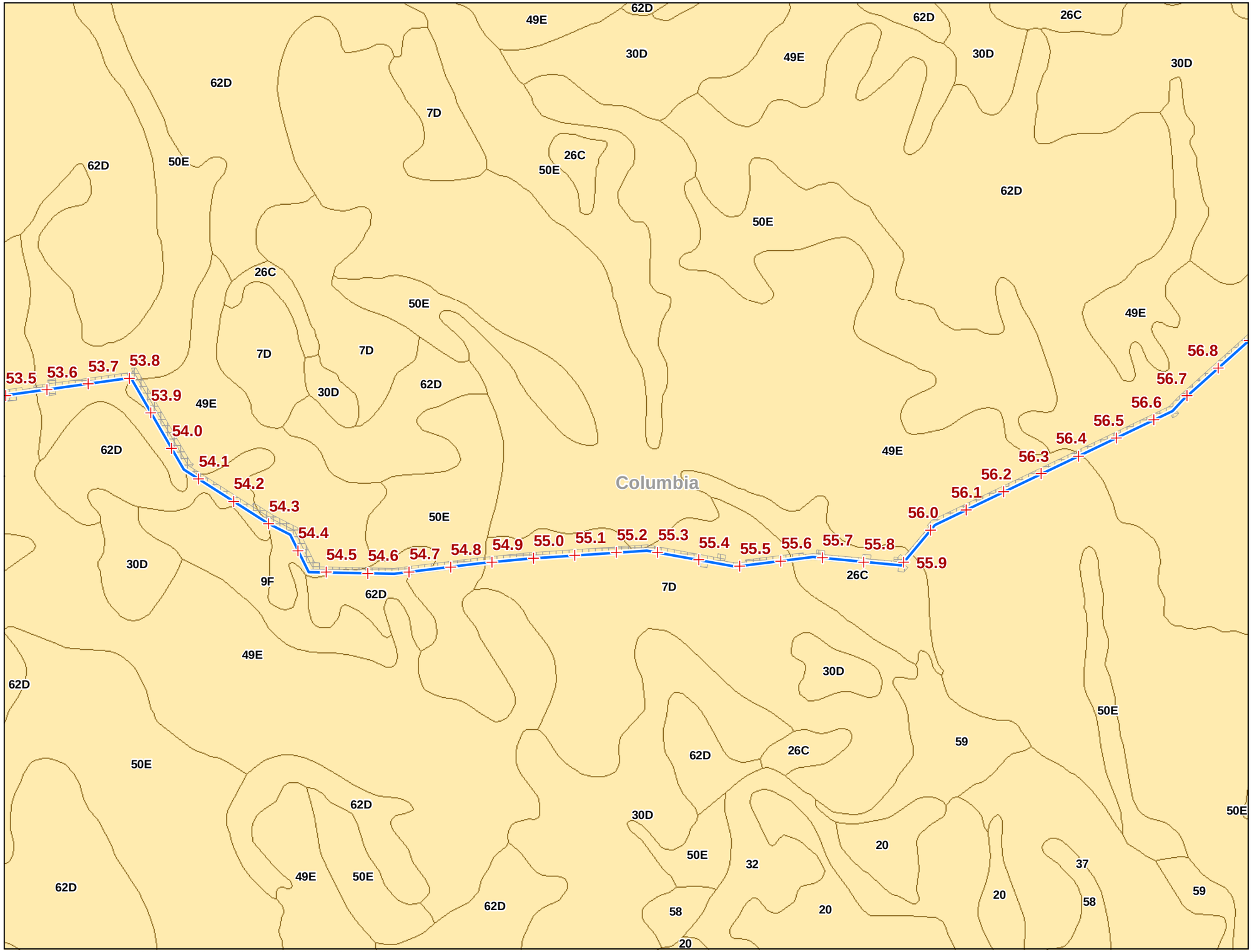


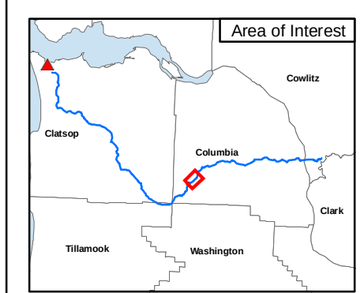
Figure 7A-19

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400

Feet

CH2MHILL.

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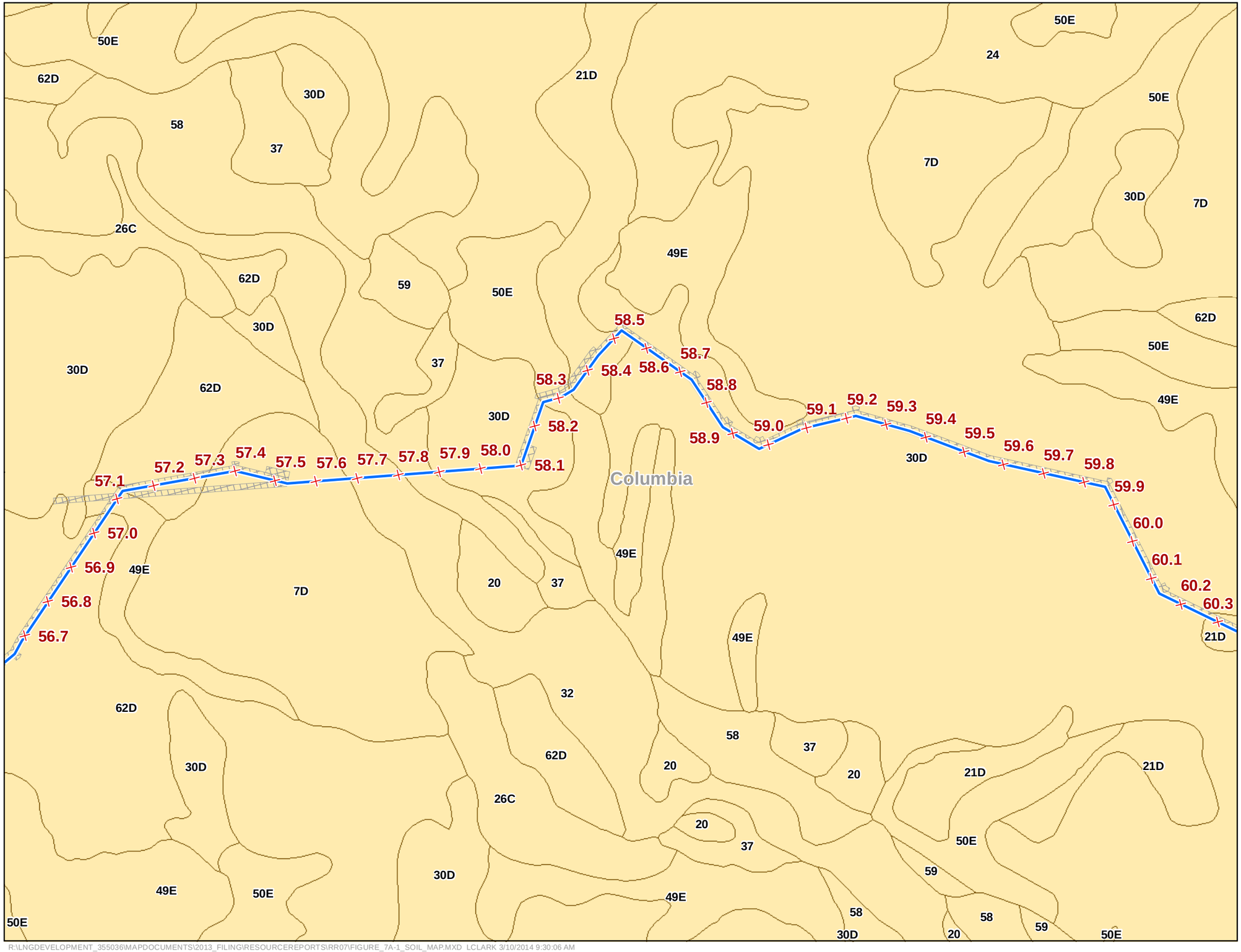


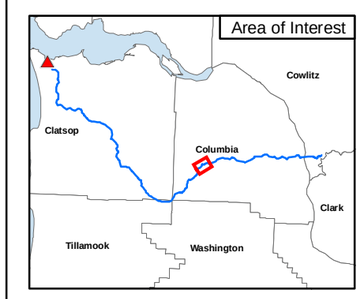
Figure 7A-20

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400
Feet

CH2MHILL.

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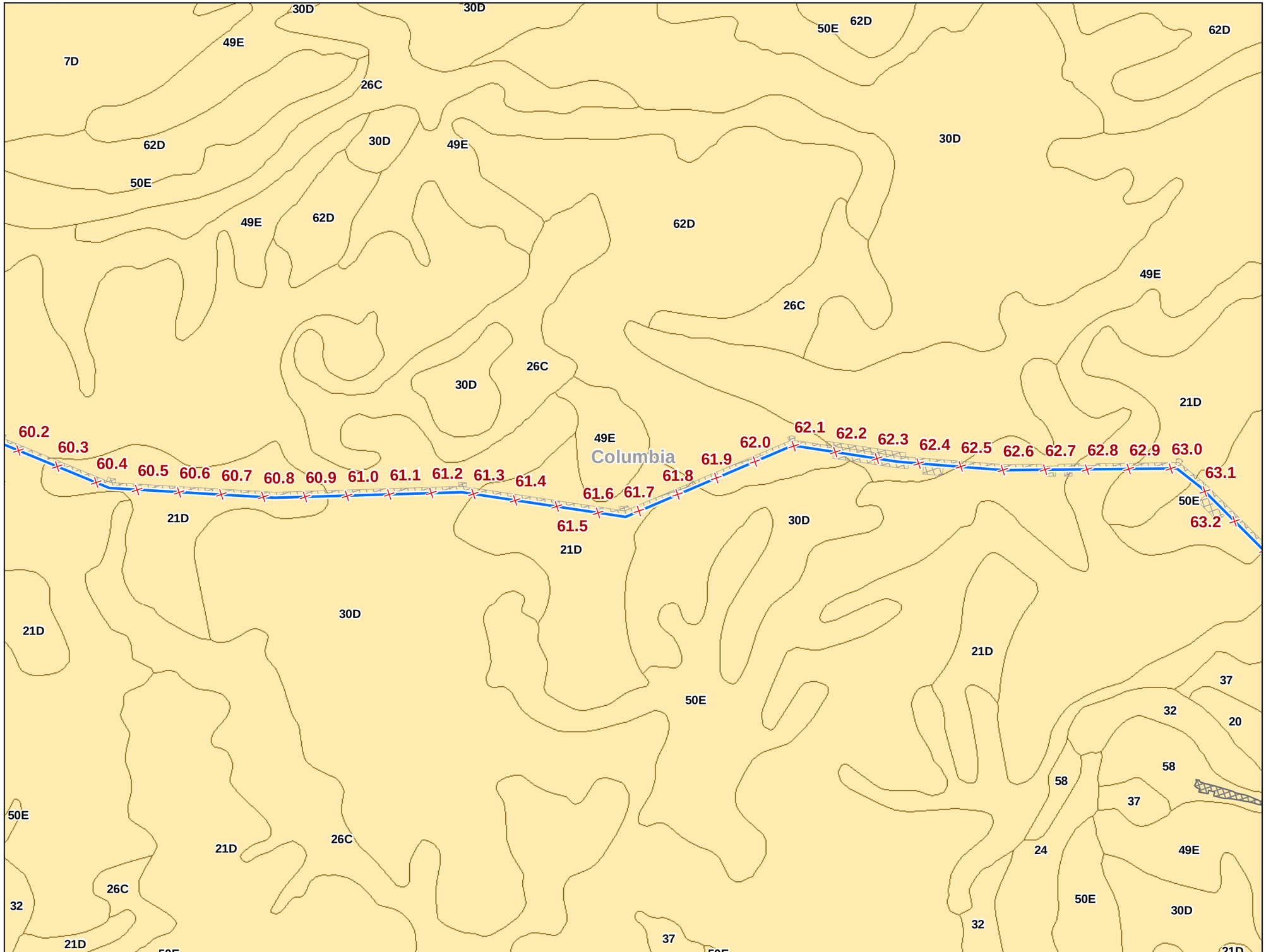


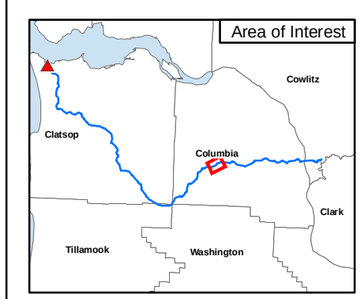
Figure 7A-21

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400
Feet

CH2MHILL.

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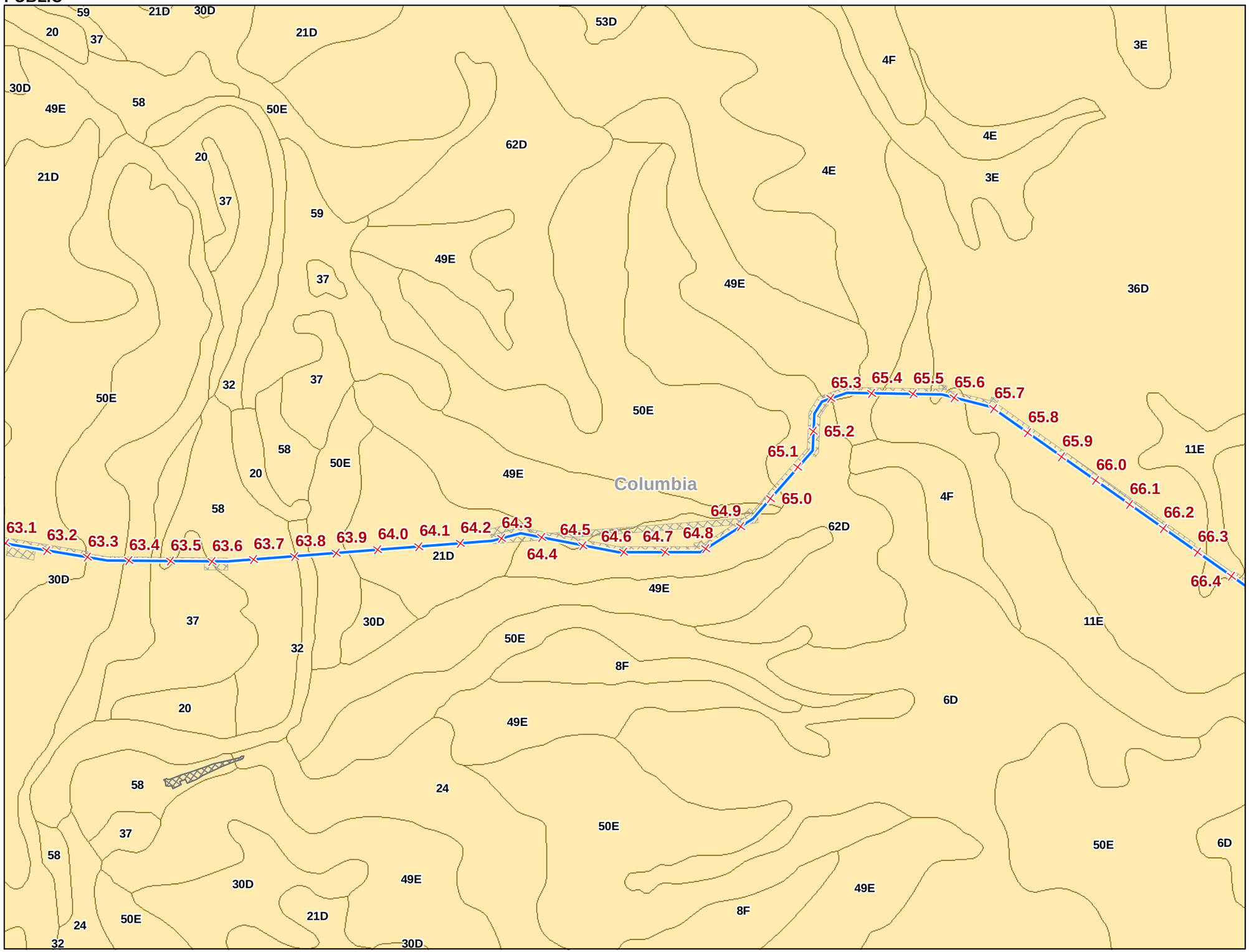


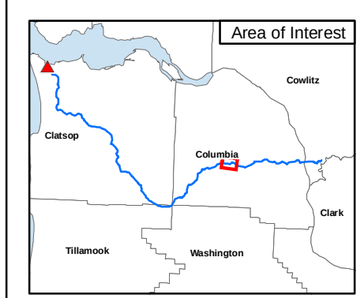
Figure 7A-22

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400

Feet

CH2MHILL.

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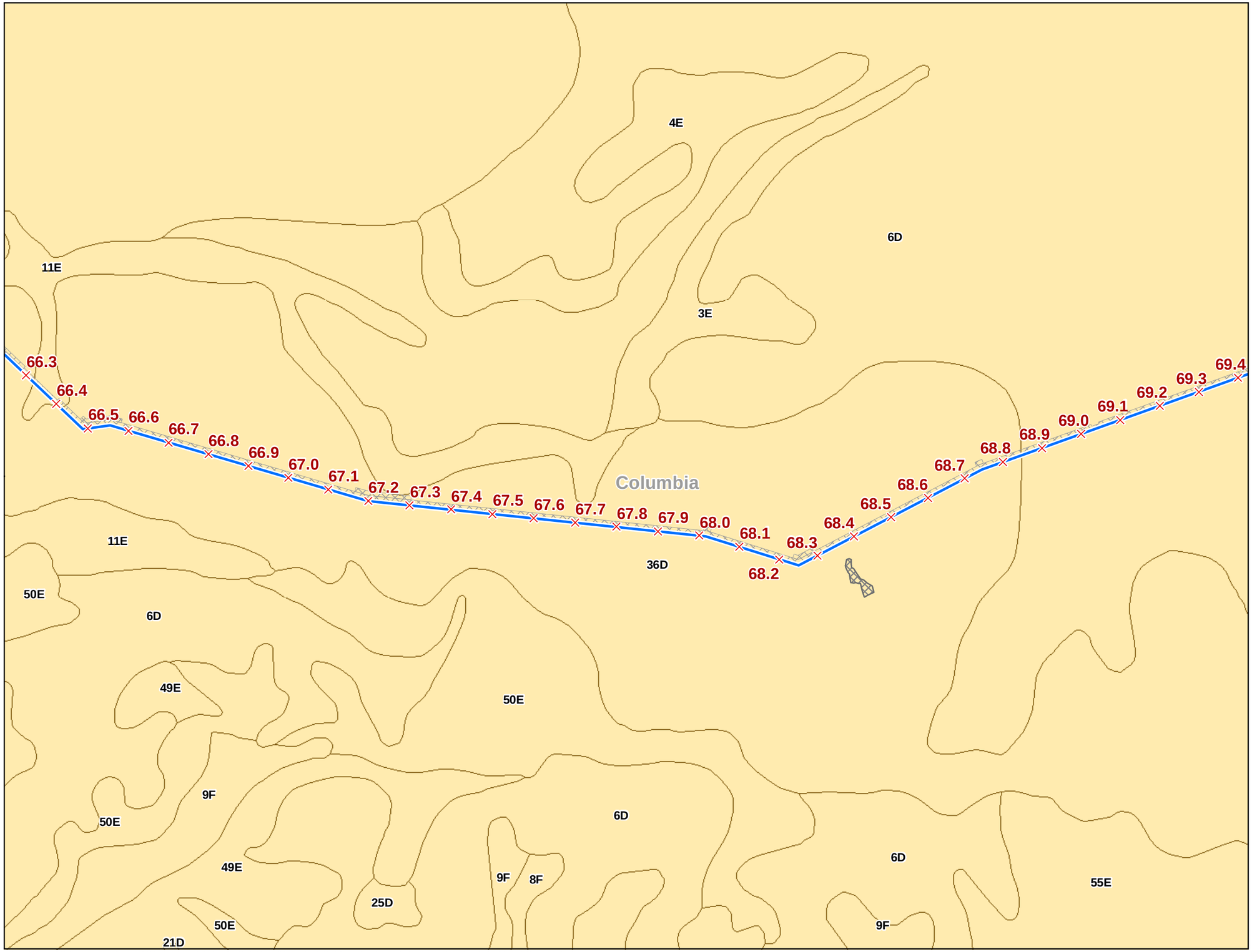


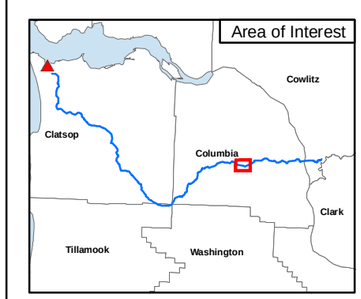
Figure 7A-23

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



N

0 1,200 2,400

Feet

CH2MHILL.

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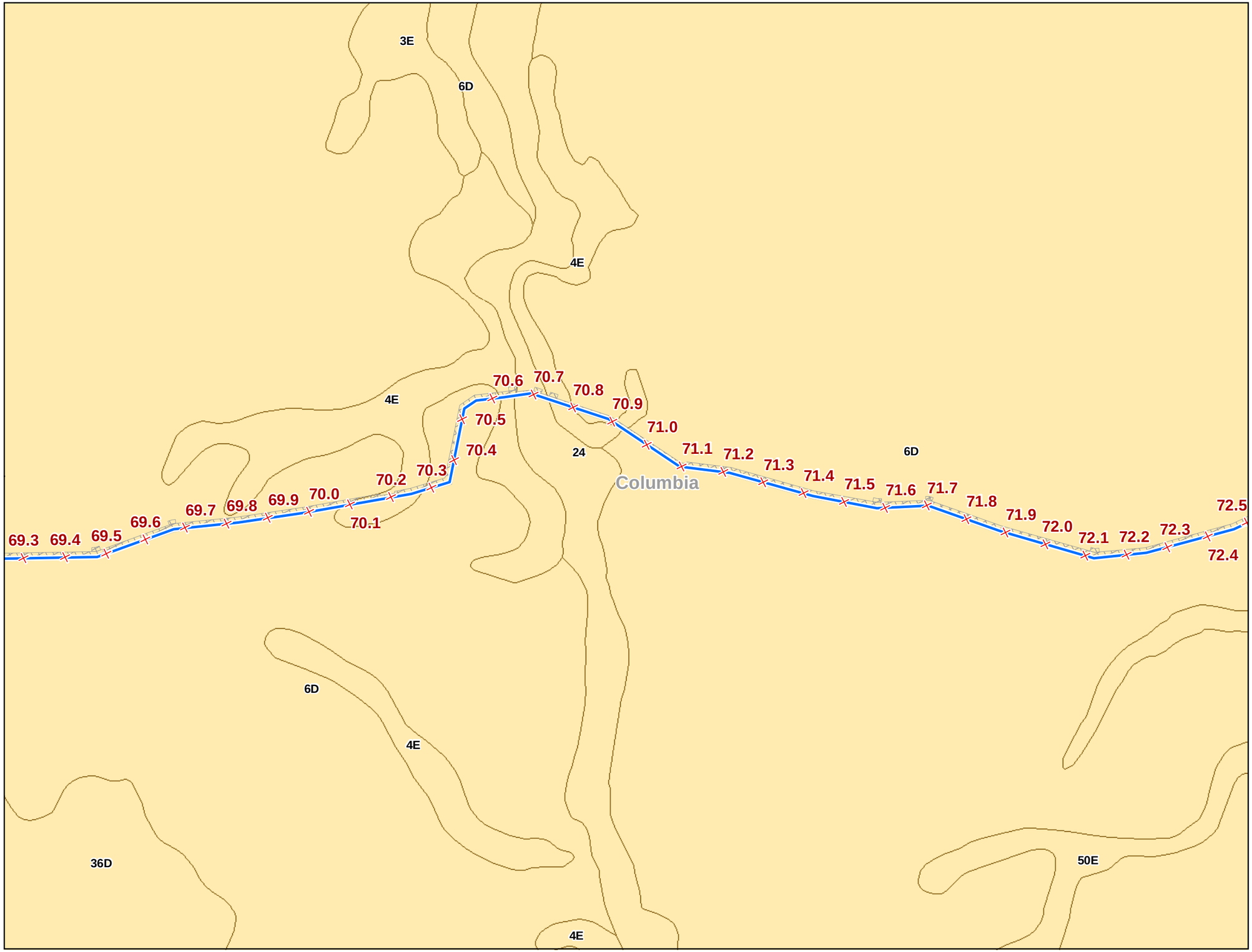

Figure 7A-24

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water

N

0 1,200 2,400
Feet

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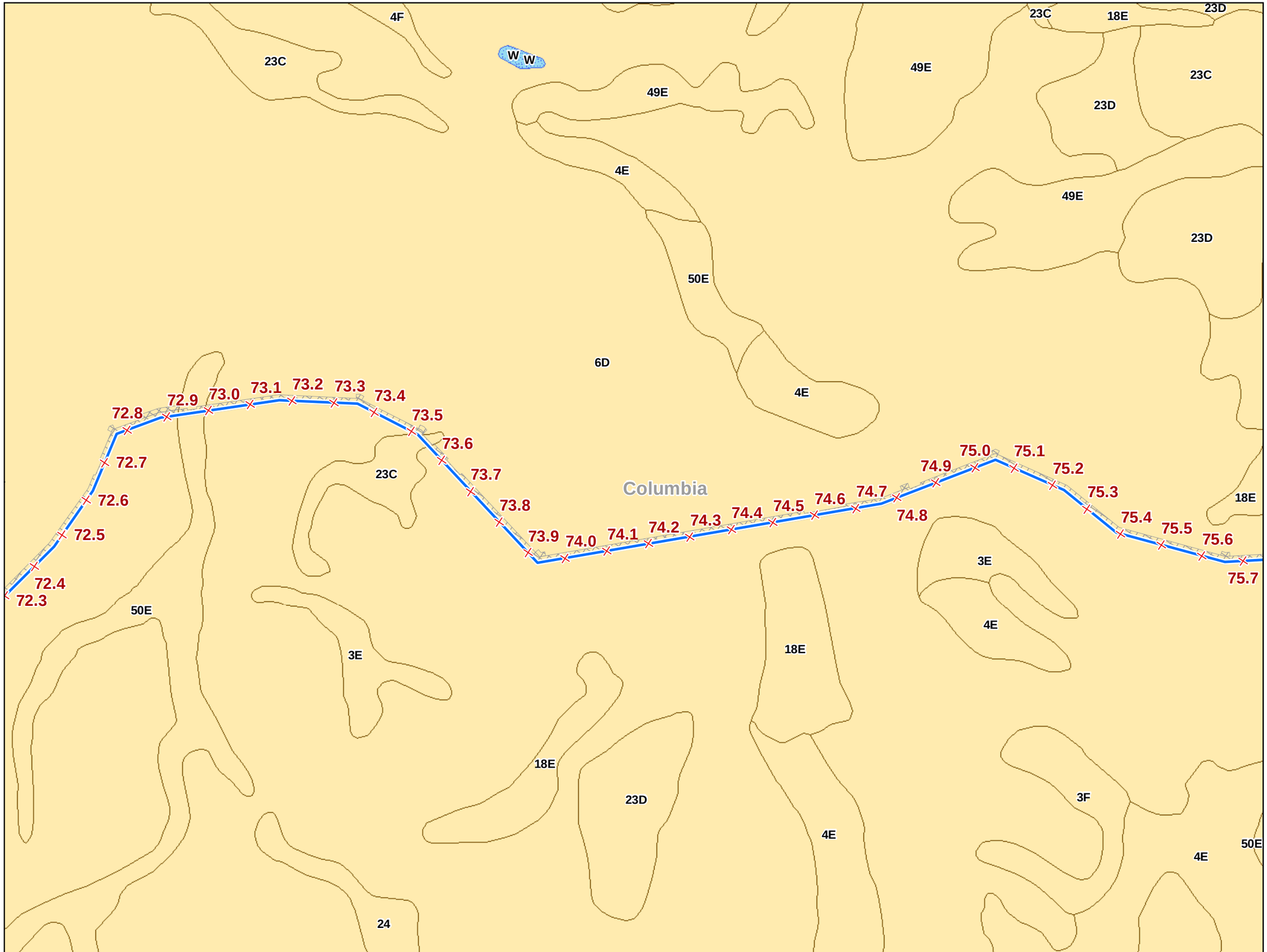

Figure 7A-25

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water

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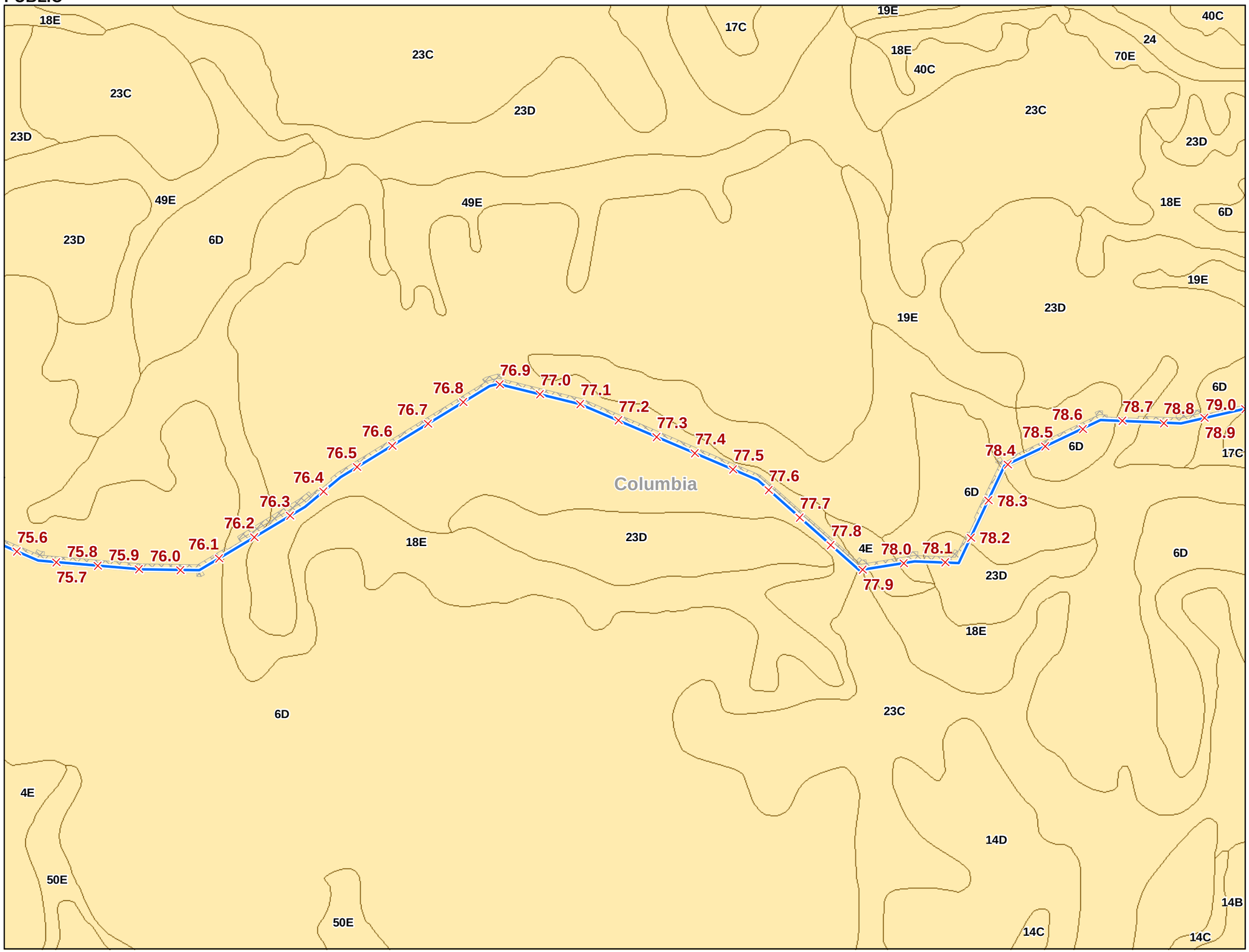


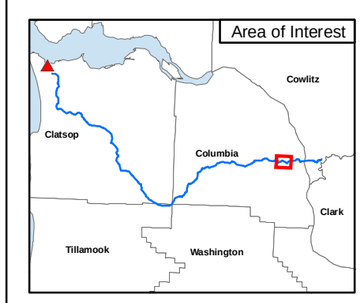
Figure 7A-26

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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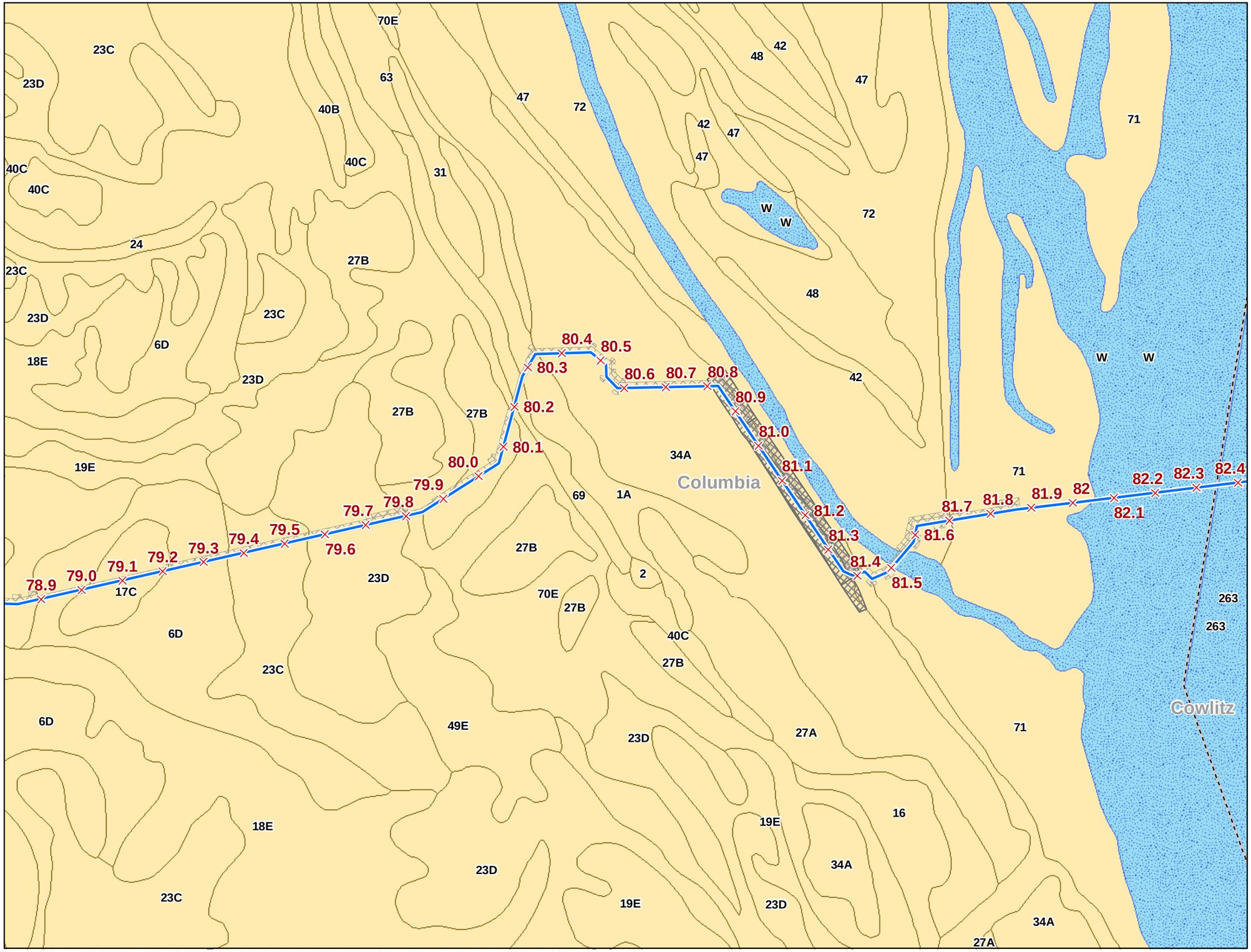


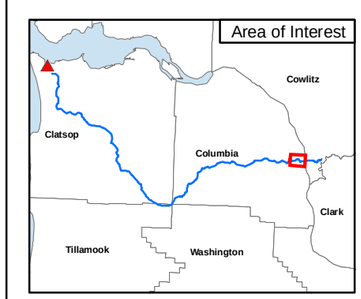
Figure 7A-27

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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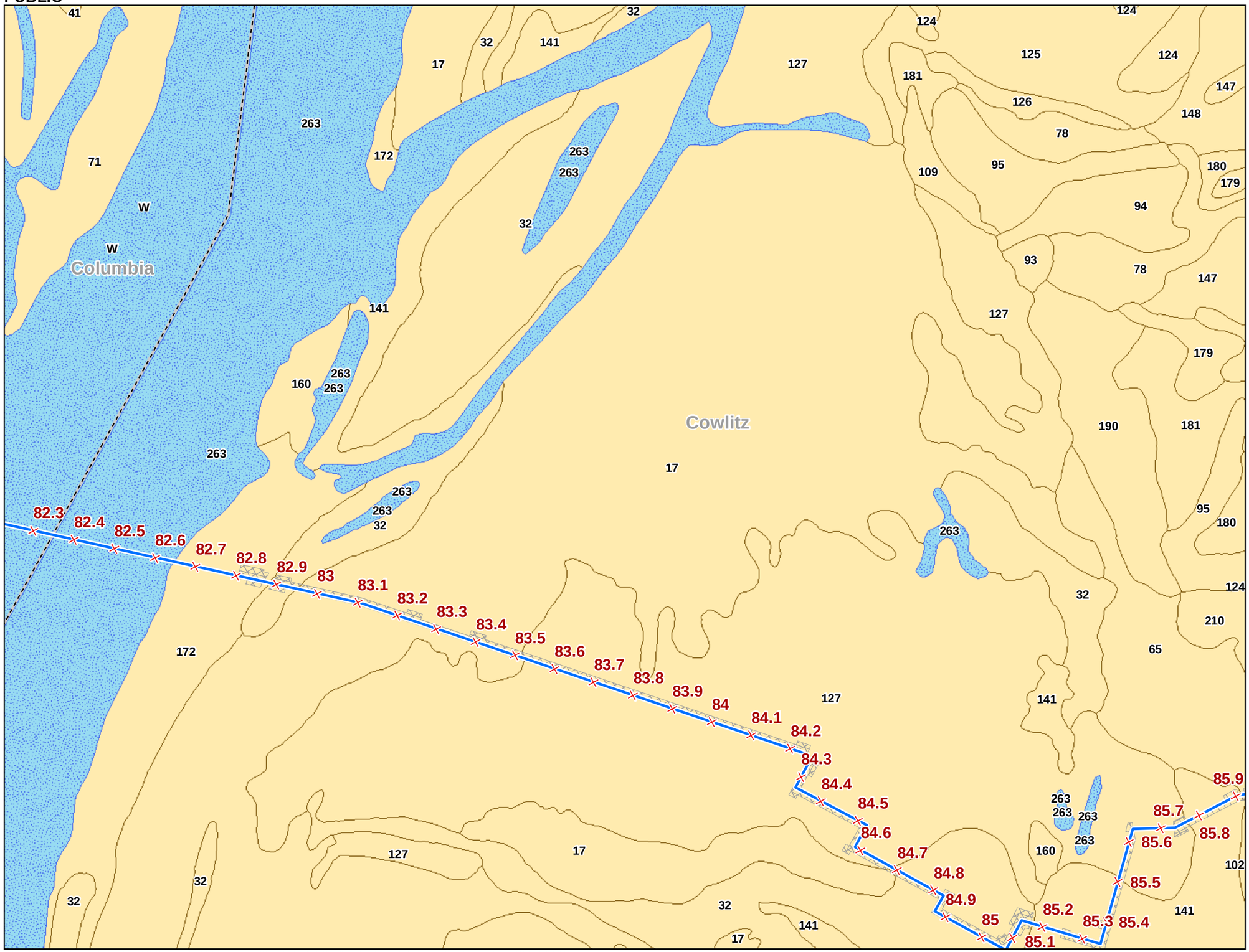


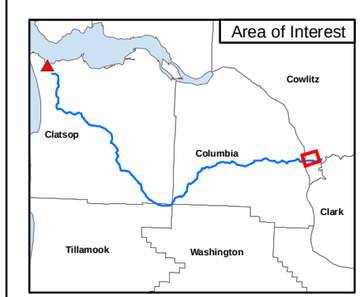
Figure 7A-28

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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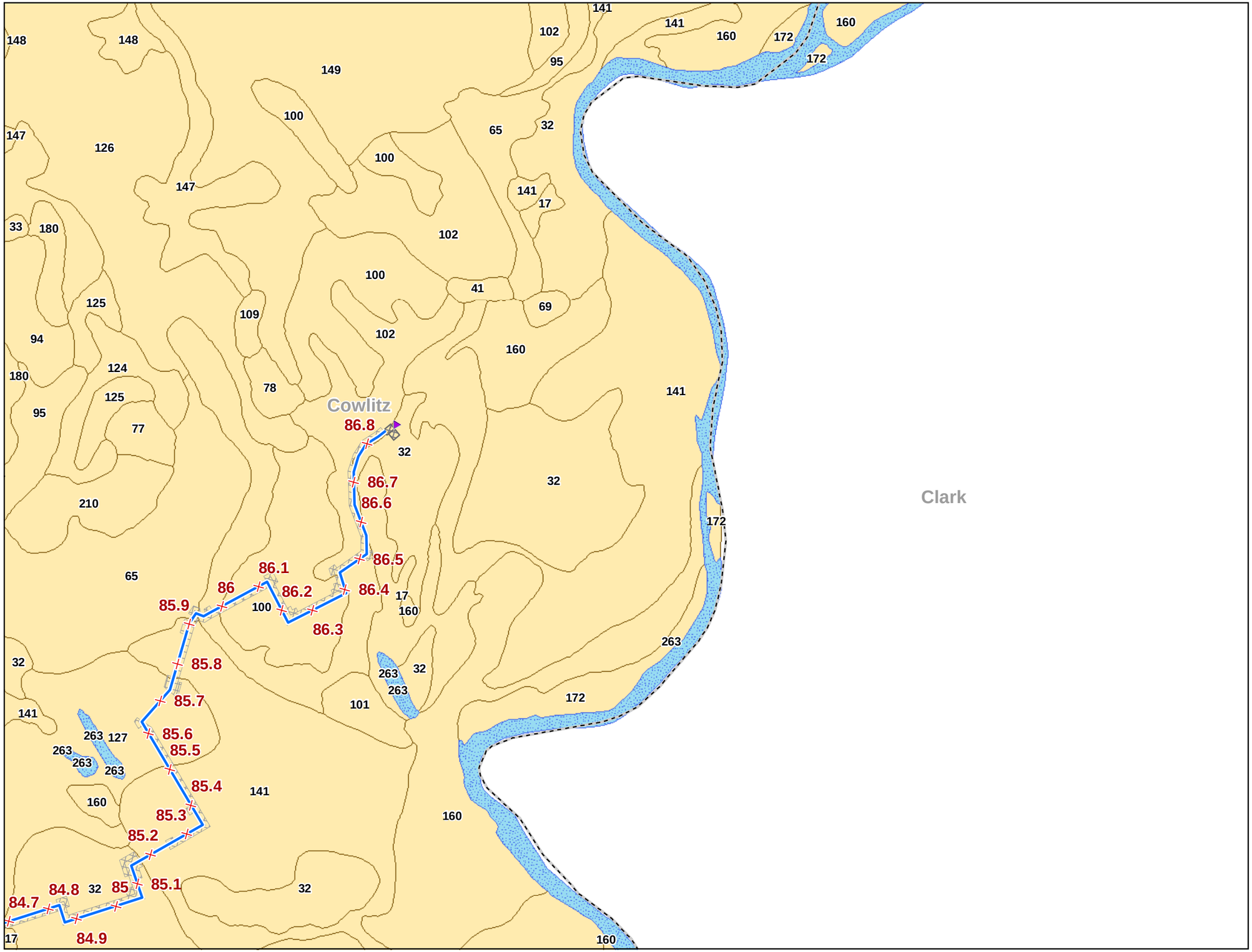


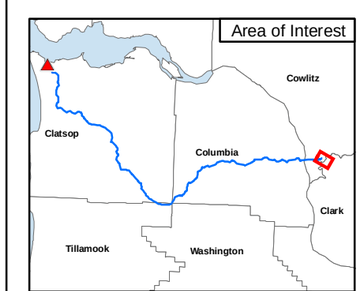
Figure 7A-29

Soil Map

OregonLNG

LEGEND

- Pipeline Route
- Pipeline Permanent, Temporary, and Additional Temporary Workspace
- Soil Mapping Unit
- Water



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Appendix 7C
Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
Clatsop County													
8A	Brenner silt loam, 0 to 3 percent slopes	Brenner	85	No	No	No	No (6)	No	3w				
		Brenner, silt loam substratum	7	No	No	No	No (6)	No	3w	Yes - I	No	Yes	No
		Percent or Range Within Unit 8A		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
9D	Caterl-Laderly complex, 3 to 30 percent slopes	Caterl	45	Yes	No	Yes	No (6)	Yes	6e				
		Laderly	35	Yes	No	Yes	No (6)	Yes	6e				
		Aquands	2	NA	NA	NA	NA	NA	NA	No	No	No	No
		Percent or Range Within Unit 9D		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
9E	Caterl-Laderly complex, 30 to 60 percent slopes	Caterl	45	Yes	No	Yes	No (6)	Yes	7e				
		Laderly	35	Yes	No	Yes	No (6)	Yes	7e	No	No	No	No
		Percent or Range Within Unit 9E		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
10B		Chitwood	85	No	No	Yes	No (6)	No	3e				
	Chitwood silt loam, 0 to 7 percent slopes	Aquepts	4	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within 10B		**0.0**	**0.0**	**0.9**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
11A	Coquille-Clatsop complex, unprotected, 0 to 1 percent slopes	Coquille	60	No	No	Yes	No (6)	Yes	6w				
		Clatsop	30	No	Yes	Yes	No (5)	Yes	4w				
		Histosols	3	NA	NA	NA	NA	NA	NA				
		Coquille, very gravelly	3	No	No	Yes	No (6)	Yes	6w				
		Coquille, sandy substratum	2	No	No	Yes	No (6)	Yes	6w				
		Psammaquents	2	NA	NA	NA	NA	NA	NA	No	No	No	No
		Percent or Range Within Unit 11A		**0.0**	**0.3**	**1.0**	**0.0**	**1.0**		**0.0**	**0.0**	**0.0**	**0.0**
12A	Coquille-Clatsop complex, protected, 0 to 1 percent slopes	Coquille	60	No	No	Yes	No (6)	Yes	4w				
		Clatsop	30	No	Yes	Yes	No (5)	Yes	4w				
		Histosols	3	NA	NA	NA	NA	NA	NA				
		Coquille, very gravelly	3	No	No	Yes	No (6)	Yes	6w				
		Coquille, sandy substratum	2	No	No	Yes	No (6)	Yes	6w				
		Psammaquents	2	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within Unit 12A		**0.0**	**0.3**	**0.9**	**0.0**	**0.9**		**1.0**	**0.0**	**1.0**	**0.0**
13A	Coquille variant silt loam, 0 to 1 percent slopes	Coquille variant	80	No	No	No	No (6)	No	3w	Yes -I	No	Yes	No
		Percent or Range Within Unit 13A		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
17A	Eilertsen silt loam, 0 to 3 percent slopes	Eilertsen	85	No	No	No	No (6)	No	2c				
		Aqualfs	8	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within Unit 17A		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
20B		Grindbrook	85	No	No	No	No (6)	No	2e				
	Grindbrook silt loam, 0 to 7 percent slopes	Aquepts	4	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within Unit 20B		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
20C		Grindbrook	85	No	No	Yes	No (6)	No	3e				
	Grindbrook silt loam, 7 to 20 percent slopes	Aquepts	3	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within Unit 20C		**0.0**	**0.0**	**0.9**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
21D	Grindbrook silt loam, bedrock substratum, 3 to 30 percent slopes	Grindbrook	85	Yes	No	Yes	No (6)	Yes	4e				
		Aquepts	3	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
		Percent or Range Within Unit 21D		**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**1.0**	**0.0**	**1.0**	**0.0**
22F	Harslow-Kilchis very gravelly loams, 60 to 90 percent slopes	Harslow	50	Yes	No	Yes	No (8)	Yes	7e				
		Kilchis	35	Yes	No	No	No (8)	Yes	7s	No	No	No	No
		Percent or Range Within Unit 22F		**0.9**	**0.0**	**0.5**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
23A	Hebo silty clay loam, 0 to 3 percent slopes	Hebo silty clay loam	85	No	Yes	Yes	No (7)	Yes	4w				
		Hebo, loamy substratum	4	No	Yes	Yes	No (7)	Yes	4w				
		Hebo, gravelly	3	No	Yes	Yes	No (7)	Yes	4w	Yes - I	No	Yes	No
		Percent or Range Within Unit 23A		**0.0**	**0.9**	**0.9**	**0.0**	**0.9**		**1.0**	**0.0**	**1.0**	**0.0**

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
25D	Hemcross silt loam, 3 to 30 percent slopes	Hemcross	75	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Aquands	5	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 25D			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
26E	Hemcross-Klistan complex, 30 to 60 percent slopes	Hemcross	45	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Klistan	35	Yes	No	Yes	No (6)	Yes	6e				
	Percent or Range Within Unit 26E			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
27	Humitropepts, 25 to 60 percent slopes	Humitropepts	75	Yes	No	Yes	No (5)	Yes	6e	No	No	No	No
		Aquepts	6	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 27			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
28	Humitropepts-Tropaquents complex, 0 to 20 percent slopes	Humitropepts	45	Yes	No	Yes	No (5)	Yes	6e	No	No	No	No
		Tropaquepts	40	No	No	Yes	No (6)	Yes	6e				
	Percent or Range Within Unit 28			**0.5**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
30A	Kirkendall silt loam, 0 to 3 percent slopes	Kirkendall	85	No	No	No	No (6)	No	2w	Yes - I	No	Yes	No
		Aquepts	7	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 30A			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
31E	Klistan-Harslow complex, 30 to 60 percent slopes	Klistan	45	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Harslow	30	Yes	No	Yes	No (8)	Yes	6e				
	Percent or Range Within Unit 31E			**0.9**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
32D	Klootchie silt loam, 3 to 30 percent slopes	Klootchie	85	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Aquands	3	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 32D			**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
33E	Klootchie-Necanicum complex, 30 to 60 percent slopes	Klootchie	50	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Necanicum	30	Yes	No	Yes	No (6)	Yes	6e				
	Percent or Range Within Unit 33E			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
35C	Knappa silt loam, 7 to 15 percent slopes	Knappa	85	No	No	No	No (6)	No	2e	Yes - I	No	Yes	No
		Aquepts	4	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 35C			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
41D	Mayger silt loam, 3 to 30 percent slopes	Mayger	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 41D			**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
42D	McMille silt loam, 3 to 30 percent slopes	McMille	85	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 42D			**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
43A	McNulty silt loam, 0 to 3 percent slopes	McNulty	85	No	No	No	No (5)	No	2w	Yes - I	No	Yes	No
		Aquepts	4	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 43A			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
46D	Murtip loam, 3 to 30 percent slopes	Murtip	75	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Aquands	6	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 46D			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
49A	Natal silty clay loam, 0 to 3 percent slopes	Natal	85	No	Yes	Yes	No (7)	No	3e	Yes - I	No	Yes	No
		Natal, loamy substratum	7	No	Yes	Yes	No (7)	No	3e				
	Percent or Range Within Unit 49A			**0.0**	**0.9**	**0.9**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
51A	Nehalem silt loam, 0 to 3 percent slopes	Nehalem	85	No	No	No	No (6)	No	2w	Yes - I	No	Yes	No
		Aquepts	4	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 51A			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
52A	Nestucca silt loam, 0 to 3 percent slopes	Nestucca	85	No	No	No	No (6)	No	3w	Yes - I	No	Yes	No
		Aquepts, poorly and very poorly drained	7	NA	NA	NA	NA	NA	NA				
	Percent or Range Within Unit 52A			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
55C	Northrup silt loam, 7 to 15 percent slopes	Northrup	80	No	No	No	No (6)	No	3w	Yes - I	No	Yes	No
	Percent or Range Within Unit 55C			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
56D	Rinearson silt loam, 3 to 30 percent slopes	Rinearson	85	Yes	No	Yes	No (6)	Yes	6e				
		Aquepts	3	NA	NA	NA	NA	NA	NA	No	No	No	No
	Percent or Range Within Unit 56D			**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
56E	Rinearson silt loam, 30 to 60 percent slopes	Rinearson	85	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 56E			**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
56F	Rinearson silt loam, 60 to 90 percent slopes	Rinearson	75	Yes	No	Yes	No (6)	Yes	7e	No	No	No	No
	Percent or Range Within Unit 56F			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
58D	Skipanon gravelly silt loam, 3 to 30 percent slopes	Skipanon	80	Yes	No	Yes	No (6)	Yes	6e				
		Aquaepts	5	NA	NA	NA	NA	NA	NA	No	No	No	No
	Percent or Range Within Unit 58D			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
58E	Skipanon gravelly silt loam, 30 to 60 percent slopes	Skipanon	80	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 58E			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
60D	Templeton silt loam, 3 to 30 percent slopes	Templeton	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 60D			**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
61E	Templeton-Ecola silt loams, 30 to 60 percent slopes	Templeton	50	No	No	Yes	No (6)	Yes	6e				
		Ecola	40	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 61E			**0.4**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
63D	Tolke silt loam, 3 to 30 percent slopes	Tolke	80	No	No	Yes	No (6)	Yes	6e				
		Aquands	5	NA	NA	NA	NA	NA	NA	No	No	No	No
	Percent or Range Within Unit 63D			**0.0**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
65A	Treharne silt loam, 0 to 3 percent slopes	Treharne	85	No	No	No	No (6)	No	2c				
		Aqualfs	10	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
	Percent or Range Within Unit 65A			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
66	Tropofluvents, 0 to 3 percent slopes	Tropofluvents	80	Yes	No	No	No (5)	Yes	6w				
		Aquents	10	NA	NA	NA	NA	NA	NA	No	No	No	No
	Percent or Range Within Unit 66			**0.8**	**0.0**	**0.0**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
67	Tropopsamments, 0 to 15 percent slopes	Tropopsamments	90	No	No	Yes	Yes (1)	Yes	6e				
		Aquents	10	NA	NA	NA	NA	NA	NA	No	No	No	No
	Percent or Range Within Unit 67			**0.0**	**0.0**	**0.9**	**0.9**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
68	Udifluvents-Hapludalfs, complex 0 to 15 percent slopes	Udifluvents	45	Yes	No	No	No (6)	No	3w				
		Hapludalfs	40	No	No	No	No (6)	No	2c	Yes - I	No	Yes	No
	Percent or Range Within Unit 68			**0.5**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
70C	Waldport fine sand, 3 to 15 percent slopes	Waldport	85	No	No	Yes	Yes (1)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 70C			**0.0**	**0.0**	**0.9**	**0.9**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
71B	Walluski silt loam, 0 to 7 percent slopes	Walluski	85	No	No	No	No (6)	No	2e				
		Aquepts	4	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
	Percent or Range Within Unit 71B			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
71C	Walluski silt loam, 7 to 15 percent slopes	Walluski	85	No	No	No	No (6)	No	2e				
		Aquepts	4	NA	NA	NA	NA	NA	NA	Yes - I	No	Yes	No
	Percent or Range Within Unit 71C			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
71D	Walluski silt loam, 15 to 20 percent slopes	Walluski	80	No	No	Yes	No	No	3e	Yes - I	No	Yes	No
	Percent or Range Within Unit 71D			**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
Tillamook County													
116A	Aquepts, warm, 0 to 1 percent slopes	Aquepts	85	No	No	No	No (6)	Yes	5w	No	No	No	No
	Percent or Range Within Unit 116A			**0.0**	**0.0**	**0.0**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
342D	McMille medial silt loam, 3 to 30 percent slopes	McMille	85	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 342D			**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
347E		Murtip	45	Yes	No	Yes	No (6)	Yes	6e				
	Murtip-Caterl complex, 30 to 60 percent slopes	Caterl	35	Yes	No	Yes	No (7)	Yes	6e	No	No	No	No
	Percent or Range Within Unit 347E			**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
356D	Rinearson silt loam, 3 to 30 percent slopes	Rinearson	85	Yes	No	Yes	No (6)	Yes	6e				
		Aquepts	3	NA	NA	NA	NA	NA	NA	No	No	No	No
		Percent or Range Within Unit 356D		**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
357E	Scaponia-Braun silt loams, 30 to 60 percent slopes	Scaponia	50	Yes	No	Yes	No (6)	Yes	6e				
		Braun	35	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 357E		**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
363D	Tolke medial silt loam, 5 to 30 percent	Tolke	80	No	No	Yes	No (6)	Yes	6e				
		Aquands	5	NA	NA	NA	NA	NA	NA	No	No	No	No
		Percent or Range Within Unit 363D		**0.0**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
Columbia County													
1A	Aloha silt loam, 0 to 3 percent slopes	Aloha	90	No	No	No	No (5)	No	2w	Yes - Pd	Yes - d	No	No
		Percent or Range Within Unit 1A		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
4E	Alstony gravelly loam, 30 to 60 percent south	Alstony, south	80	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 4E		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
6D	Bacona silt loam, 3 to 30 percent slopes	Bacona	80	No	No	No	No (6)	No	2w	Yes - Pd	Yes - d	No	No
		Percent or Range Within Unit 6D		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
7D	Braun-Scaponia silt loams, 5 to 30 percent slopes	Braun	50	Yes	No	Yes	No (6)	Yes	6e				
		Scaponia	30	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 7D		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
8F	Braun-Scaponia silt loams, 60 to 90 percent north slopes	Braun, north	50	Yes	No	Yes	No (6)	Yes	7e				
		Scaponia, north	30	Yes	No	Yes	No (6)	Yes	7e	No	No	No	No
		Percent or Range Within Unit 8F		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
9F	Braun-Scaponia silt loams, 60 to 90 percent south slopes	Braun, south	50	Yes	No	Yes	No (6)	Yes	7e				
		Scaponia, south	30	Yes	No	Yes	No (6)	Yes	7e	No	No	No	No
		Percent or Range Within Unit 9F		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
11E	Caterl gravelly silt loam, 30 to 60 percent north	Caterl, north	80	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 11E		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
17C	Delena silt loam, 3 to 12 percent slopes	Delena	90	No	Yes	No	No (5)	Yes	4w	Yes - I	No	Yes	No
		Percent or Range Within Unit 17C		**0.0**	**0.9**	**0.0**	**0.0**	**0.9**		**1.0**	**0.0**	**1.0**	**0.0**
18E	Dowde silt loam, 30 to 60 percent north slopes	Dowde, north	80	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 18E		**0.0**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
21D	Glohm silt loam, 3 to 30 percent slopes	Glohm	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 21D		**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
23C	Goble silt loam, warm, 3 to 15 percent slopes	Goble, warm	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 23C		**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
23D	Goble silt loam, warm, 15 to 30 percent slopes	Goble, warm	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 23D		**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
24	Hapludalfs-Udifluvents complex	Hapludalfs	60	No	No	No	No (6)	No	2c				
		Udifluvents	30	No	No	No	No (6)	No	3w	Yes - I	No	Yes	No
		Percent or Range Within Unit 24		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
26C	Kenusky silty clay loam, 0 to 15 percent slopes	Kenusky	80	No	No	No	No (7)	Yes	6w	No	No	No	No
		Percent or Range Within Unit 26C		**0.0**	**0.0**	**0.0**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
27B	Latourell silt loam, 3 to 8 percent slopes	Latourell	90	No	No	No	No (5)	No	2e	Yes - P	Yes	No	No
		Percent or Range Within Unit 27B		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
30D	Mayger silt loam, 3 to 30 percent slopes	Mayger	85	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 30D		**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
32	McNulty silt loam	McNulty	85	No	No	No	No (5)	No	2w	Yes - I	No	Yes	No
		Percent or Range Within Unit 32		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
34A	Multnomah loam, 0 to 3 percent slopes	Multnomah	90	No	No	No	No (6)	No	3s	Yes - P	Yes	No	No
		Percent or Range Within Unit 34A		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
36D	Murnen silt loam, 3 to 30 percent slopes	Murnen	80	Yes	No	Yes	No (5)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 36D		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
37	Natal silty clay loam	Natal	85	No	Yes	No	No (7)	No	3w	Yes - I	No	Yes	No
		Percent or Range Within Unit 37		**0.0**	**0.9**	**0.0**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
49E	Scaponia-Braun silt loams, 30 to 60 percent north sl	Scaponia, north	45	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Braun, north	40	Yes	No	Yes	No (6)	Yes	6e				
		Percent or Range Within Unit 49E		**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
50E	Scaponia-Braun silt loams, 30 to 60 percent south slopes	Scaponia, south	45	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Braun, south	40	Yes	No	Yes	No (6)	Yes	6e				
		Percent or Range Within Unit 50E		**0.9**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
56D	Tolke silt loam, 5 to 30 percent slopes	Tolke	80	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 56D		**0.0**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
58	Treharne silt loam	Treharne	85	No	No	No	No (6)	No	2c	Yes - I	No	Yes	No
		Percent or Range Within Unit 58		**0.0**	**0.0**	**0.8**	**0.0**	**0.8**		**1.0**	**0.0**	**1.0**	**0.0**
62D	Vernonia silt loam, 3 to 30 percent slopes	Vernonia	80	Yes	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 62D		**0.8**	**0.0**	**0.8**	**0.0**	**0.8**		**0.0**	**0.0**	**0.0**	**0.0**
69	Wollent silt loam	Wollent	85	Yes	No	No	No (5)	No	3w	Yes - Pd	Yes - d	No	No
		Percent or Range Within Unit 69		**0.9**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
70E	Xerochrepts, steep	Xerochrepts	90	No	No	Yes	No (6)	Yes	6e	No	No	No	No
		Percent or Range Within Unit 70E		**0.0**	**0.0**	**0.9**	**0.0**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
71	Xeropsamments, nearly level	Xeropsamments	85	No	No	No	Yes (2)	Yes	6w	No	No	No	No
		Percent or Range Within Unit 71		**0.0**	**0.0**	**0.0**	**0.9**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
72	Xeropsamments, nearly level, protected	Xeropsamments, protected	85	No	No	No	Yes (2)	Yes	6s	No	No	No	No
		Percent or Range Within Unit 72		**0.0**	**0.0**	**0.0**	**0.9**	**0.9**		**0.0**	**0.0**	**0.0**	**0.0**
Cowlitz County, Washington													
17	Caples silty clay loam, 0 to 3 percent slopes	Caples, drained	90	No	Yes	No	No (7)	No	4w	Yes - Pdp	Yes - dp	No	No
		Percent or Range Within Unit 17		**0.0**	**0.9**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
32	Clato silt loam, 0 to 3 percent slopes	Clato	85	No	No	No	No (5)	No	1	Yes - P	Yes	No	No
		Percent or Range Within Unit 32		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
65	Godfrey silt loam, 0 to 3 percent slopes	Godfrey	85	No	No	No	No (5)	No	4w	Yes - Pd	Yes - d	No	No
		Percent or Range Within Unit 65		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
68	Greenwater gravelly loamy sand, 0 to 8 percent slopes	Greenwater	75	Yes	No	No	Yes (2)	No	3s	Yes - Pi	Yes - I	No	No
		Percent or Range Within Unit 68		**0.8**	**0.0**	**0.0**	**0.8**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
77	Hazeldell gravelly silt loam, 20 to 30 percent slopes	Hazeldell	80	No	No	Yes	No (7)	No	4e	Yes - I	No	Yes	No
		Percent or Range Within Unit 77		**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
100	Kelso silt loam, 0 to 8 percent slopes	Kelso	80	No	No	No	No (5)	No	2w	Yes - P	Yes	No	No
		Percent or Range Within Unit 100		**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
102	Kelso silt loam, 15 to 30 percent slopes	Kelso	80	No	No	Yes	No (5)	No	4e	Yes - I	No	Yes	No
		Percent or Range Within Unit 102		**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
124	Mart silt loam, 8 to 20 percent slopes	Mart	80	No	No	Yes	No (6)	No	4e	Yes - I	No	Yes	No
		Percent or Range Within Unit 124		**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
127	Maytown silt loam, 0 to 3 percent slopes	Maytown	80	No	No	No	No (6)	No	3w	Yes - P	Yes	No	No
		Percent or Range Within Unit 127		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
141	Newberg fine sandy loam, 0 to 3 percent slopes	Newberg	85	No	No	No	No (3)	No	3w	Yes - Pdp	Yes - dp	No	No
		Chehalis	5	No	No	No	No (3)	No	NA				
		Percent or Range Within Unit 141		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**1.0**	**1.0**	**0.0**	**0.0**
172	Riverwash	Riverwash	85	No	No	No	UNK	No	8	No	No	No	No
		Percent or Range Within Unit 172		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**0.0**	**0.0**	**0.0**	**0.0**
	Schneider-Rock outcrop complex, 15 to 65 percent	Schneider	55	Yes	No	Yes	No (7)	Yes	7e				

APPENDIX 7C

Characteristics of Soil Map Units Encountered at the Terminal and Along the Pipeline

											Prime Farmland Type		
MU ID	**Soil Map Unit**	**Soil Series Component**	**Percent in Soil Map Unit**	**Shallow Depth to Bedrock or Coarse Fragments[a]**	**High Compaction Potential[b]**	**High Erosion Potential from Water[c]**	**High Erosion Potential from Wind[d]**	**Poor Reveg. Potential[e]**	**Land Capability Classification[f]**	**Prime and Important Farmlands[g]**	**Prime**	**Statewide Importance**	**Unique**
190	slopes	Rock outcrop	30	NA	NA	NA	NA	NA	8s	No	No	No	No
		Percent or Range Within Unit 190		**0.9**	**0.0**	**0.6**	**0.0**	**0.6**		**0.0**	**0.0**	**0.0**	**0.0**
210	Stella silt loam, 15 to 30 percent slopes	Stella	80	No	No	Yes	No (5)	No	4e	Yes - I	No	Yes	No
		Percent or Range Within Unit 210		**0.0**	**0.0**	**0.8**	**0.0**	**0.0**		**1.0**	**0.0**	**1.0**	**0.0**
263	Water	Water	100	No	Yes	Yes	No	No	NA	No	No	No	No
		Percent or Range Within Unit 263		**0.0**	**1.0**	**1.0**	**0.0**	**0.0**		**0.0**	**0.0**	**0.0**	**0.0**
W	**Water**	**Water**	**100**	**0.0**	**1.0**	**1.0**	**0.0**	**0.0**	**NA**	**0.0**	**0.0**	**0.0**	**0.0**

[a] Bedrock or coarse soil with a gravelly or cobbly modifier within 60 inches of the ground surface.

[b] Soil that has a surface texture of sandy clay loam or finer and a somewhat poorly, poorly, or very poorly drainage class; all areas covered with water or seasonally ponded.

[c] Soil with a Land Capability Class of 3 or higher and a subclass of "e", indicating risk of erosion unless close-grown cover is mantained; all areas covered with water or seasonally ponded.

[d] Soil with a WEG of 1 or 2.

[e] Soil with a Land Capability Class of 4 or higher or soil with a surface texture of fine sand or coarser and a drainage class of well, somewhat excessively, or excessively.

[f] Land Capability Classifications as defined by the NRCS (NRCS, 2012b).

[g] Prime and Important Farmland designations as indicated by the NRCS (NRCS, 2012c). P = Prime Farmland; I = Farmland of Statewide Importance; U = Unique Farmland.

Yes - Pi or Yes - I = Prime farmland if irrigated.

Yes - Pd or Yes - d = Prime farmland if drained.

Yes - Pdp or Yes - dp = Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season.

Yellow highlighting indicates a change from the June 2013 submittal version of this table.

Precision loss may occur because of rounding.

Appendix 7D-1
Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Clatsop	Pipeline	67	0.00	0.36	0.36	0.0	0.0	0.3	0.3	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	11A	0.36	0.38	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	W	0.38	0.46	0.08	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	11A	0.46	0.92	0.46	0.0	0.1	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	12A	0.92	1.00	0.08	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	W	1.00	1.02	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	12A	1.02	1.83	0.81	0.0	0.2	0.7	0.0	0.7	0.8	0.0	0.8	0.0
Clatsop	Pipeline	71C	1.83	2.37	0.54	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0
Clatsop	Pipeline	12A	2.37	2.98	0.61	0.0	0.2	0.5	0.0	0.5	0.6	0.0	0.6	0.0
Clatsop	Pipeline	11A	2.98	3.03	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	W	3.03	3.07	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	11A	3.07	3.11	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	W	3.11	3.20	0.09	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	12A	3.20	4.48	1.28	0.0	0.4	1.2	0.0	1.2	1.3	0.0	1.3	0.0
Clatsop	Pipeline	W	4.48	4.50	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	12A	4.50	5.66	1.15	0.0	0.3	1.0	0.0	1.0	1.2	0.0	1.2	0.0
Clatsop	Pipeline	W	5.66	5.73	0.07	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	12A	5.73	5.92	0.19	0.0	0.1	0.2	0.0	0.2	0.2	0.0	0.2	0.0
Clatsop	Pipeline	71C	5.92	5.99	0.07	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	35C	5.99	6.19	0.20	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
Clatsop	Pipeline	20B	6.19	6.26	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	23A	6.25	6.31	0.06	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	20B	6.31	6.41	0.09	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	61E	6.41	7.80	1.39	0.6	0.0	1.3	0.0	1.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	21D	7.80	7.80	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	28	7.80	7.99	0.19	0.1	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	7.99	8.10	0.12	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	21D	8.10	8.46	0.36	0.3	0.0	0.3	0.0	0.3	0.4	0.0	0.4	0.0
Clatsop	Pipeline	20B	8.46	8.59	0.13	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	23A	8.59	8.83	0.24	0.0	0.2	0.2	0.0	0.2	0.2	0.0	0.2	0.0
Clatsop	Pipeline	20C	8.83	9.02	0.19	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.2	0.0
Clatsop	Pipeline	21D	9.02	9.08	0.06	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	20C	9.08	9.16	0.08	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	21D	9.16	10.01	0.85	0.7	0.0	0.7	0.0	0.7	0.8	0.0	0.8	0.0
Clatsop	Pipeline	61E	10.01	10.14	0.14	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	20B	10.14	10.23	0.09	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	23A	10.23	10.57	0.34	0.0	0.3	0.3	0.0	0.3	0.3	0.0	0.3	0.0
Clatsop	Pipeline	20B	10.57	10.72	0.15	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	23A	10.72	10.84	0.12	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	27	10.84	10.89	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	8A	10.89	10.94	0.05	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	51A	10.94	11.01	0.07	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	66	11.01	11.07	0.07	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	52A	11.07	11.12	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	66	11.12	11.13	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	52A	11.13	11.19	0.05	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0

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Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Clatsop	Pipeline	27	11.19	11.27	0.09	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	23A	11.27	11.40	0.13	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	58E	11.40	11.45	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	11.45	12.62	1.18	0.9	0.0	0.9	0.0	0.9	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	12.62	12.77	0.15	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	12.77	13.22	0.45	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	13.22	13.30	0.08	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	13.30	13.46	0.16	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	13.46	13.72	0.25	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	13.72	13.78	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	13.78	13.89	0.11	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	13.89	14.01	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	14.01	14.32	0.31	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	14.32	14.38	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	14.38	14.56	0.18	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	14.56	14.57	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	14.57	15.50	0.94	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0
Clatsop	Pipeline	23A	15.50	16.12	0.62	0.0	0.6	0.6	0.0	0.6	0.6	0.0	0.6	0.0
Clatsop	Pipeline	28	16.12	16.46	0.34	0.2	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	16.46	16.67	0.21	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	16.67	16.76	0.10	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	32D	16.76	17.08	0.31	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	17.08	17.31	0.23	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	17.31	17.38	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	17.38	17.65	0.28	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	17.65	17.76	0.10	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	17.76	17.82	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	17.82	18.04	0.22	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	18.04	18.30	0.26	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	18.30	18.43	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	18.43	18.45	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	52A	18.45	18.62	0.17	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.0
Clatsop	Pipeline	28	18.62	18.66	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	18.66	18.97	0.31	0.1	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	66	18.97	19.07	0.10	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	19.07	19.08	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	66	19.08	19.12	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	19.12	19.18	0.06	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	21D	19.18	19.25	0.08	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Clatsop	Pipeline	52A	19.25	19.39	0.14	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	60D	19.39	19.64	0.24	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	28	19.64	19.75	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	19.75	20.05	0.30	0.1	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	28	20.05	20.12	0.07	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	20.12	20.20	0.08	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	20.20	20.44	0.24	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0

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Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Clatsop	Pipeline	61E	20.44	20.64	0.20	0.1	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	20.64	21.00	0.37	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	21.00	21.35	0.34	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	21.35	21.46	0.11	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	28	21.46	21.49	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	21.49	21.81	0.32	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	28	21.81	21.88	0.07	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	66	21.88	21.92	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	21.92	22.16	0.24	0.1	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	22.16	22.87	0.72	0.6	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	22.87	22.95	0.08	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	22.95	23.06	0.11	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	23.06	23.33	0.27	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	23.33	23.50	0.17	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	23.50	23.54	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	33E	23.54	23.91	0.38	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	32D	23.91	24.30	0.39	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	24.30	24.56	0.25	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	24.56	24.61	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	24.61	24.78	0.17	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	24.78	24.83	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	24.83	24.88	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	24.88	24.92	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	24.92	25.02	0.10	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	25.02	25.58	0.57	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	25.58	26.05	0.46	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	26.05	26.27	0.22	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	26.27	26.40	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	26.40	26.45	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	26.45	26.49	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	26.49	26.62	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	26.62	26.68	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	26.68	26.86	0.19	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	26.86	26.91	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	26.91	26.94	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	26.94	27.06	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	27.06	27.18	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56F	27.18	27.22	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	27.22	28.37	1.15	1.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	28.37	28.65	0.28	0.1	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	28.65	28.71	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	28.71	28.95	0.24	0.1	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	28.95	29.17	0.22	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58D	29.17	29.49	0.33	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	29.49	29.51	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	58E	29.51	30.35	0.84	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Clatsop	Pipeline	60D	30.35	30.39	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	30.39	30.46	0.07	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	30.46	30.89	0.43	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	30.89	30.95	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	30.95	31.16	0.21	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	61E	31.16	31.28	0.12	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	60D	31.28	31.50	0.22	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	31.50	33.02	1.53	1.3	0.0	1.3	0.0	1.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	41D	33.02	33.39	0.36	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	55C	33.39	33.44	0.05	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	W	33.44	33.47	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	43A	33.47	33.49	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	30A	33.49	33.59	0.10	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	17A	33.59	33.67	0.08	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	30A	33.67	33.78	0.11	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	65A	33.78	33.83	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	68	33.83	33.94	0.12	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	49A	33.94	34.12	0.18	0.0	0.2	0.2	0.0	0.0	0.2	0.0	0.2	0.0
Clatsop	Pipeline	41D	34.12	34.18	0.06	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	34.18	34.46	0.28	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	34.46	35.26	0.79	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	35.26	36.09	0.84	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	36.09	36.36	0.27	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	25D	36.36	36.92	0.55	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	36.92	37.08	0.17	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	31E	37.08	37.29	0.21	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	26E	37.29	37.54	0.25	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	22F	37.54	37.81	0.27	0.2	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	26E	37.81	38.21	0.41	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	46D	38.21	38.73	0.51	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	38.73	38.84	0.11	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	9E	38.84	38.92	0.08	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	38.92	39.91	0.98	0.8	0.0	0.8	0.0	0.8	0.0	0.0	0.0	0.0
Clatsop	Pipeline	26E	39.91	40.16	0.25	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	9D	40.16	40.26	0.10	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	31E	40.26	40.41	0.15	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	40.41	40.89	0.48	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Clatsop	Pipeline	68	40.89	40.98	0.09	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	26E	40.98	41.02	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	31E	41.02	41.07	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	41.07	41.19	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	68	41.19	41.25	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	Pipeline	56D	41.25	41.28	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	41.28	41.38	0.10	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	41.38	41.72	0.34	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56E	41.72	42.30	0.58	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Clatsop	Pipeline	56D	42.30	42.39	0.09	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	9E	42.39	42.60	0.21	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	42.60	42.73	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	9E	42.73	43.02	0.29	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	43.02	43.15	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	Pipeline	9E	43.15	43.39	0.24	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Clatsop	Pipeline	56D	43.39	43.80	0.41	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	42D	43.80	44.06	0.26	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Tillamook	Pipeline	342D	44.06	44.18	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Tillamook	Pipeline	116A	44.18	44.22	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tillamook	Pipeline	356D	44.22	45.25	1.02	0.9	0.0	0.9	0.0	0.9	0.0	0.0	0.0	0.0
Tillamook	Pipeline	357E	45.25	45.85	0.60	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
Tillamook	Pipeline	363D	45.85	46.30	0.46	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Tillamook	Pipeline	357E	46.30	46.63	0.32	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Tillamook	Pipeline	363D	46.63	46.84	0.22	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Tillamook	Pipeline	357E	46.84	47.04	0.20	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Tillamook	Pipeline	363D	47.04	47.45	0.42	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Clatsop	Pipeline	63D	47.44	47.45	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	56D	47.45	47.60	0.15	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	24	47.60	47.61	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	47.61	47.92	0.31	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	56D	47.92	48.18	0.26	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	48.18	48.24	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	56D	48.24	48.59	0.35	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	48.59	48.63	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	48.63	48.69	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	48.69	48.77	0.08	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	56D	48.77	48.82	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	48.82	49.05	0.22	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	49.05	50.03	0.99	0.8	0.0	0.8	0.0	0.8	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	50.03	50.16	0.13	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	50.16	50.47	0.31	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	24	50.47	50.53	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Columbia	Pipeline	62D	50.53	50.86	0.33	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	50.86	51.05	0.19	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	51.05	51.43	0.38	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	8F	51.43	51.48	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	51.48	52.21	0.73	0.6	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	52.21	52.26	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	52.26	52.32	0.06	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	36D	52.32	52.81	0.48	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	52.81	53.57	0.77	0.7	0.0	0.7	0.0	0.7	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	53.57	53.81	0.24	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	53.81	54.00	0.19	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	54.00	54.06	0.06	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	54.06	54.07	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Columbia	Pipeline	62D	54.07	54.30	0.22	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	54.30	54.52	0.22	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	54.52	54.72	0.21	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	54.72	54.88	0.16	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	7D	54.88	55.62	0.74	0.6	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0
Columbia	Pipeline	26C	55.62	55.93	0.30	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	55.93	56.41	0.48	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	56.41	57.06	0.66	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	57.06	57.13	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	57.13	57.33	0.20	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	7D	57.33	57.68	0.35	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	32	57.68	57.81	0.13	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Columbia	Pipeline	58	57.81	57.89	0.07	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0
Columbia	Pipeline	30D	57.89	58.26	0.37	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	58.26	58.33	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	58.33	58.53	0.19	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	58.53	58.53	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	58.53	58.56	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	58.56	60.27	1.71	0.0	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	60.27	60.95	0.68	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	60.95	61.30	0.35	0.0	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	61.30	61.78	0.48	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	61.78	61.85	0.07	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	61.85	62.21	0.36	0.3	0.0	0.3	0.0	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	62.21	62.49	0.28	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	62.49	62.76	0.27	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	62.76	62.89	0.13	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	62.89	63.06	0.16	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	63.06	63.29	0.24	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	30D	63.29	63.39	0.09	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	63.39	63.45	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	37	63.45	63.47	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	58	63.47	63.51	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	37	63.51	63.59	0.09	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Columbia	Pipeline	58	63.59	63.80	0.21	0.0	0.0	0.2	0.0	0.2	0.2	0.0	0.2	0.0
Columbia	Pipeline	32	63.80	63.84	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	63.84	63.93	0.09	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	21D	63.93	64.36	0.43	0.0	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	64.36	64.43	0.06	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	64.43	64.50	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	64.50	64.96	0.46	0.4	0.0	0.4	0.0	0.4	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	64.96	64.98	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	50E	64.98	65.03	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	62D	65.03	65.29	0.26	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	49E	65.29	65.36	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	4E	65.36	65.42	0.06	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Columbia	Pipeline	11E	65.42	65.54	0.12	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	36D	65.54	65.57	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	11E	65.57	65.62	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	36D	65.62	66.32	0.70	0.6	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0
Columbia	Pipeline	11E	66.32	66.41	0.09	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	36D	66.41	68.84	2.44	1.9	0.0	1.9	0.0	1.9	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	68.84	70.08	1.24	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0
Columbia	Pipeline	4E	70.08	70.28	0.20	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	70.28	70.62	0.34	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0
Columbia	Pipeline	4E	70.62	70.65	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	24	70.65	70.74	0.08	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Columbia	Pipeline	4E	70.74	70.79	0.06	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	70.79	70.90	0.11	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Columbia	Pipeline	4E	70.90	70.93	0.03	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	70.93	72.93	1.99	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0
Columbia	Pipeline	50E	72.93	72.99	0.07	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	72.99	73.51	0.52	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
Columbia	Pipeline	23C	73.51	73.55	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	73.55	76.11	2.56	0.0	0.0	0.0	0.0	0.0	2.6	2.6	0.0	0.0
Columbia	Pipeline	18E	76.11	76.20	0.09	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	76.20	77.89	1.69	0.0	0.0	0.0	0.0	0.0	1.7	1.7	0.0	0.0
Columbia	Pipeline	23C	77.89	77.90	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	18E	77.90	77.91	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	4E	77.91	77.99	0.08	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	77.99	78.05	0.07	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Columbia	Pipeline	23D	78.05	78.19	0.14	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	78.19	78.38	0.19	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Columbia	Pipeline	18E	78.38	78.44	0.06	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	78.44	78.68	0.24	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Columbia	Pipeline	18E	78.68	78.74	0.06	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	23D	78.74	78.89	0.15	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	6D	78.89	79.01	0.12	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Columbia	Pipeline	17C	79.01	79.21	0.20	0.0	0.2	0.0	0.0	0.2	0.2	0.0	0.2	0.0
Columbia	Pipeline	6D	79.21	79.36	0.15	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Columbia	Pipeline	23C	79.36	79.56	0.20	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	23D	79.56	79.80	0.24	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0
Columbia	Pipeline	70E	79.80	79.84	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	27B	79.84	80.18	0.34	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0
Columbia	Pipeline	70E	80.18	80.21	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	69	80.21	80.27	0.06	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Columbia	Pipeline	1A	80.27	80.34	0.08	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Columbia	Pipeline	34A	80.34	81.38	1.03	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0
Columbia	Pipeline	70E	81.38	81.42	0.04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	71	81.42	81.51	0.09	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Columbia	Pipeline	W	81.51	81.56	0.05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	Pipeline	72	81.56	81.70	0.14	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0

APPENDIX 7D-1

Mileposts of Soil Map Units and Associated Soil Limitations Along the Pipeline

						Limitations (miles) *						Prime Farmland Type (miles)		
County	Proposed Facility	Soil Map Unit	Begin MP	End MP	Miles	Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique & Soils of Statewide Importance	Prime	Statewide Importance	Unique
Columbia	Pipeline	71	81.70	82.05	0.35	0.0	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0
Columbia	Pipeline	W	82.05	82.35	0.30	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	263	82.35	82.64	0.29	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	172	82.64	82.88	0.24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	32	82.88	82.95	0.07	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Cowlitz	Pipeline	17	82.95	83.52	0.57	0.0	0.5	0.0	0.0	0.0	0.6	0.6	0.0	0.0
Cowlitz	Pipeline	127	83.52	84.68	1.16	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.0	0.0
Cowlitz	Pipeline	32	84.68	85.18	0.50	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
Cowlitz	Pipeline	141	85.18	85.51	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0
Cowlitz	Pipeline	127	85.51	85.76	0.25	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.0	0.0
Cowlitz	Pipeline	141	85.76	85.91	0.15	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Cowlitz	Pipeline	65	85.91	85.93	0.02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	102	85.93	86.00	0.07	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Cowlitz	Pipeline	100	86.00	86.43	0.43	0.0	0.0	0.3	0.0	0.0	0.4	0.4	0.0	0.0
Cowlitz	Pipeline	102	86.43	86.56	0.13	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Cowlitz	Pipeline	17	86.56	86.59	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	102	86.59	86.71	0.12	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
Cowlitz	Pipeline	32	86.71	86.72	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	102	86.72	86.73	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	Pipeline	32	86.73	86.79	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Cowlitz	Pipeline	102	86.79	86.85	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
					TOTAL	**39.3**	**4.7**	**57.5**	**0.8**	**56.7**	**25.1**	**14.3**	**11.8**	**0.0**
					Percentage of Pipeline with Limitations	**45%**	**5%**	**66%**	**1%**	**65%**	**29%**	**16%**	**14%**	**0%**

Note: 86.86

* Miles of limitations are calculated by multiplying the miles of each soil map unit encountered by the percentage of the map unit containing that limitation. Example: The 0.08-mile Pipeline section from mile 0.92 to 1.00 crosses map unit 12A in Clatsop County. Map unit 12A consists of 60% Coquille soil, 30% Clatsop soil, and 10% other minor soil components. The extent of soil limitations within this section is calculated as: 0.08 mile * 30% high compaction potential (Clatsop soil) = 0.024 miles; 0.08 mile * 90% high erosion potential, poor revegetation potential, and farmland soil (Coquille and Clatsop soil) = 0.07 mile.

Precision loss may occur because of rounding.

Yellow highlighting indicates a change from the June 2013 submittal version of this table.

Appendix 7D-2
Acreages of Soil Map Units and Associated Soil Limitations Within the Workspace Along the Pipeline

APPENDIX 7D-2

Acreages of Soil Map Units and Associated Soil Limitations Within the Workspace Along the Pipeline

County	Soil Map Unit	Land Affected During Construction - Temporary Workspaces (acres)	Land Affected During Operation - Permanent ROW (acres)	Total Construction Impacts (acres)	Total Construction Impacts								
					Limitations (acres)						Prime Farmland Type (acres)		
					Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique and Soils of Statewide Importance)	Prime	Of Statewide Importance	Unique
Clatsop	8A	0.56	0.32	0.88	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.9	0.0
Clatsop	9D	1.27	0.60	1.87	1.5	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0
Clatsop	9E	4.08	5.01	9.09	7.3	0.0	7.3	0.0	7.3	0.0	0.0	0.0	0.0
Clatsop	10B	0.00	-	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	11A	3.12	3.51	6.62	0.0	2.0	6.3	0.0	6.3	0.0	0.0	0.0	0.0
Clatsop	12A	30.35	25.25	55.60	0.0	16.7	50.0	0.0	50.0	55.6	0.0	55.6	0.0
Clatsop	17A	0.12	0.41	0.54	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0
Clatsop	20B	2.83	3.15	5.97	0.0	0.0	0.0	0.0	0.0	6.0	0.0	6.0	0.0
Clatsop	20C	2.78	1.76	4.54	0.0	0.0	3.9	0.0	0.0	4.5	0.0	4.5	0.0
Clatsop	21D	9.43	8.12	17.54	14.9	0.0	14.9	0.0	14.9	17.5	0.0	17.5	0.0
Clatsop	22F	2.16	1.65	3.81	3.2	0.0	1.9	0.0	3.2	0.0	0.0	0.0	0.0
Clatsop	23A	10.24	9.12	19.36	0.0	17.8	17.8	0.0	17.8	19.4	0.0	19.4	0.0
Clatsop	25D	3.20	3.07	6.26	4.7	0.0	4.7	0.0	4.7	0.0	0.0	0.0	0.0
Clatsop	26E	9.21	5.66	14.87	11.9	0.0	11.9	0.0	11.9	0.0	0.0	0.0	0.0
Clatsop	27	1.09	0.85	1.94	1.5	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0
Clatsop	28	4.90	5.27	10.17	4.6	0.0	8.6	0.0	8.6	0.0	0.0	0.0	0.0
Clatsop	30A	2.46	1.24	3.70	0.0	0.0	0.0	0.0	0.0	3.7	0.0	3.7	0.0
Clatsop	31E	3.98	2.43	6.41	5.4	0.0	4.8	0.0	4.8	0.0	0.0	0.0	0.0
Clatsop	32D	4.55	4.26	8.80	7.5	0.0	7.5	0.0	7.5	0.0	0.0	0.0	0.0
Clatsop	33E	10.15	7.78	17.93	14.3	0.0	14.3	0.0	14.3	0.0	0.0	0.0	0.0
Clatsop	35C	1.95	1.22	3.17	0.0	0.0	0.0	0.0	0.0	3.2	0.0	3.2	0.0
Clatsop	41D	3.32	2.72	6.04	0.0	0.0	5.1	0.0	5.1	0.0	0.0	0.0	0.0
Clatsop	42D	1.71	1.57	3.28	2.8	0.0	2.8	0.0	2.8	0.0	0.0	0.0	0.0
Clatsop	43A	0.00	0.12	0.12	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	46D	4.04	3.12	7.16	5.4	0.0	5.4	0.0	5.4	0.0	0.0	0.0	0.0
Clatsop	49A	1.45	1.35	2.81	0.0	2.6	2.6	0.0	0.0	2.8	0.0	2.8	0.0
Clatsop	51A	0.56	0.42	0.98	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
Clatsop	52A	1.83	2.43	4.26	0.0	0.0	0.0	0.0	0.0	4.3	0.0	4.3	0.0
Clatsop	55C	0.00	0.29	0.29	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0
Clatsop	56D	29.11	25.18	54.29	46.1	0.0	46.1	0.0	46.1	0.0	0.0	0.0	0.0
Clatsop	56E	48.08	39.58	87.66	74.5	0.0	74.5	0.0	74.5	0.0	0.0	0.0	0.0
Clatsop	56F	4.67	3.29	7.96	6.0	0.0	6.0	0.0	6.0	0.0	0.0	0.0	0.0
Clatsop	58D	26.04	22.44	48.48	38.8	0.0	38.8	0.0	38.8	0.0	0.0	0.0	0.0
Clatsop	58E	33.63	27.80	61.44	49.1	0.0	49.1	0.0	49.1	0.0	0.0	0.0	0.0
Clatsop	60D	15.86	12.67	28.53	0.0	0.0	24.2	0.0	24.2	0.0	0.0	0.0	0.0
Clatsop	61E	26.05	21.42	47.46	19.0	0.0	42.7	0.0	42.7	0.0	0.0	0.0	0.0
Clatsop	63D	0.00	0.14	0.14	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
Clatsop	65A	0.23	0.30	0.53	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.5	0.0
Clatsop	66	0.88	1.44	2.33	1.9	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0
Clatsop	67	2.29	2.07	4.36	0.0	0.0	3.9	3.9	3.9	0.0	0.0	0.0	0.0
Clatsop	68	1.86	1.72	3.58	1.6	0.0	0.0	0.0	0.0	3.6	0.0	3.6	0.0
Clatsop	71B	0.06	-	0.06	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0
Clatsop	71C	4.01	3.69	7.69	0.0	0.0	0.0	0.0	0.0	7.7	0.0	7.7	0.0
Clatsop	71D	0.00	-	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop	W	0.45	2.30	2.74	0.0	2.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0
Clatsop Subtotal		**314.6**	**266.7**	**581.3**	**322.0**	**41.8**	**461.1**	**3.9**	**455.1**	**131.6**	**0.0**	**131.6**	**0.0**
Tillamook	116A	0.13	0.27	0.39	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Tillamook	342D	1.02	0.70	1.72	1.5	0.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0
Tillamook	347E	0.00		0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tillamook	356D	6.68	6.21	12.89	11.0	0.0	11.0	0.0	11.0	0.0	0.0	0.0	0.0
Tillamook	357E	6.92	6.74	13.66	11.6	0.0	11.6	0.0	11.6	0.0	0.0	0.0	0.0

APPENDIX 7D-2

Acreages of Soil Map Units and Associated Soil Limitations Within the Workspace Along the Pipeline

County	Soil Map Unit	Land Affected During Construction - Temporary Workspaces (acres)	Land Affected During Operation - Permanent ROW (acres)	Total Construction Impacts (acres)	Total Construction Impacts								
					Limitations (acres)						Prime Farmland Type (acres)		
					Shallow Depth to Bedrock or Coarse Fragments	High Compaction Potential	High Erosion Potential from Water	High Erosion Potential from Wind	Poor Revegetation Potential	All Important Farmlands (Prime, Unique and Soils of Statewide Importance)	Prime	Of Statewide Importance	Unique
Tillamook	363D	6.32	6.22	12.54	0.0	0.0	10.0	0.0	10.0	0.0	0.0	0.0	0.0
Tillamook Subtotal		**21.1**	**20.1**	**41.2**	**24.0**	**0.0**	**34.1**	**0.0**	**34.4**	**0.0**	**0.0**	**0.0**	**0.0**
Columbia	1A	0.41	0.45	0.86	0.0	0.0	0.0	0.0	0.0	0.9	0.9	0.0	0.0
Columbia	4E	2.75	2.76	5.51	4.4	0.0	4.4	0.0	4.4	0.0	0.0	0.0	0.0
Columbia	6D	56.86	55.80	112.66	0.0	0.0	0.0	0.0	0.0	112.7	112.7	0.0	0.0
Columbia	7D	7.97	6.62	14.58	11.7	0.0	11.7	0.0	11.7	0.0	0.0	0.0	0.0
Columbia	8F	0.29	0.32	0.61	0.5	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
Columbia	9F	0.00	-	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Columbia	11E	1.31	1.56	2.88	2.3	0.0	2.3	0.0	2.3	0.0	0.0	0.0	0.0
Columbia	17C	0.66	1.21	1.87	0.0	1.7	0.0	0.0	1.7	1.9	0.0	1.9	0.0
Columbia	18E	1.70	1.36	3.06	0.0	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0
Columbia	21D	11.87	12.00	23.87	0.0	0.0	20.3	0.0	20.3	0.0	0.0	0.0	0.0
Columbia	23C	1.36	1.53	2.89	0.0	0.0	2.5	0.0	2.5	0.0	0.0	0.0	0.0
Columbia	23D	4.04	3.19	7.24	0.0	0.0	6.2	0.0	6.2	0.0	0.0	0.0	0.0
Columbia	24	0.70	0.92	1.62	0.0	0.0	0.0	0.0	0.0	1.6	0.0	1.6	0.0
Columbia	26C	1.54	1.83	3.37	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0
Columbia	27B	1.77	2.00	3.77	0.0	0.0	0.0	0.0	0.0	3.8	3.8	0.0	0.0
Columbia	30D	17.15	16.57	33.71	0.0	0.0	28.7	0.0	28.7	0.0	0.0	0.0	0.0
Columbia	32	0.00	1.03	1.03	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0
Columbia	34A	7.63	6.26	13.88	0.0	0.0	0.0	0.0	0.0	13.9	13.9	0.0	0.0
Columbia	36D	24.32	22.13	46.45	37.2	0.0	37.2	0.0	37.2	0.0	0.0	0.0	0.0
Columbia	37	0.57	0.67	1.25	0.0	1.1	0.0	0.0	0.0	1.2	0.0	1.2	0.0
Columbia	49E	25.37	14.52	39.89	33.9	0.0	33.9	0.0	33.9	0.0	0.0	0.0	0.0
Columbia	50E	21.49	17.33	38.82	33.0	0.0	33.0	0.0	33.0	0.0	0.0	0.0	0.0
Columbia	56D	5.20	4.60	9.81	0.0	0.0	7.8	0.0	7.8	0.0	0.0	0.0	0.0
Columbia	58	0.54	1.90	2.44	0.0	0.0	2.0	0.0	2.0	2.4	0.0	2.4	0.0
Columbia	62D	35.52	27.57	63.09	50.5	0.0	50.5	0.0	50.5	0.0	0.0	0.0	0.0
Columbia	69	0.19	0.37	0.56	0.5	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0
Columbia	70E	3.65	0.72	4.37	0.0	0.0	3.9	0.0	3.9	0.0	0.0	0.0	0.0
Columbia	71	2.51	2.62	5.12	0.0	0.0	0.0	4.4	4.4	0.0	0.0	0.0	0.0
Columbia	72	2.31	0.91	3.21	0.0	0.0	0.0	2.7	2.7	0.0	0.0	0.0	0.0
Columbia	W	0.28	2.11	2.39	0.0	2.4	2.4	0.0	0.0	0.0	0.0	0.0	0.0
Columbia Subtotal		**240.0**	**210.9**	**450.8**	**173.9**	**5.1**	**249.5**	**7.1**	**258.6**	**140.0**	**131.7**	**8.2**	**0.0**
Cowlitz	17	3.56	3.61	7.17	0.0	6.5	0.0	0.0	0.0	7.2	7.2	0.0	0.0
Cowlitz	32	4.86	3.87	8.73	0.0	0.0	0.0	0.0	0.0	8.7	8.7	0.0	0.0
Cowlitz	65	0.24	0.14	0.38	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.0
Cowlitz	100	3.13	2.59	5.72	0.0	0.0	4.6	0.0	0.0	5.7	5.7	0.0	0.0
Cowlitz	102	3.19	2.38	5.57	0.0	0.0	4.5	0.0	0.0	5.6	0.0	5.6	0.0
Cowlitz	127	8.97	8.52	17.49	0.0	0.0	0.0	0.0	0.0	17.5	17.5	0.0	0.0
Cowlitz	141	2.92	2.95	5.87	0.0	0.0	0.0	0.0	0.0	5.9	5.9	0.0	0.0
Cowlitz	172	1.23	1.43	2.66	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	263	0.00	1.78	1.78	0.0	1.8	1.8	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz	W	0.00	0.03	0.03	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cowlitz Subtotal		**28.1**	**27.3**	**55.4**	**0.0**	**8.3**	**10.8**	**0.0**	**0.0**	**50.9**	**45.4**	**5.6**	**0.0**
All Counties Total		**603.7**	**525.0**	**1128.7**	**519.9**	**55.2**	**755.5**	**11.0**	**748.1**	**322.5**	**177.1**	**145.4**	**0.0**

Precision loss may occur because of rounding.

Yellow highlighting indicates a change from the June 2013 submittal version of this table.

Appendix 8A
Additional Temporary Workspace for the Project Pipeline

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	0.1	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 100	0.02	OS
					0.10	PEM
Clatsop	~~0.3~~0.2	Point of Intersection	Additional Spoils Area	~~150 x 350~~407 x 123	~~0.98~~1.12	~~PEM~~EW
					0.03	OS
~~Clatsop~~	~~0.4~~	~~Point of Intersection~~	~~Additional Spoils Area~~	~~50 x 175~~	~~0.20~~	~~OS~~
~~Clatsop~~	~~0.4~~	~~Point of Intersection/ Slough/Waterbody~~	~~Additional Spoils Area~~	~~50 x 175~~	~~0.17~~	~~OS~~
					~~0.04~~	~~PEM~~
Clatsop	0.6	Slough/Waterbody	Additional Spoil Area/Staging Area	~~75 x 300~~175 x 50	~~0.55~~0.20	~~PEM~~EW
Clatsop	0.6	Slough/Waterbody	Additional Spoil Area/Staging Area	175 x 100	0.41	EW
Clatsop	0.8	Highway 101 Crossing	Additional Spoil Area/Staging Area	~~175 x 300~~512 x 50	~~1.11~~0.59	~~PEM~~EW
Clatsop	~~0.9~~0.8	Highway 101 Crossing	Additional Spoil Area/Staging Area	~~50 x 100~~373 x 117	~~0.11~~0.07	~~PEM~~EW
					0.03	OS
Clatsop	0.8	Highway 101 Crossing	Additional Spoil Area/Staging Area	85 x 50	0.56	EW
~~Clatsop~~	~~1.0~~	~~Highway 101 Crossing~~	~~Additional Spoil Area/Staging Area~~	~~50 x 175~~	~~0.20~~	~~PEM~~
~~Clatsop~~	~~1.0~~	~~Highway 101 Crossing~~	~~Additional Spoil Area/Staging Area~~	~~50 x 175~~	~~0.20~~	~~PEM~~
Clatsop	1.1	Slough/Waterbody	Additional Spoil Area/Staging Area	~~175 x 450~~535 x 180	~~1.73~~2.21	PEM
Clatsop	1.5	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 200	0.23	AW
Clatsop	1.7	Airport Road	Bore Pit and Equipment	~~50 x 90~~50 x 175	~~0.10~~0.20	AW
Clatsop	1.7	Airport Road	Bore Pit and Equipment	~~50 x 60~~50 x 175	~~0.08~~0.20	AW
Clatsop	1.7	Airport Road	Bore Pit and Equipment	50 x 175	0.20	AW
Clatsop	1.7	Airport Road	Bore Pit and Equipment	50 x 175	0.20	AW
~~Clatsop~~	~~1.7~~	~~Airport Road~~	~~Bore Pit and Equipment~~	~~50 x 175~~	~~0.20~~	~~AW~~
Clatsop	1.8	Point of Intersection	Additional Spoils Area	~~75 x 100~~50 x 100	~~0.17~~0.12	UP
Clatsop	2.3	Clatsop Airport Road	Bore Pit and Equipment	50 x 150	0.17	ROW
Clatsop	2.4	Clatsop Airport Road	Bore Pit and Equipment	50 x 425	0.56	PEM
					0.03	OS
Clatsop	2.4	Clatsop Airport Road	Bore Pit and Equipment	50 x 200	0.18	AG
					0.02	ROW
Clatsop	2.4	Clatsop Airport Road	Bore Pit and Equipment	50 x 175	0.13	PSS
					0.10	PEM

APPENDIX 8A
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County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	2.8	Lewis and Clark River	HDD Equipment Pad	125 x 300	0.21	UF
					0.76	PSS
Clatsop	3.4	Lewis and Clark River	HDD Equipment Pad/Pullback	150 x 300	0.95	AW
Clatsop	3.7	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 500	0.57	AW
Clatsop	4.0	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 770	0.88	AW
Clatsop	4.1	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 400	0.46	AW
Clatsop	4.2	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 350	0.32	AW
					0.08	PEM
Clatsop	4.4	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 1100	1.27	PEM
Clatsop	4.6	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 125	0.14	PEM
Clatsop	4.6	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 175	0.20	AW
Clatsop	4.7	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 150	0.17	AW
Clatsop	4.8	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 250	0.29	AW
Clatsop	4.9	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 325	0.37	AW
Clatsop	5.0	Lewis and Clark River Bank	HDD Equipment Pad	80 x 300	0.55	AW
Clatsop	5.4	Lewis and Clark River	HDD Pullback	75 x 410	0.70	AW
Clatsop	5.5	Lewis and Clark River Bank	HDD Equipment Pad/Pullback/ Additional Spoil Area/Staging Area	50 x 325 & 75 x 1300	2.50	AW
Clatsop	5.5	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 225	0.27	AW
Clatsop	5.5	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 320	0.37	AW
Clatsop	5.6	Slough/Waterbody	Additional Spoil Area/Staging Area	50 x 200	0.23	AW
Clatsop	5.6	Lewis and Clark River	HDD Equipment Pad	80 x 250	0.46	AW
Clatsop	6	Lewis and Clark River	HDD Equipment Pad	80 x 300	0.55	OS
Clatsop	6.1	Point of Intersection	Additional Spoil Area	50 x 300	0.36	OS
Clatsop	6.2	Point of Intersection	Additional Spoil Area	50 x 175	0.20	OS
Clatsop	6.3	Point of Intersection	Additional Spoil Area	50 x 175	0.05	IF
					0.10	AG
					0.05	PEM
Clatsop	6.3	Point of Intersection	Additional Spoil Area	50 x 175	0.20	PEM
Clatsop	6.8	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	6.9	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	7.6	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	7.8	Wetland	Additional Spoil Area	50 x 150	0.17	IF
Clatsop	8.0	Wetland	Additional Spoil Area	50 x 250	0.29	IF
Clatsop	8.2	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 700	0.79	IF
Clatsop	8.7	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	8.9	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	9.3	Point of Intersection	Additional Spoil Area	50 x 100	0.15	IF
Clatsop	9.6	Point of Intersection	Additional Spoil Area	50 x 100	0.15	IF
Clatsop	9.9	Stream	Additional Spoil Area/Staging Area	50 x 60	0.07	IF
Clatsop	10.0	Stream	Additional Spoil Area/Staging Area	50 x 300	0.35	IF
Clatsop	10.0	Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	10.1	Wetland	Additional Spoil Area	50 x 500	0.59	IF
Clatsop	10.3	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	10.7	Point of Intersection	Additional Spoil Area	50 x 100	0.15	IF
Clatsop	10.9	Lewis and Clark River	HDD Equipment Pad	80 x 300	0.63	PEM
					0.01	ROW
Clatsop	11.2	Lewis and Clark River	HDD Equipment Pad	80 x 300	0.36	AG
					0.01	IF
					0.04	RE
					0.27	UF
Clatsop	12.2	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	12.4	Wetland	Additional Spoil Area	50 x 205	0.24	IF
Clatsop	12.5	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 385	0.44	IF
Clatsop	12.6	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 110	0.13	IF
Clatsop	12.7	Stream	Additional Spoil Area/Staging Area	50 x 400	0.48	IF
Clatsop	12.8	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	13.1	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	13.3	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	13.6	Point of Intersection	Additional Spoil Area	50 x 260	0.26	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	13.8	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	13.8	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	14	Point of Intersection	Additional Spoil Area	50 x 100	0.13	IF
Clatsop	14.1	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	14.1	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	14.2	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	14.2	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	14.3	Point of Intersection	Additional Spoil Area	50 x 100	0.12	IF
Clatsop	14.8	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	15.2	Steep Terrain/Stream	Additional Spoil Area/Staging Area	50 x 600	0.75	IF
Clatsop	15.4	Steep Terrain/Stream	Additional Spoil Area/Staging Area	50 x 335	0.35	IF
Clatsop	15.5	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	15.6	Stream	Additional Spoil Area/Staging Area	50 x 150	0.16	IF
Clatsop	15.7	Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	IF
Clatsop	15.8	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	16	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.36	IF
Clatsop	16.2	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	IF
Clatsop	16.4	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	16.9	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	17.3	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	17.3	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	17.4	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	17.4	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	17.6	Point of Intersection	Additional Spoil Area	50 x 100	0.13	IF
Clatsop	17.9	Stream	Additional Spoil Area/Staging Area	50 x 160	0.19	IF
Clatsop	18.2	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	18.3	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	18.3	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 175	0.20	IF
Clatsop	18.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 315	0.36	IF
Clatsop	18.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.35	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	18.6	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	IF
Clatsop	18.7	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	18.9	Point of Intersection	Additional Spoil Area	50 x 150	0.04	IF
					0.24	UF
Clatsop	19.0	Wetland	Additional Spoil Area/Staging Area	50 x 80	0.04	ROW
Clatsop	19.1	Wetland	Additional Spoil Area/Staging Area	50 x 100 & 50 x 150	0.25	UP
Clatsop	19.2	Point of Intersection/Wetland	Additional Spoil Area	50 x 75 & 50 x 350	0.10	IF
					0.36	UP
					0.04	ROW
Clatsop	19.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 110 & 50 x 220	0.02	PEM
					0.31	IF
Clatsop	19.5	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 600	0.69	IF
Clatsop	19.6	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 200	0.24	IF
Clatsop	19.8	Wetland	Additional Spoil Area	50 x 200	0.23	IF
Clatsop	19.8	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	20.0	Stream	Additional Spoil Area/Staging Area	50 x 300	0.36	IF
Clatsop	20.0	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	20.1	Stream	Additional Spoil Area/Staging Area	50 x 310	0.36	IF
Clatsop	20.2	Stream	Additional Spoil Area/Staging Area	50 x 310	0.36	IF
Clatsop	20.7	Point of Intersection	Additional Spoil Area	50 x 100	0.12	IF
Clatsop	20.8	Point of Intersection	Additional Spoil Area	50 x 100	0.12	IF
Clatsop	21.3	Stream	Additional Spoil Area/Staging Area	50 x 200	0.22	IF
Clatsop	21.5	Stream	Additional Spoil Area/Staging Area	50 x 175	0.20	IF
Clatsop	21.7	Steep Terrain	Additional Spoil Area	50 x 800	0.94	IF
Clatsop	21.9	Steep Terrain	Additional Spoil Area	50 x 390	0.44	IF
Clatsop	21.9	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 320	0.35	IF
Clatsop	22.1	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	22.2	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	22.3	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 340	0.37	IF
Clatsop	22.5	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 550	0.63	IF

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Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	23.0	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	23.0	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	23.4	Stream/Riparian Area	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	23.5	Stream/Riparian Area	Additional Spoil Area/Staging Area	50 x 200	0.26	IF
Clatsop	24.3	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	24.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.20	IF
Clatsop	24.5	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.20	IF
Clatsop	24.7	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	24.9	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 220	0.25	IF
Clatsop	25.0	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 480	0.52	IF
Clatsop	25.2	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 125	0.15	IF
Clatsop	25.3	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 225	0.29	IF
Clatsop	25.3	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 175	0.20	IF
Clatsop	25.4	Stream	Additional Spoil Area/Staging Area	50 x 125	0.14	IF
Clatsop	25.4	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	25.5	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	25.6	Point of Intersection	Additional Spoil Area	50 x 100	0.12	IF
Clatsop	25.6	Stream	Additional Spoil Area/Staging Area	50 x 240	0.30	IF
Clatsop	25.6	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	25.8	Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	26	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	26.1	Point of Intersection	Additional Spoil Area	50 x 125	0.16	IF
Clatsop	26.2	Point of Intersection	Additional Spoil Area	50 x 125	0.15	IF
Clatsop	26.3	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	26.3	Stream	Additional Spoil Area/Staging Area	50 x 95	0.11	IF
Clatsop	26.4	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	26.5	Steep	Additional Spoil Area/Staging Area	50 x 580	0.68	IF
Clatsop	26.7	Stream	Additional Spoil Area/Staging Area	50 x 120	0.14	IF
Clatsop	26.7	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 700	0.82	IF
Clatsop	26.9	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	26.9	Stream	Additional Spoil Area/Staging Area	50 x 200	0.23	IF
Clatsop	27.1	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	27.2	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	27.3	Stream	Additional Spoil Area/Staging Area	50 x 170	0.19	IF
Clatsop	27.4	Stream	Additional Spoil Area/Staging Area	50 x 220	0.25	IF
Clatsop	27.9	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	28.1	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	28.1	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	IF
Clatsop	28.3	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	28.7	Point of Intersection	Additional Spoil Area	50 x 100	0.15	IF
Clatsop	29	Point of Intersection	Additional Spoil Area	50 x 100	0.13	IF
Clatsop	29.4	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 140	0.18	IF
Clatsop	29.6	Stream	Additional Spoil Area/Staging Area	50 x 300	0.35	IF
Clatsop	29.6	Stream	Additional Spoil Area/Staging Area	50 x 300	0.35	IF
Clatsop	29.6	Point of Intersection	Additional Spoil Area	50 x 100	0.12	IF
Clatsop	30.1	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	30.1	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 300	0.35	IF
Clatsop	30.5	Point of Intersection	Additional Spoil Area	50 x 100	0.13	IF
Clatsop	30.8	Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	31.3	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 420	0.48	IF
Clatsop	31.4	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 320	0.37	IF
Clatsop	31.4	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 300	0.35	IF
Clatsop	31.6	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 450	0.40	IF
Clatsop	31.7	Point of Intersection/Stream	Additional Spoil Area/Staging Area	50 x 375	0.43	IF
Clatsop	32.9	Point of Intersection	Additional Spoil Area	50 x 125	0.16	IF
Clatsop	33.3	Nehalem River	HDD Equipment Pad	80 x 300	0.66	UF
Clatsop	33.7	Nehalem River	HDD Equipment Pad/Pullback	80 x 300 & 75 x 625	1.85	AG
Clatsop	34.0	Point of Intersection	Additional Spoil Area/Staging Area	100 x 425	0.24	AG
					0.58	AW
					0.02	ROW

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	34.4	Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	UF
Clatsop	34.5	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 100	0.14	UF
Clatsop	35.2	Point of Intersection	Additional Spoil Area	50 x 110	0.13	UF
Clatsop	35.2	Point of Intersection	Additional Spoil Area	50 x 125	0.14	UF
Clatsop	35.3	Point of Intersection	Additional Spoil Area	50 x 110	0.13	UF
Clatsop	36.3	Wetland	Additional Spoil Area	50 x 150	0.03	PSS
					0.14	UF
Clatsop	36.4	Wetland	Additional Spoil Area/Staging Area	50 x 150	0.11	PSS
					0.06	UF
Clatsop	36.9	Steep Terrain/Wetland	Additional Spoil Area	50 x 100	0.03	PSS
					0.09	UF
Clatsop	37.1	Wetland	Additional Spoil Area	50 x 300	0.34	UF
Clatsop	37.4	Steep Terrain/Point of Intersection	Additional Spoil Area	50 x 1325	1.50	UF
Clatsop	37.4	Stream	Additional Spoil Area/Staging Area	50 x 300	0.33	UF
Clatsop	37.6	Stream	Additional Spoil Area/Staging Area	50 x 100	0.12	PEM
					0.02	IF
Clatsop	37.8	Steep Terrain	Additional Spoil Area	50 x 1460	1.67	IF
Clatsop	38.3	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	38.4	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 200	0.26	IF
Clatsop	38.6	Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	IF
Clatsop	39.2	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	39.4	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	39.4	Point of Intersection	Additional Spoil Area	50 x 100	0.14	IF
Clatsop	39.7	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	40.1	Steep Terrain/Point of Intersection	Additional Staging Area	50 x 2500	2.59	IF
Clatsop	40.5	Point of Intersection	Additional Spoil Area/Staging Area	50 x 1500	1.88	UF
Clatsop	40.8	Point of Intersection	Additional Spoil Area	50 x 100	0.14	UF
Clatsop	40.9	Steep Terrain	Additional Spoil Area	150 x 175	0.79	IF
Clatsop	41.3	Highway 26 Crossing	HDD Exit	50 x 400	0.47	UF
Clatsop	41.4	Highway 26 Crossing	HDD Pullback	80 x 1850	3.46	UF

Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Clatsop	41.5	Wetland	Additional Spoil Area	50 x 260	0.30	UF
Clatsop	41.6	Wetland	Additional Spoil Area	50 x 500	0.57	UF
Clatsop	41.8	Wetland	Additional Spoil Area	50 x 300	0.36	IF
Clatsop	41.9	Wetland	Additional Spoil Area	50 x 300	0.34	IF
Clatsop	42.2	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 425	0.48	IF
Clatsop	42.2	Point of Intersection/Wetland	Additional Spoil Area/Staging Area	50 x 100	0.13	IF
Clatsop	42.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	IF
Clatsop	42.4	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 150	0.17	IF
Clatsop	42.6	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	42.7	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	IF
Clatsop	43.1	Point of Intersection	Additional Spoil Area/Staging Area	100 x 300	0.92	IF
Clatsop	43.6	Hwy 26	HDD Equipment Pad	80 x 300	0.63	UF
Clatsop	43.7	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	UF
Clatsop	43.8	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	UF
Clatsop	44	Point of Intersection	Additional Spoil Area	50 x 100	0.12	UF
Tillamook	44.1	Wetland/Stream	Additional Spoil Area/Staging Area	50 x 300	0.34	UF
Tillamook	44.2	Point of Intersection	Additional Spoil Area	50 x 100	0.12	UF
Tillamook	44.5	Point of Intersection	Additional Spoil Area	50 x 100	0.13	UF
Tillamook	44.7	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	UF
Tillamook	44.8	Stream	Additional Spoil Area/Staging Area	50 x 100	0.11	UF
Tillamook	45.6	Wetland	Additional Spoil Area	50 x 200	0.23	UF
Tillamook	45.7	Point of Intersection	Additional Spoil Area	50 x 100	0.14	UF
Tillamook	45.8	Point of Intersection	Additional Spoil Area	50 x 100	0.04	IF
Tillamook	45.8	Point of Intersection	Additional Spoil Area	50 x 100	0.09	UF
Tillamook	46.4	Point of Intersection	Additional Spoil Area	50 x 100	0.11	UF
Tillamook	46.7	Point of Intersection	Additional Spoil Area	50 x 100	0.12	UF
Tillamook	47.3	Wetland	Additional Spoil Area	50 x 175	0.20	UF
Columbia	47.7	Point of Intersection	Additional Spoil Area	100 x 50	0.11	IF
Columbia	47.9	Steep Terrain	Additional Cut/Fill Area	150 x 50	0.21	IF
Columbia	48.0	Steep Terrain	Additional Cut/Fill Area	100 x 50	0.10	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Columbia	48.2	Point of Intersection/Road Crossing	Additional Spoil Area/Staging Area	350 x 50 & 200 x 50	0.59	IF
Columbia	48.3	Steep Terrain/Wetland	Additional Cut/Fill Area	200 x 50	0.23	IF
Columbia	48.9	Point of Intersection	Additional Spoil Area	100 x 50	0.10	IF
Columbia	49.1	Steep Terrain	Additional Spoil Area	400 x 50	0.46	IF
Columbia	49.2	Point of Intersection	Additional Spoil Area	100 x 50	0.10	IF
Columbia	49.4	Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.11	IF
Columbia	49.5	Steep Terrain	Additional Cut/Fill Area	450 x 50	0.52	IF
Columbia	49.7	Steep Terrain	Additional Cut/Fill Area	900 x 50	1.03	IF
Columbia	49.9	Point of Intersection	Additional Spoil Area	75 x 50	0.08	IF
Columbia	50.1	POI/steep Terrain	Additional Cut/Fill Area	1100 x 50	1.28	IF
Columbia	50.3	Point of Intersection	Additional Spoil Area	80 x 50	0.10	IF
Columbia	50.4	Point of Intersection	Additional Spoil Area	100 x 50	0.14	IF
Columbia	50.5	Stream Crossing	Additional Spoil Area/Staging Area	175 x 50	0.20	IF
Columbia	50.6	Wetland	Additional Spoil Area/Staging Area	80 x 50	0.10	IF
Columbia	50.8	Steep Terrain/Wetland	Additional Cut/Fill Area	75 x 50	0.08	IF
Columbia	50.9	Point of Intersection	Additional Spoil Area	175 x 50	0.20	IF
Columbia	51.8	Steep Terrain	Additional Cut/Fill Area	75 x 50	0.09	IF
Columbia	51.9	Point of Intersection	Additional Spoil Area	800 x 50	0.92	IF
Columbia	52.0	Point of Intersection	Additional Spoil Area	100 x 50	0.13	IF
Columbia	52.1	Steep Terrain	Additional Cut/Fill Area	800 x 50	0.90	IF
Columbia	52.7	Point of Intersection	Additional Spoil Area	100 x 50	0.11	IF
Columbia	52.9	Steep Terrain	Additional Cut/Fill Area	800 x 50	0.92	IF
Columbia	53.1	Point of Intersection	Additional Spoil Area	100 x 50	0.12	IF
Columbia	53.3	Point of Intersection	Additional Spoil Area	100 x 50	0.11	IF
Columbia	53.4	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	53.5	Steep Terrain	Additional Cut/Fill Area	500 x 50	0.57	IF
Columbia	53.6	Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.12	IF
Columbia	53.6	Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.12	IF
Columbia	53.8	Steep Terrain	Additional Cut/Fill Area	1480 x 50	1.71	IF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Columbia	54.3	Steep Terrain	Additional Cut/Fill Area	1200 x 50	1.40	IF
Columbia	55.4	Wetland	Additional Spoil Area	100 x 50	0.12	IF
Columbia	55.4	Wetland	Additional Spoil Area	100 x 50	0.12	IF
Columbia	55.7	Wetland	Additional Spoil Area	100 x 50	0.06	IF
					0.06	PEM
Columbia	55.8	Wetland	Additional Spoil Area	100 x 50	0.11	IF
					0.01	PEM
Columbia	55.9	POI/Road Crossing	Additional Spoil Area/Staging Area	125 x 50	0.14	IF
Columbia	55.9	POI/Road Crossing	Additional Spoil Area/Staging Area	125 x 50	0.15	IF
Columbia	56.6	POI/Road Crossing	Additional Spoil Area/Staging Area	90 x 50	0.10	IF
Columbia	57.1	Rock Creek	HDD Pullback	775 x 75	1.29	IF
Columbia	57.3	Rock Creek	HDD Pullback	1925 x 75	3.43	IF
Columbia	57.4	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	57.5	Steep Terrain	Additional Cut/Fill Area	300 x 80	0.55	IF
Columbia	58.1	Rock creek	HDD Entry	300 x 80	0.55	IF
Columbia	58.4	Steep Terrain	Additional Cut/Fill Area	1025 x 50	1.19	IF
Columbia	58.5	Point of Intersection	Additional Spoil Area	150 x 50	0.18	IF
Columbia	58.7	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	58.8	Point of Intersection	Additional Spoil Area	115 x 50	0.13	IF
Columbia	59.0	Point of Intersection	Additional Spoil Area	125 x 50	0.15	IF
Columbia	59.1	Point of Intersection	Additional Spoil Area	100 x 50	0.11	IF
Columbia	59.2	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	59.9	Point of Intersection	Additional Spoil Area	75 x 50	0.09	IF
Columbia	60.1	Point of Intersection	Additional Spoil Area	115 x 50	0.13	IF
Columbia	60.4	Point of Intersection	Additional Spoil Area	110 x 50	0.12	IF
Columbia	61.3	Point of Intersection	Additional Spoil Area	100 x 50	0.11	IF
Columbia	61.7	Steep Terrain/Road Crossing	Additional Cut/Fill Area	115 x 50	0.13	IF
Columbia	62.1	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	62.2	Steep Terrain/Road Crossing	Additional Cut/Fill Area	1000 x 50	1.14	IF
Columbia	62.3	Steep Terrain/Road Crossing	Additional Cut/Fill Area	950 x 50	1.10	IF

Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Columbia	62.4	Steep Terrain	Additional Cut/Fill Area	250 x 100	0.57	IF
Columbia	62.7	Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.11	IF
Columbia	62.8	Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.11	IF
Columbia	63.0	Point of Intersection	Additional Spoil Area	80 x 50	0.09	IF
Columbia	63.1	Steep Terrain	Additional Cut/Fill Area	350 x 120	0.96	IF
Columbia	63.6	Nehalem River Crossing	HDD Entry/Equipment Pad	300 x 80	0.32	IF
					0.23	PEM
Columbia	64.3	Nehalem River Crossing	HDD Exit/Equipment Pad	300 x 80	0.78	IF
Columbia	64.3	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	64.7	Nehalem River Crossing	HDD Pullback	2800 x 75	4.25	IF
Columbia	64.8	Point of Intersection	Additional Spoil Area	115 x 50	0.13	IF
Columbia	64.9	Steep Terrain	Additional Cut/Fill Area	100 x 75	0.20	IF
Columbia	65.2	Steep Terrain	Additional Cut/Fill Area	715 x 50	0.83	IF
Columbia	65.6	Point of Intersection	Additional Spoil Area	90 x 50	0.11	IF
Columbia	65.7	Point of Intersection	Additional Spoil Area	85 x 50	0.10	IF
Columbia	66.5	Steep Terrain	Additional Cut/Fill Area	525 x 50	0.61	IF
Columbia	67.2	Steep Terrain	Additional Cut/Fill Area	700 x 50	0.82	IF
Columbia	68.0	Point of Intersection	Additional Spoil Area	95 x 50	0.11	IF
Columbia	68.3	POI/Steep Terrain	Additional Cut/Fill Area	270 x 50	0.31	IF
Columbia	68.7	Point of Intersection	Additional Spoil Area	90 x 50	0.11	IF
Columbia	69.5	Point of Intersection	Additional Spoil Area	100 x 50	0.12	IF
Columbia	69.7	Point of Intersection	Additional Spoil Area	90 x 50	0.11	IF
Columbia	70.7	Wetland	Additional Spoil Area	100 x 50	0.12	IF
Columbia	70.7	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	70.7	Point of Intersection	Additional Spoil Area	100 x 50	0.12	IF
Columbia	71.6	POI/Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.12	IF
Columbia	71.7	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	72.1	Point of Intersection	Additional Spoil Area	110 x 50	0.13	IF
Columbia	72.8	Point of Intersection	Additional Spoil Area	75 x 50	0.09	IF
Columbia	72.9	Road/Stream crossing	Additional Spoil Area/Staging Area	500 x 50	0.42	IF

Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
					0.10	PFO
Columbia	73.4	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	73.5	Point of Intersection	Additional Spoil Area	95 x 50	0.11	IF
Columbia	73.9	Point of Intersection	Additional Spoil Area	125 x 50	0.15	IF
Columbia	74.8	Stream Crossing	Additional Spoil Area/Staging Area	95 x 50	0.11	IF
Columbia	75.1	Point of Intersection	Additional Spoil Area	75 x 50	0.09	IF
Columbia	75.7	Point of Intersection	Additional Spoil Area	100 x 50	0.12	IF
Columbia	76.0	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	76.3	Stream	Additional Spoil Area/Staging Area	1075 x 50	1.24	IF
Columbia	76.9	Point of Intersection	Additional Spoil Area	250 x 50	0.28	IF
Columbia	77.9	Point of Intersection	Additional Spoil Area	125 x 50	0.14	IF
Columbia	78.0	Point of Intersection	Additional Spoil Area	95 x 50	0.11	IF
Columbia	78.1	Point of Intersection	Additional Spoil Area	130 x 50	0.15	IF
Columbia	78.4	POI/Stream crossing	Additional Spoil Area/Staging Area	70 x 50	0.09	IF
Columbia	78.6	Point of Intersection	Additional Spoil Area	90 x 50	0.10	IF
Columbia	78.8	POI/Road Crossing	Additional Spoil Area/Staging Area	100 x 50	0.12	IF
Columbia	78.9	POI/Road Crossing	Additional Spoil Area/Staging Area	95 x 50	0.11	IF
Columbia	79.2	Wetland	Additional Spoil Area	100 x 50	0.11	IF
Columbia	79.8	Steep Terrain	Additional Cut/Fill Area	535 x 50	0.61	IF
Columbia	80.1	Point of Intersection	Additional Spoil Area	120 x 50	0.14	IF
Columbia	80.3	Point of Intersection	Additional Spoil Area	70 x 50	0.08	CI
Columbia	80.5	Point of Intersection	Additional Spoil Area	80 x 50	0.09	CI
Columbia	80.5	Point of Intersection	Additional Spoil Area	75 x 50	0.08	CI
Columbia	80.6	Point of Intersection	Additional Spoil Area	80 x 50	0.09	CI
Columbia	80.6	Compressor Station	Additional Staging Area	230 x 50	0.28	CI
Columbia	80.6	Compressor Station	Additional Staging Area	80 x 50	0.09	CI
Columbia	~~80.9 – 81.5~~81.2	Columbia River Crossing	HDD Equipment Pad/Staging Area	~~3500 x 50~~3000 x 50	~~0.43~~0.37	OS
					~~3.09~~3.06	UF
Columbia	~~81.8~~81.4	Columbia River Crossing	Additional Staging Area	~~300 x 75~~175 x 50	~~0.17~~0.15	~~OS~~FW
					~~0.01~~0.01	UF

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Columbia	81.5	Columbia River Crossing	Additional Staging Area	180 x 50	0.21	FW
Columbia	81.6	Columbia River Crossing		850 x 50	0.34	EW
					0.65	FW
Columbia	81.6	Columbia River Crossing		180 x 50	0.18	EW
					0.02	FW
Columbia	81.7			140 x 50	0.06	EW
					0.10	FW
Columbia	81.7			150 x 50	0.01	ROW
					0.09	EW
					0.07	FW
Columbia	81.8	Columbia River Crossing	Additional Staging Area	300 x 80	0.07	ROW
					0.50	FW
Cowlitz	82.8	Columbia River Crossing		350 x 80	0.62	AW
Cowlitz	82.8	Columbia River Crossing		185 x 50	0.22	AW
Cowlitz	82.9	Columbia River Crossing		200 x 50	0.22	AG
Cowlitz	82.9	Columbia River Crossing		200 x 50	0.22	AG
Cowlitz	83.2			200 x 50	0.23	AW
Cowlitz	83.4			200 x 50	0.23	AW
Cowlitz	84.2			200 x 50	0.20	AG
Cowlitz	84.3			200 x 50	0.20	AG
Cowlitz	84.3	Point of Intersection		100 x 50	0.11	AG
Cowlitz	84.6	Point of Intersection		100 x 100	0.17	AG
Cowlitz	84.8	Point of Intersection		137 x 137	0.26	AG
Cowlitz	85.1	Point of Intersection		100 x 100	0.17	AG
Cowlitz	85.1	Point of Intersection		160 x 50	0.19	OS
					0.07	ROW
Cowlitz	85.1	Point of Intersection		225 x 60	0.40	AG
					0.10	ROW
Cowlitz	85.3			100 x 25	0.06	OS
Cowlitz	85.4			100 x 50	0.11	AG

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
Cowlitz	85.6	Point of Intersection		100 x 50	0.15	AG
Cowlitz	85.7	I-5		175 x 50	0.12	EW
					0.09	OS
Cowlitz	85.7	I-5		200 x 50	0.16	EW
					0.03	OS
Cowlitz	85.9			175 x 50	0.10	EW
					0.10	RE
Cowlitz	85.9	Point of Intersection		200 x 50	0.20	RE
Cowlitz	86.0			100 x 50	0.11	UF
Cowlitz	86.1	Point of Intersection		130 x 130	0.26	OS
Cowlitz	86.2	Point of Intersection		100 x 50	0.17	OS
Cowlitz	86.4	Point of Intersection		100 x 50	0.18	OS
Cowlitz	86.4	Point of Intersection		85 x 50	0.17	OS
Cowlitz	86.5	Point of Intersection		90 x 50	0.01	EW
					0.15	OS
~~Cowlitz~~	~~83.0~~	~~Columbia River Crossing~~	~~HDD Exit~~	~~300 x 50~~	~~0.17~~	~~AG~~
					~~0.38~~	~~PEM~~
~~Cowlitz~~	~~83.0~~	~~Columbia River Crossing~~	~~HDD Pullback~~	~~6050 x 75~~	~~6.61~~	~~AG~~
					~~3.35~~	~~PEM~~
					~~0.32~~	~~PFO~~
~~Cowlitz~~	~~84.9~~	~~I-5 Southbound~~	~~Additional Staging Area~~	~~95 x 50~~	~~0.11~~	~~ROW~~
~~Cowlitz~~	~~84.9~~	~~Point of Intersection~~	~~Additional Spoil Area~~	~~70 x 50~~	~~0.09~~	~~ROW~~
~~Cowlitz~~	~~85.4~~	~~I-5 Northbound/RR Crossing~~	~~Additional Staging Area~~	~~120 x 50~~	~~0.14~~	~~ROW~~
~~Cowlitz~~	~~85.5~~	~~I-5 Northbound/RR Crossing~~	~~Additional Staging Area~~	~~100 x 50~~	~~0.11~~	~~ROW~~
~~Cowlitz~~	~~85.8~~	~~Steep Terrain~~	~~Additional Cut/Fill Area~~	~~630 x 50~~	~~0.73~~	~~UF~~
~~Cowlitz~~	~~85.6~~	~~Stream~~	~~Additional Spoil Area/Staging Area~~	~~130 x 50~~	~~0.15~~	~~UF~~
~~Cowlitz~~	~~85.9~~	~~Point of Intersection~~	~~Additional Spoil Area~~	~~100 x 50~~	~~0.11~~	~~UF~~
~~Cowlitz~~	~~86.0~~	~~Road Crossing~~	~~Additional Staging Area~~	~~125 x 50~~	~~0.14~~	~~UF~~
~~Cowlitz~~	~~86.0~~	~~Road Crossing~~	~~Additional Staging Area~~	~~100 x 50~~	~~0.10~~	~~RE~~
					~~0.02~~	~~ROW~~

APPENDIX 8A
Additional Temporary Workspace for the Project Pipeline

County	Milepost	Crossing	Description	Dimensions (Feet)	Acreage	Land Use Within Additional Temporary Workspace
~~Cowlitz~~	~~86.1~~	~~Point of Intersection~~	~~Additional Spoil Area~~	~~125 x 50~~	~~0.01~~	~~ROW~~
					~~0.13~~	~~UF~~
~~Cowlitz~~	~~86.2~~	~~Point of Intersection~~	~~Additional Spoil Area~~	~~120 x 50~~	~~0.14~~	~~RE~~
~~Cowlitz~~	~~86.4~~	~~Steep Terrain~~	~~Additional Cut/Fill Area~~	~~135 x 50~~	~~0.16~~	~~CI~~
~~Cowlitz~~	~~86.6~~	~~Steep Terrain~~	~~Additional Cut/Fill Area~~	~~150 x 50~~	~~0.17~~	~~RE~~
Total for Additional Temporary Workspaces					~~143.57~~137.23	

Abbreviations of Land Use Classifications:

AG = Agriculture
AW = Agricultural Wetland
CI = Commercial/Industrial
IF = Industrial Forest
OS = Open Space
PEM = Palustrine Emergent Wetlands
PFO = Palustrine Forested Wetlands
PSS = Palustrine Scrub-Shrub Wetlands
RE = Residential
ROW = Right-of-Way
UF = Upland Forest

Precision loss may occur because of rounding.

Appendix 9D
Analysis of Horizontal Directional Drilling at Nearby Noise-Sensitive Areas

Appendix 9D

Analysis of Horizontal Directional Drilling at Nearby Noise-Sensitive Areas

										Estimated Noise Levels from HDD Activities							
										Unmitigated		Mitigated (10 dBA)		Mitigated (15 dBA)		Mitigated (20 dBA)	
Site ID	MP	Site Name	Site Type	Noise-Sensitive Area (NSA) Address, or General Location Description	NSA Type	Distance from HDD Site to NSA (ft)	Bearing from HDD to closest NSA (degrees)	Estimated Number of Drilling Days (based on 10 hrs. per day)	Estimated or Measured Existing Ldn	Leq	Ldn (24 hr)	Leq	Ldn (24 hr)	Leq	Ldn (24 hr)	Leq	Ldn (24 hr)
0	-	Skipanon River	HDD ENTRY	M2 - Port Warren Condos, NE Skipanon Drive, Warrenton OR 97146	Residence	1065	203	27	61	62	69	52	59	47	54	42	49
0	-	Skipanon River	HDD EXIT	M2 - Port Warren Condos, NE Skipanon Drive, Warrenton OR 97146	Residence	550	265		61	69	75	59	65	54	60	49	55
1	0.3	Levee at 0.4	HDD ENTRY	88872 Blue Heron Rd, Gearhart, OR 97138	Residence	1882	221	15	>55	56	63	46	53	41	48	36	43
1	0.5	Levee at 0.4	HDD EXIT	Shilo Inn, 1609 E Harbor St, Warrenton, OR 97146	Commercial	1173	173		>55	61	68	51	58	46	53	41	48
2	0.9	Highway 101/Adair Slough	HDD ENTRY	65 U.S. 101, Warrenton, OR 97146	Commercial	513	248	15	<55	70	76	60	66	55	61	50	56
2	1.1	Highway 101/Adair Slough	HDD EXIT	65 U.S. 101, Warrenton, OR 97146	Commercial	1165	316		<55	61	68	51	58	46	53	41	48
3	3.4	Lewis & Clark River @ MP 03	HDD ENTRY	35082 7th Ln, Astoria OR	Farm/Residence	1082	36	32	<55	57	64	47	54	42	49	37	44
3	2.8	Lewis & Clark River @ MP 03	HDD EXIT	Intersection of Airport Lane and Hwy 101 Business, Warrenton OR 97146	Residence	1161	228		<55	61	68	51	58	46	53	41	48
4	5.0	Lewis & Clark Bank @ MP 5.0	HDD ENTRY	35079 Reith-Larson Ln, Astoria, OR 97103	Farm/Residence	703	146	29	<55	67	73	57	63	52	58	47	53
4	5.5	Lewis & Clark Bank @ MP 5.0	HDD EXIT	35116 Reith-Larson Lane, Astoria, OR 97103	Farm/Residence	1029	4		<55	63	69	53	59	48	54	43	49
5	6.0	Lewis & Clark River @ MP 5.5	HDD ENTRY	S side of Fort Clatsop Rd	Residence	1218	176	26	<55	61	67	51	57	46	52	41	47
5	5.6	Lewis & Clark River @ MP 5.5	HDD EXIT	W Side of Lewis & Clark Rd	Residence	1211	115		<55	61	67	51	57	46	52	41	47
6	11.2	Lewis & Clark River @ MP 11	HDD ENTRY	87981 Lewis & Clark Rd, Astoria, OR 97138	Farm/Residence	187	45	17	<55	64	70	54	60	49	55	44	50
6	10.9	Lewis & Clark River @ MP 11	HDD EXIT	87813 Lewis & Clark Rd, Astoria, OR, 97103	Farm/Residence	900	219		<55	66	72	56	62	51	57	46	52
7	33.3	Nehalem River	HDD ENTRY	41948 Alder Ln, Seaside, OR 97138	Residence	517	109	17	<55	76	83	66	73	61	68	56	63
7	33.7	Nehalem River	HDD EXIT	42198 Pope-Meeker Rd, Seaside, OR 97138	Residence	345	222		<55	67	74	57	64	52	59	47	54
8	40.9	Highway 26 @ MP 41	HDD ENTRY	NE side of Hwy 26	Sunset Rest Area	4749	137	22	>55	44	50	34	40	29	35	24	30
8	41.3	Highway 26 @ MP 41	HDD EXIT	NE side of Hwy 26	Sunset Rest Area	3916	116		>55	47	53	37	43	32	38	27	33
9	43.1	Highway 26 @ MP 43	HDD ENTRY	NE side of Hwy 26	Sunset Rest Area	5606	320	35	>55	41	48	31	38	26	33	21	28
9	43.6	Highway 26 @ MP 43	HDD EXIT	NE side of Hwy 26	Sunset Rest Area	8197	309		>55	34	40	24	30	19	25	14	20
10	58.1	Rock Creek	HDD ENTRY	15994 Keasey Rd Vernonia, OR 97064	Residence	945	120	32	<55	64	70	54	60	49	55	44	50
10	57.5	Rock Creek	HDD EXIT	15358 Creek View Lane Vernonia, OR 97064	Residence	1250	24		<55	61	67	51	57	46	52	41	47
11	63.6	Nehalem River	HDD ENTRY	63135 Nehalem Hwy N Vernonia, OR 97064	Residence	1081	21	38	<55	62	69	52	59	47	54	42	49
11	64.3	Nehalem River	HDD EXIT	Scappoose Vernonia Hwy Scappoose, OR 97056	Residence	2519	208		<55	53	59	43	49	38	44	33	39
12	81.9	Columbia River	HDD ENTRY	63100 Columbia River Highway, Columbia City, OR 97018	Residence	3276	257	54	<55	49	56	39	46	34	41	29	36
12	82.8	Columbia River	HDD EXIT	1300 Dike Road, Woodland, WA 98674	Farm/Residence	1928	49		<55	56	62	46	52	41	47	36	42

Abbreviations:

dBA = A-weighted decibels.

ft = feet

HDD = horizontal directional drilling.

Ldn = average day-night sound level

Leq = equivalent level.

MP = milepost.

Appendix 10C
Major Pipeline Route Alternatives
[on Aerial Photography]

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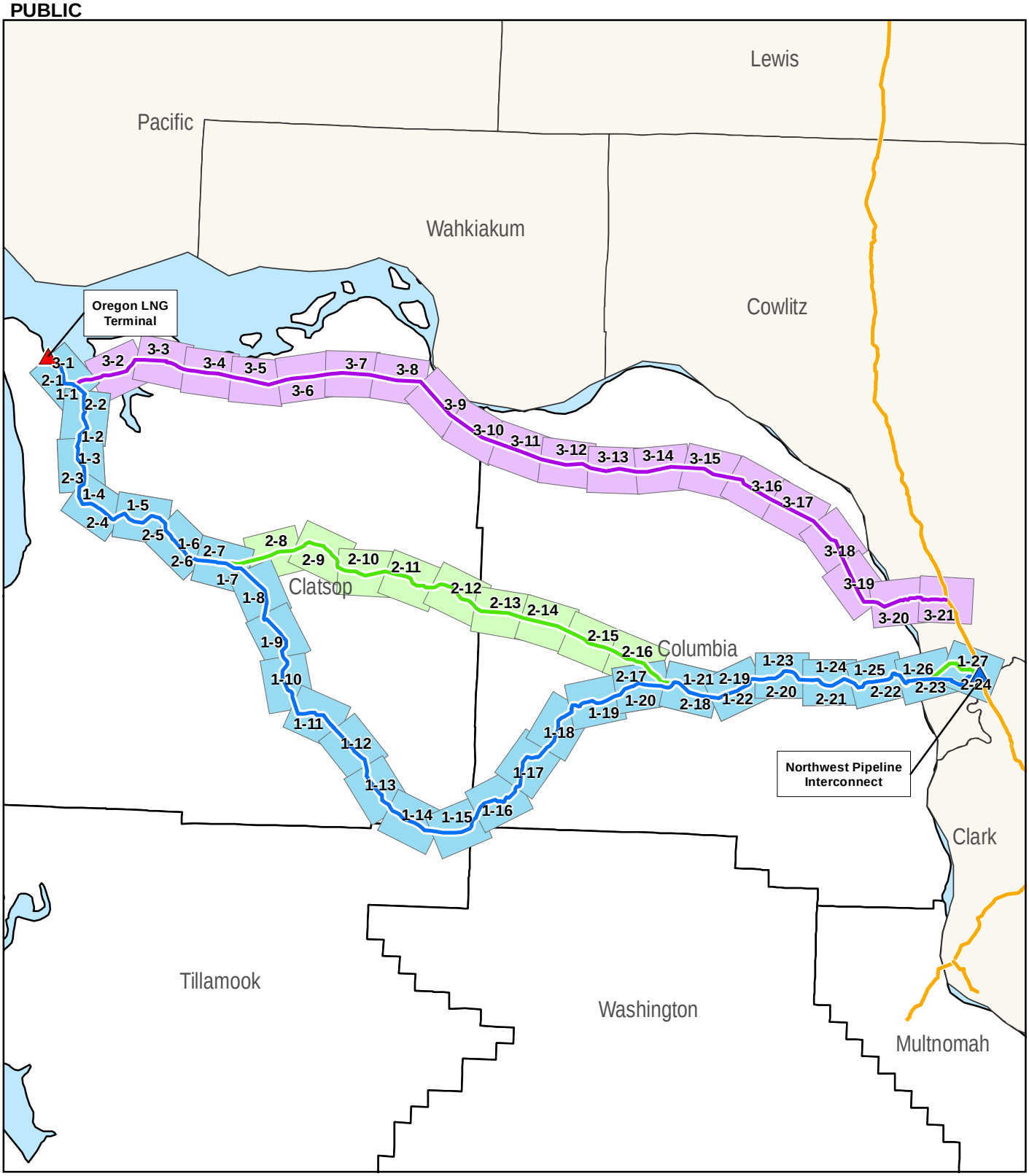

Legend

- Northwest Pipeline Interconnect
- Oregon LNG Terminal - Warrenton, Oregon
- sde_OregonLNG_PDX.DBO.Preferred_Pipeline_Route
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline
- Proposed Pipeline Route
- Alternative 1
- Alternative 2

0 2.5 5 10
Miles

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Appendix 10C

Major Pipeline Route Alternatives - Aerial

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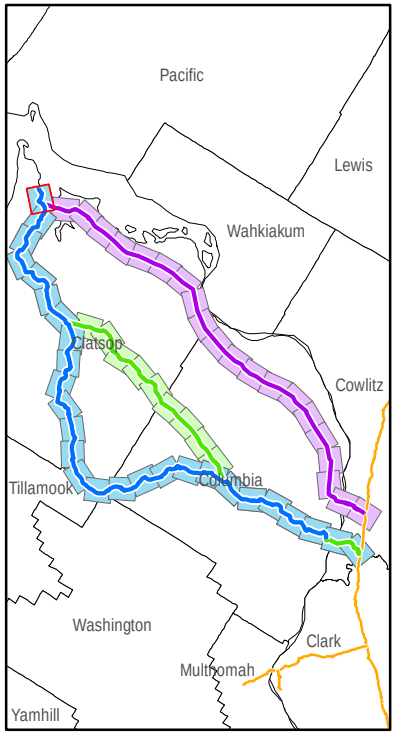
Appendix 10C

Figure 1-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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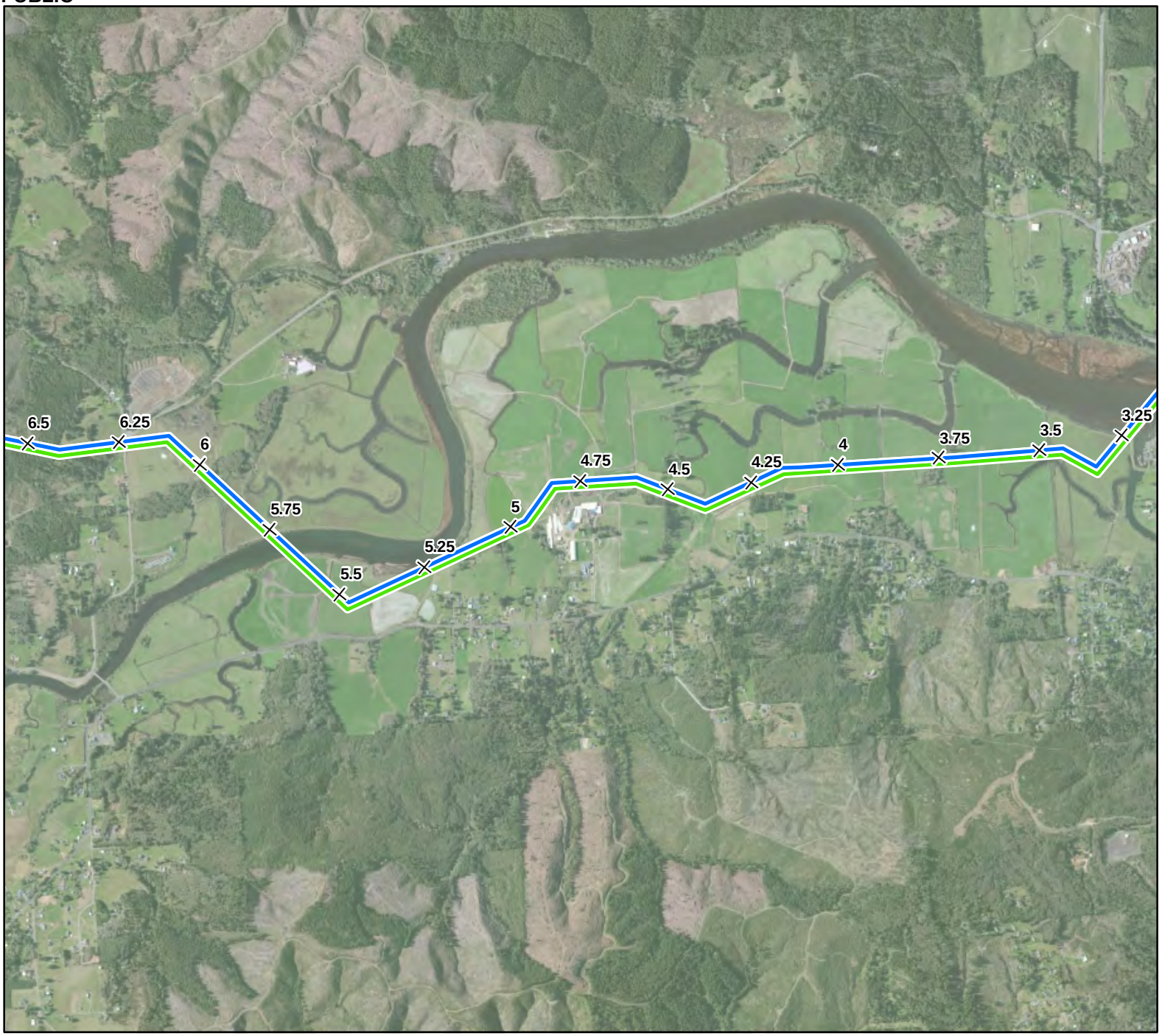


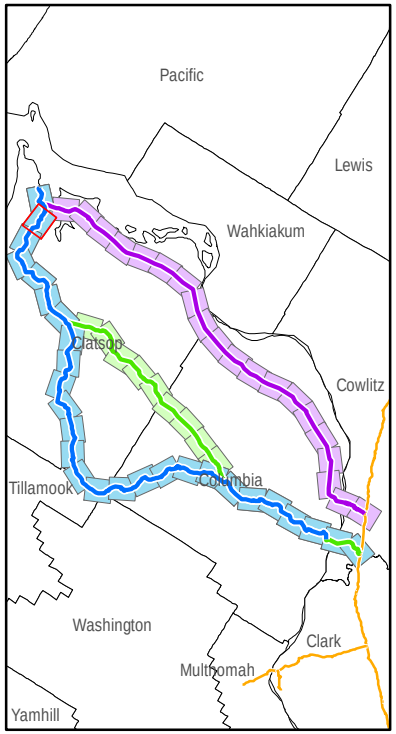
Appendix 10C

Figure 1-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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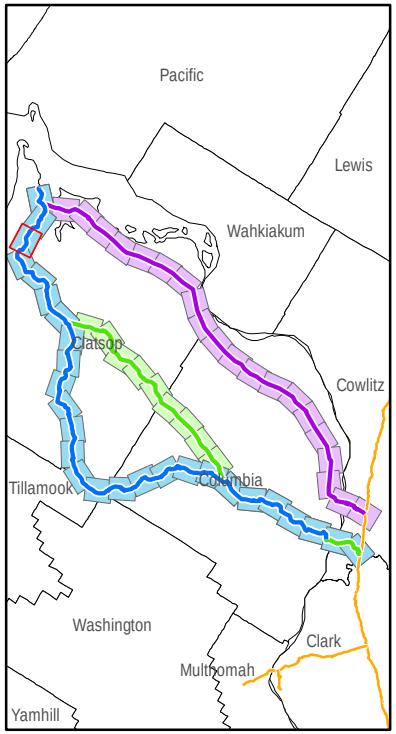
Appendix 10C

Figure 1-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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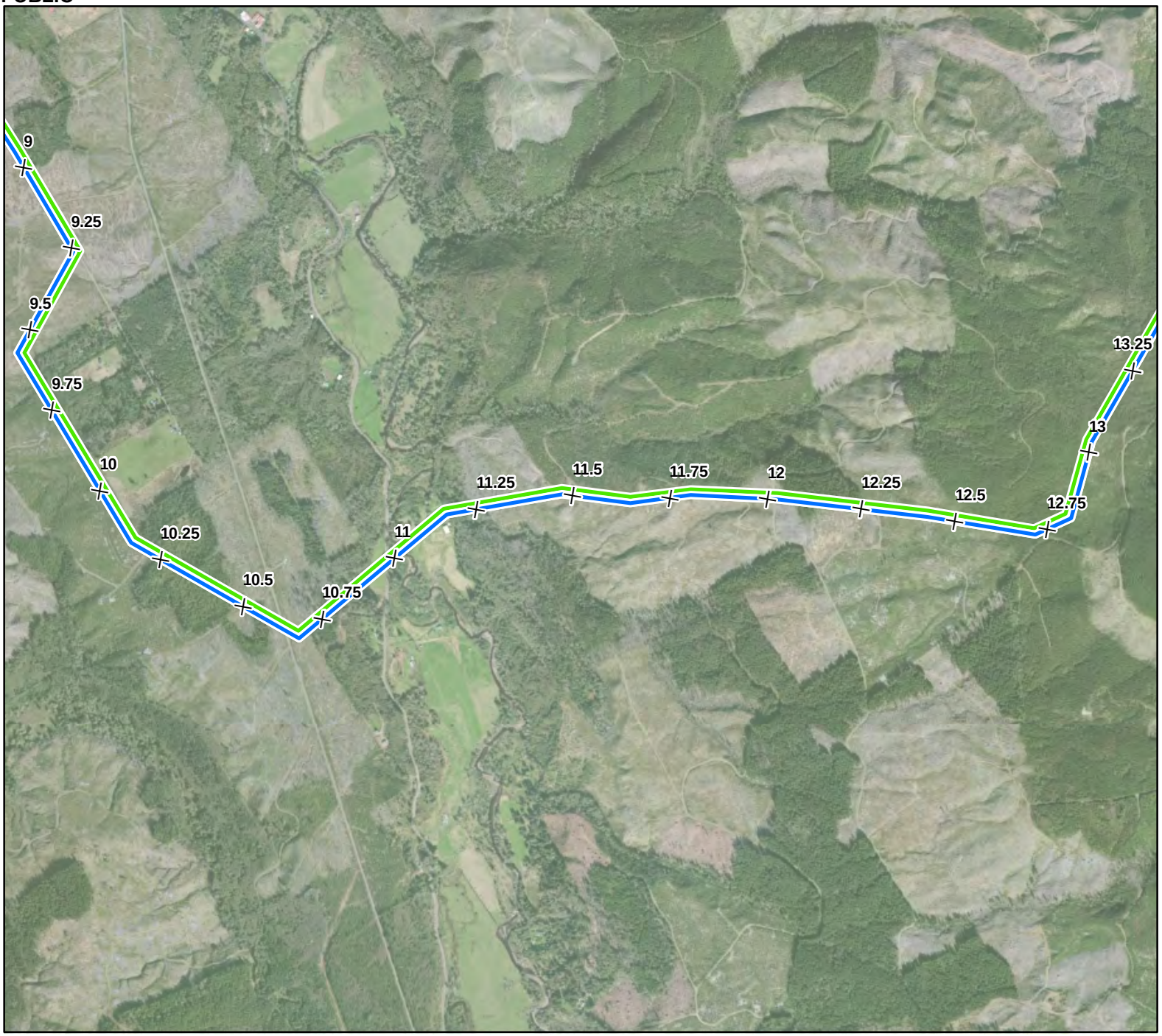


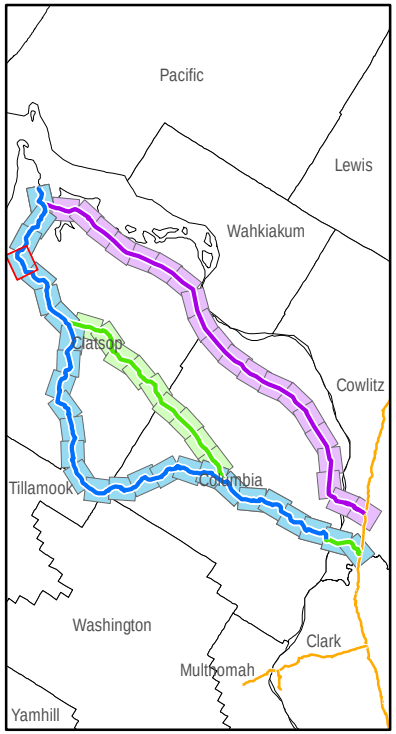
Appendix 10C

Figure 1-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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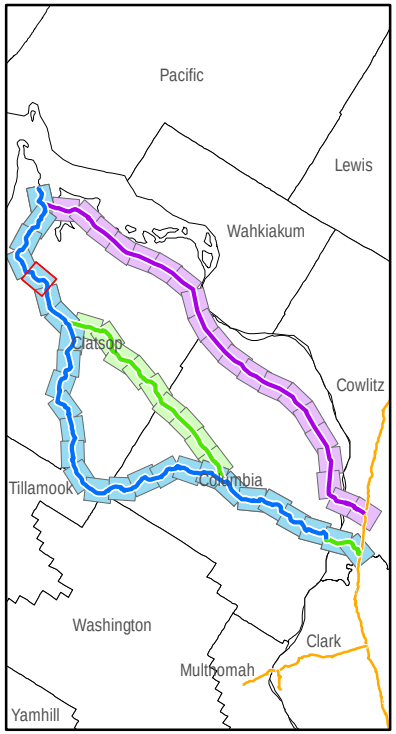
Appendix 10C

Figure 1-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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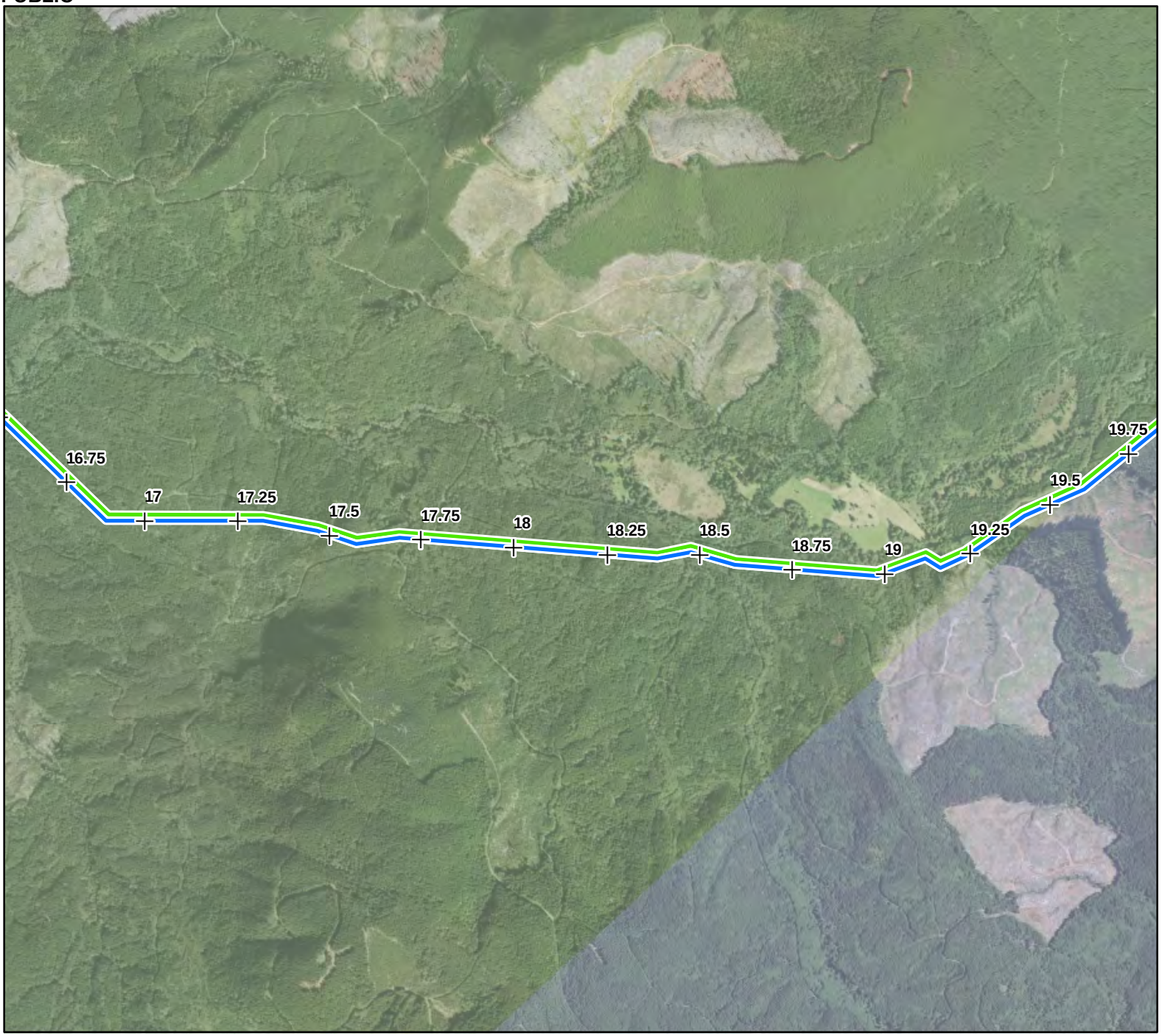


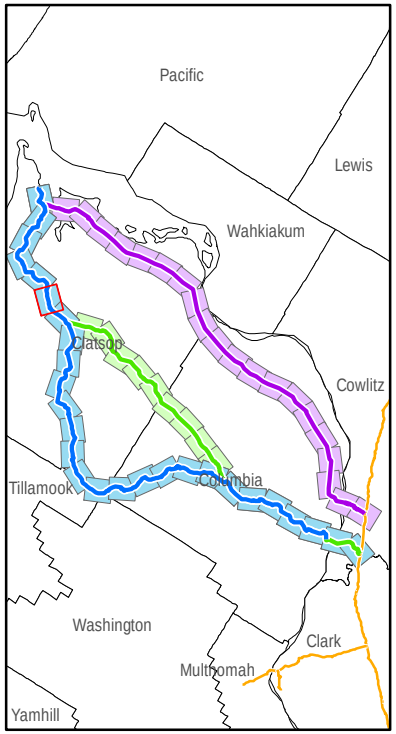
Appendix 10C

Figure 1-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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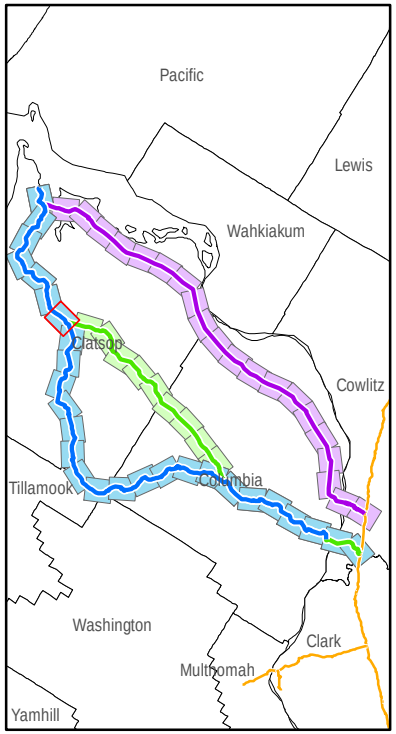
Appendix 10C

Figure 1-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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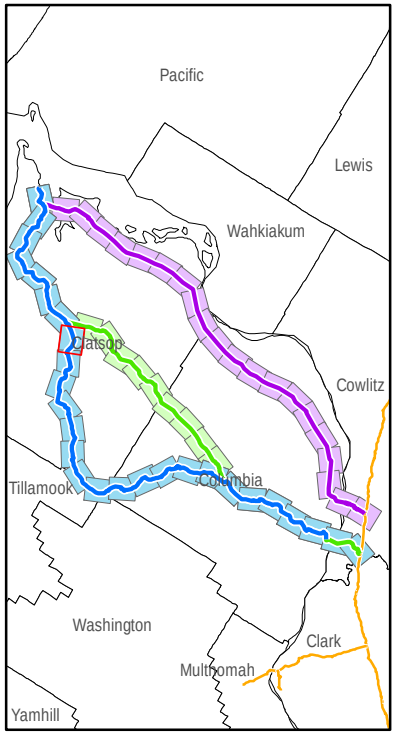
Appendix 10C

Figure 1-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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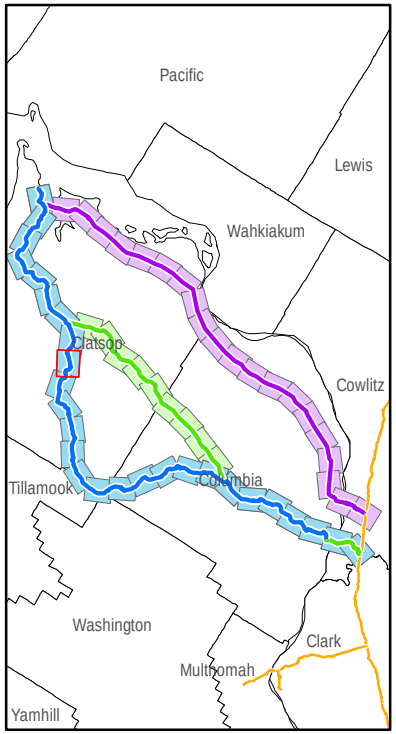
Appendix 10C

Figure 1-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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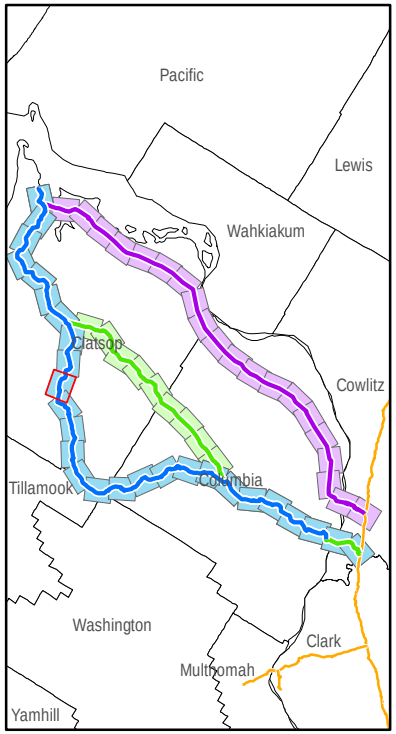
Appendix 10C

Figure 1-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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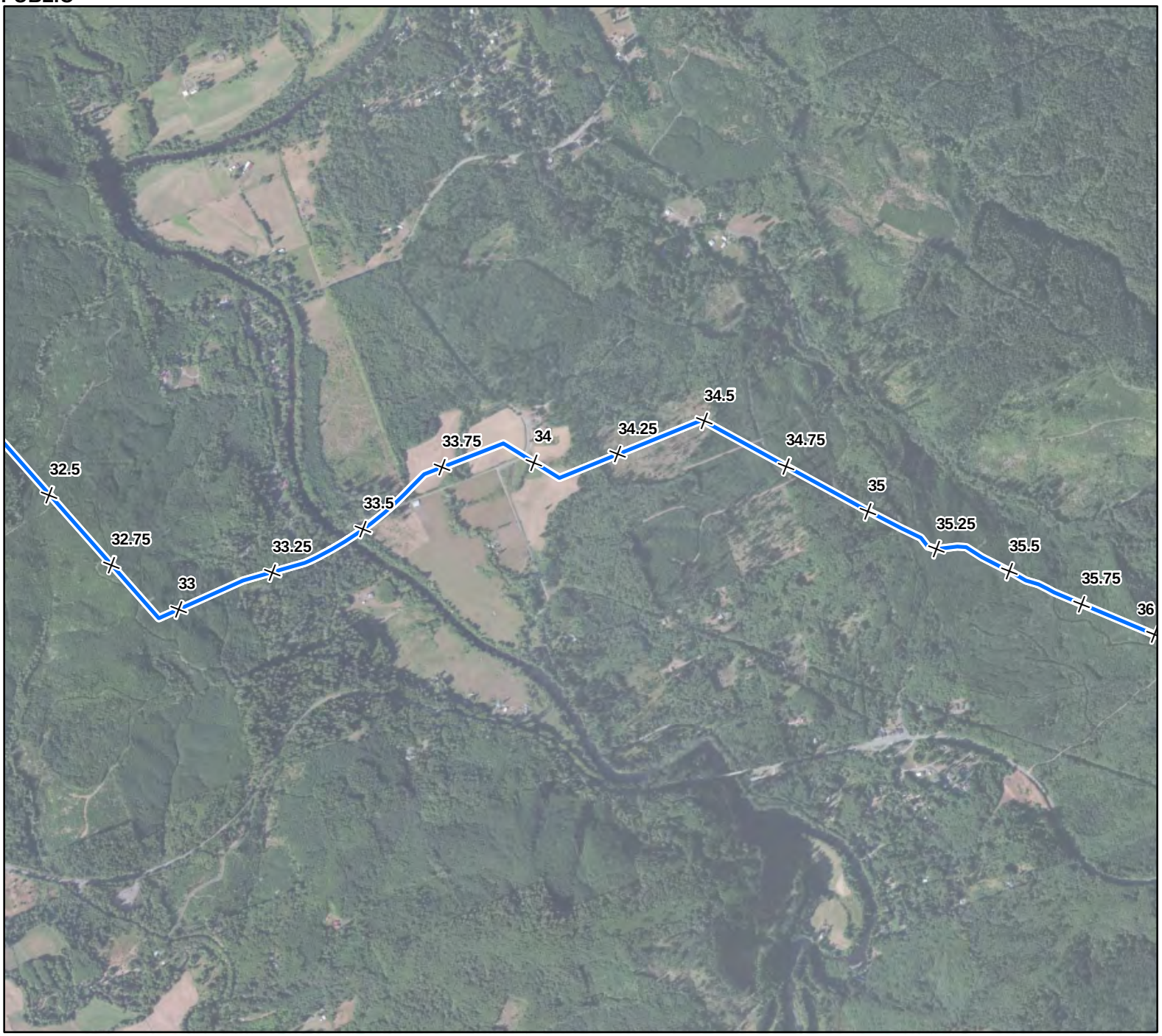


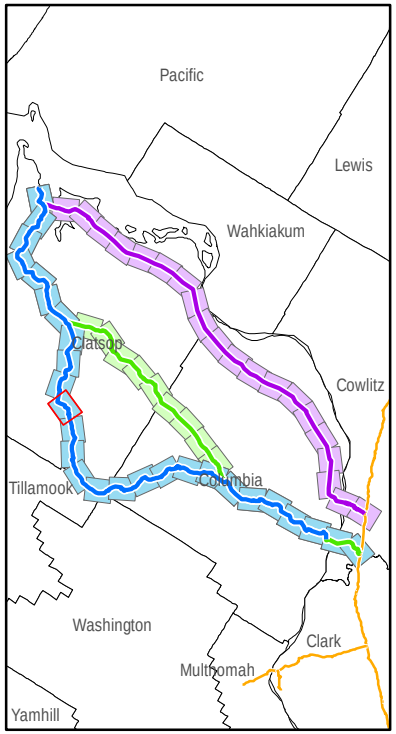
Appendix 10C

Figure 1-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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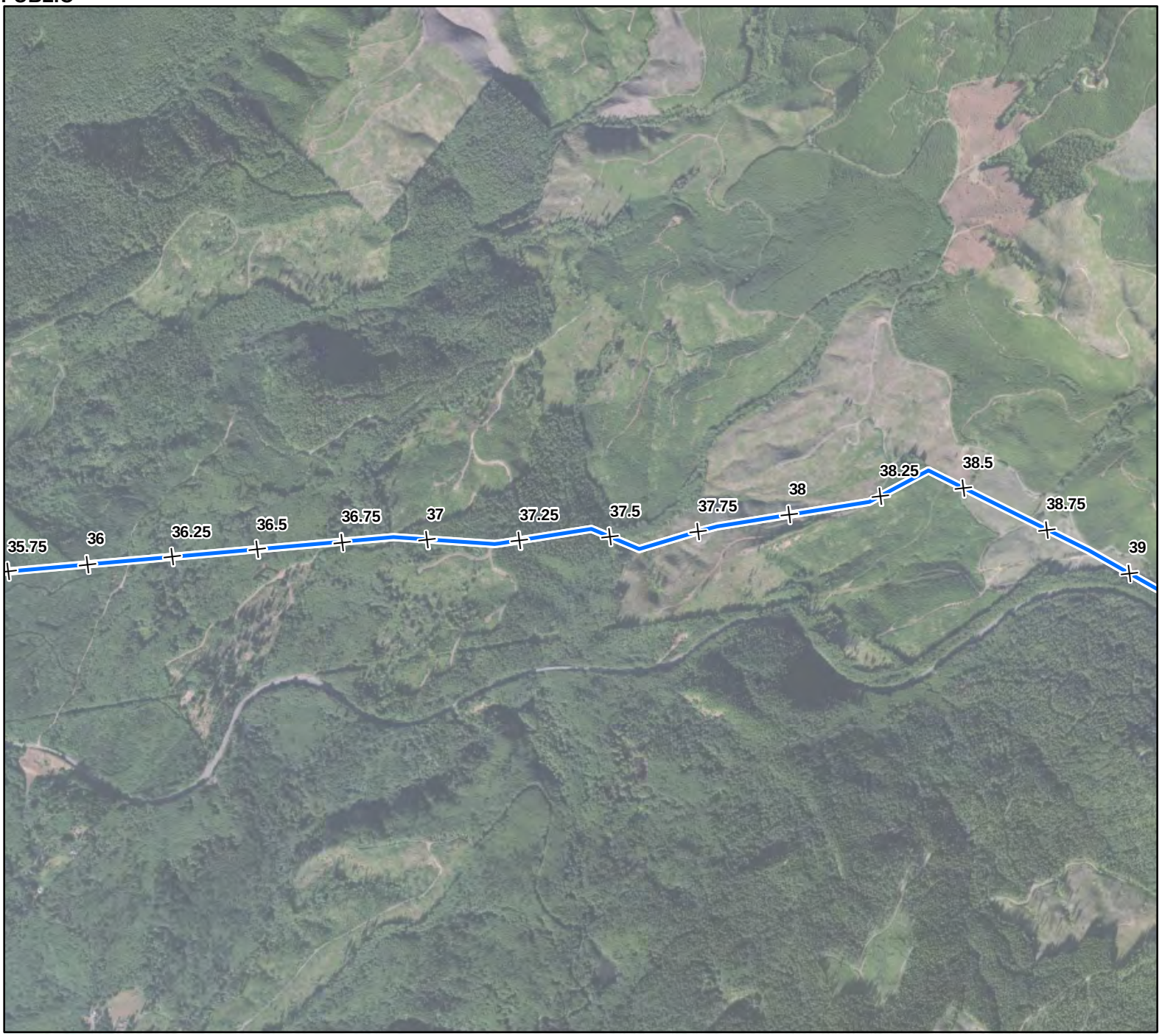


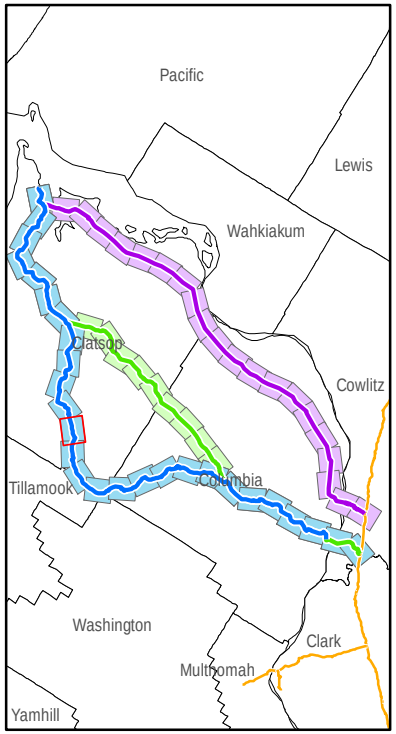
Appendix 10C

Figure 1-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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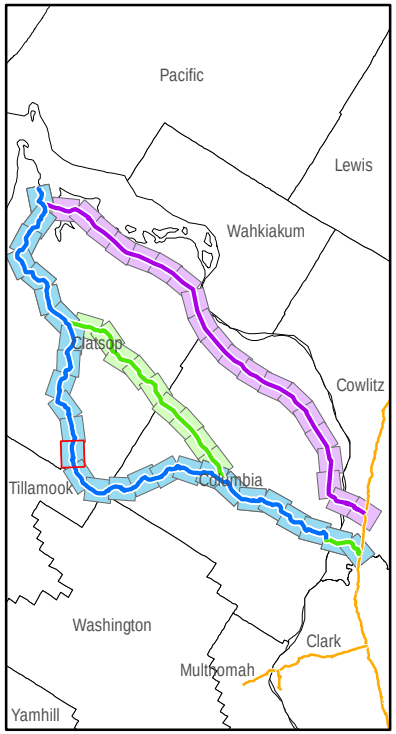
Appendix 10C

Figure 1-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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Appendix 10C

Figure 1-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

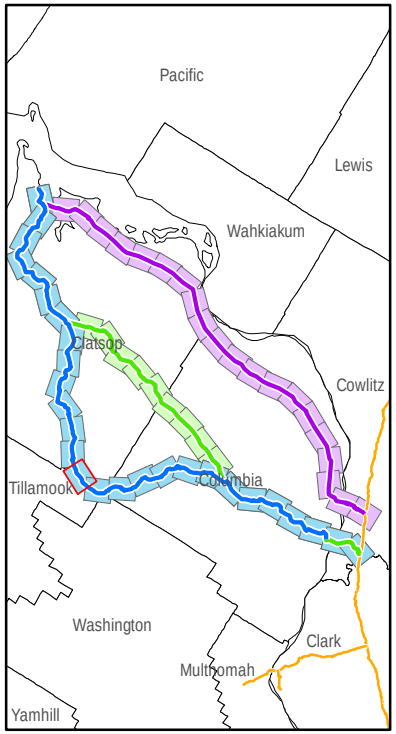

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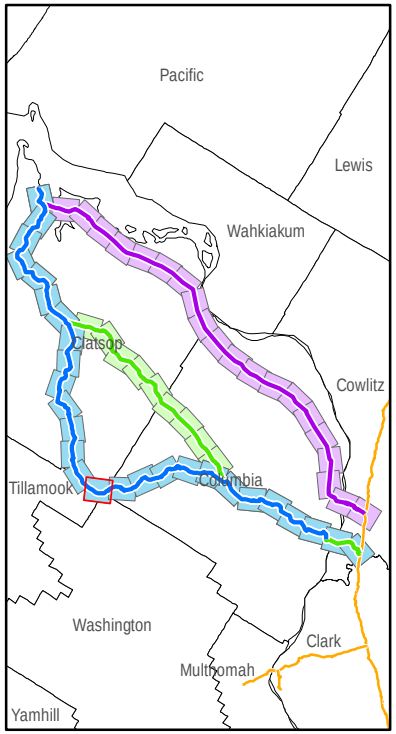
Figure 1-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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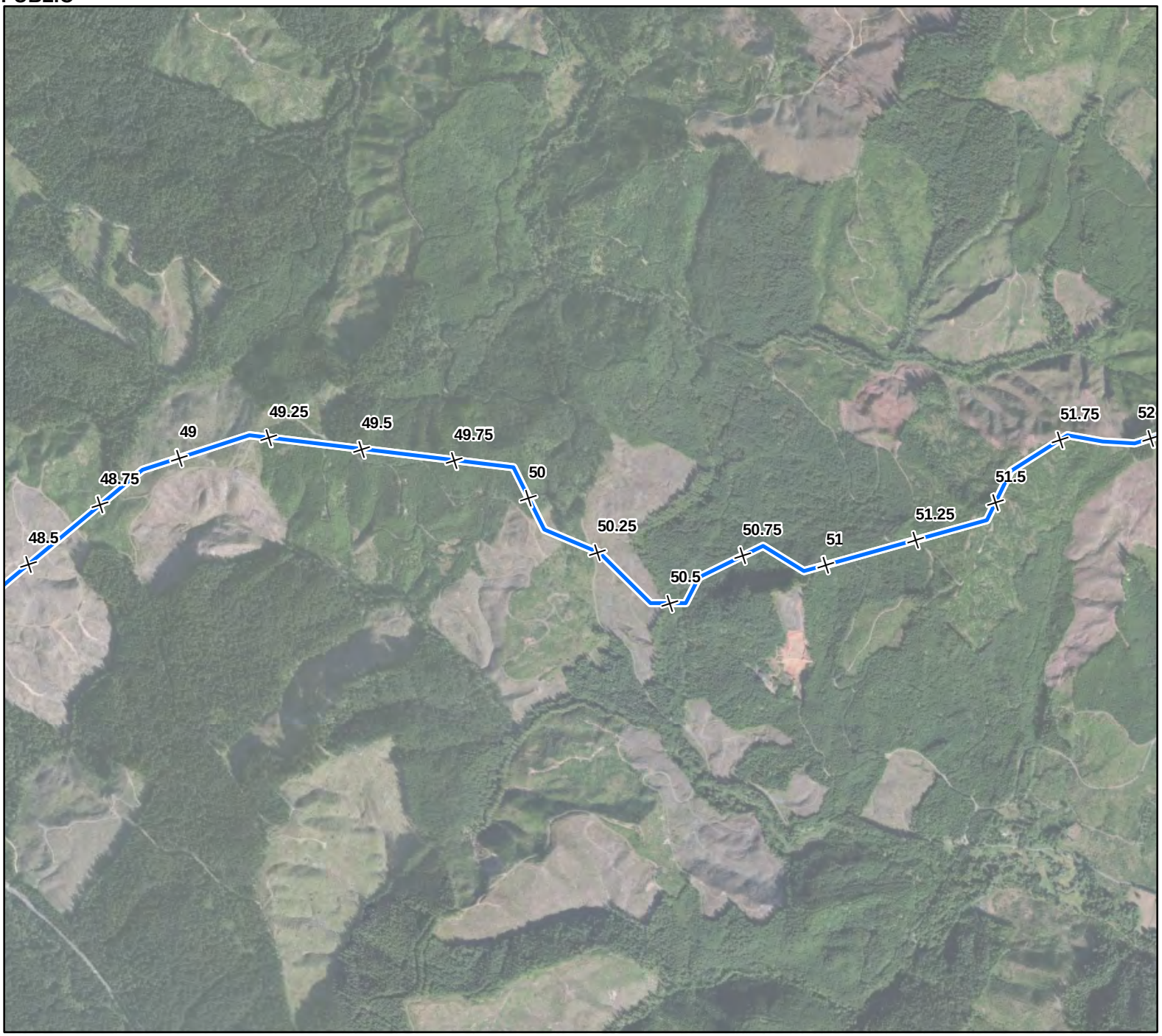

Appendix 10C

Figure 1-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

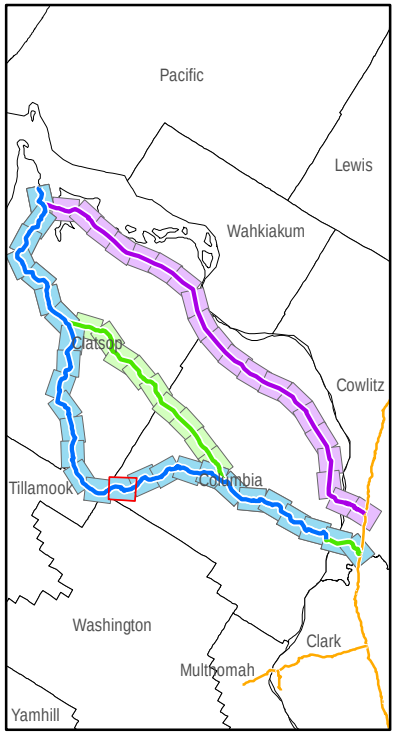

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Figure 1-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

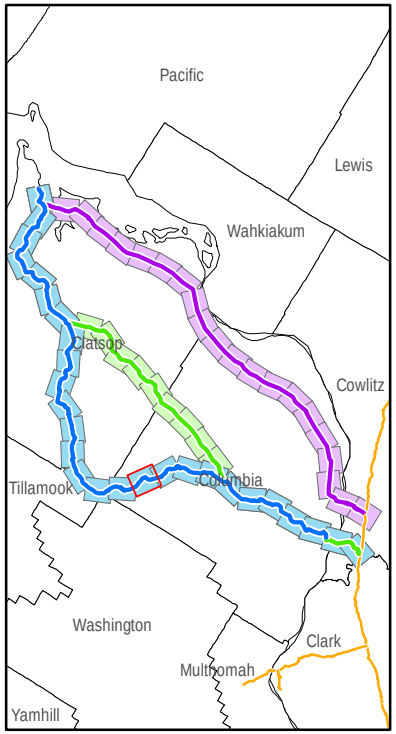

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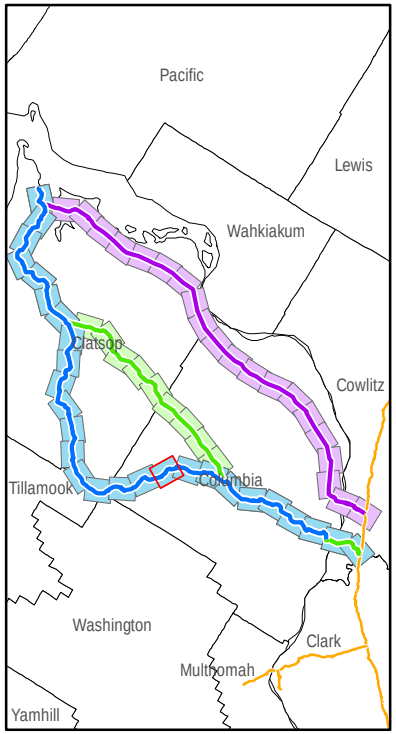
Figure 1-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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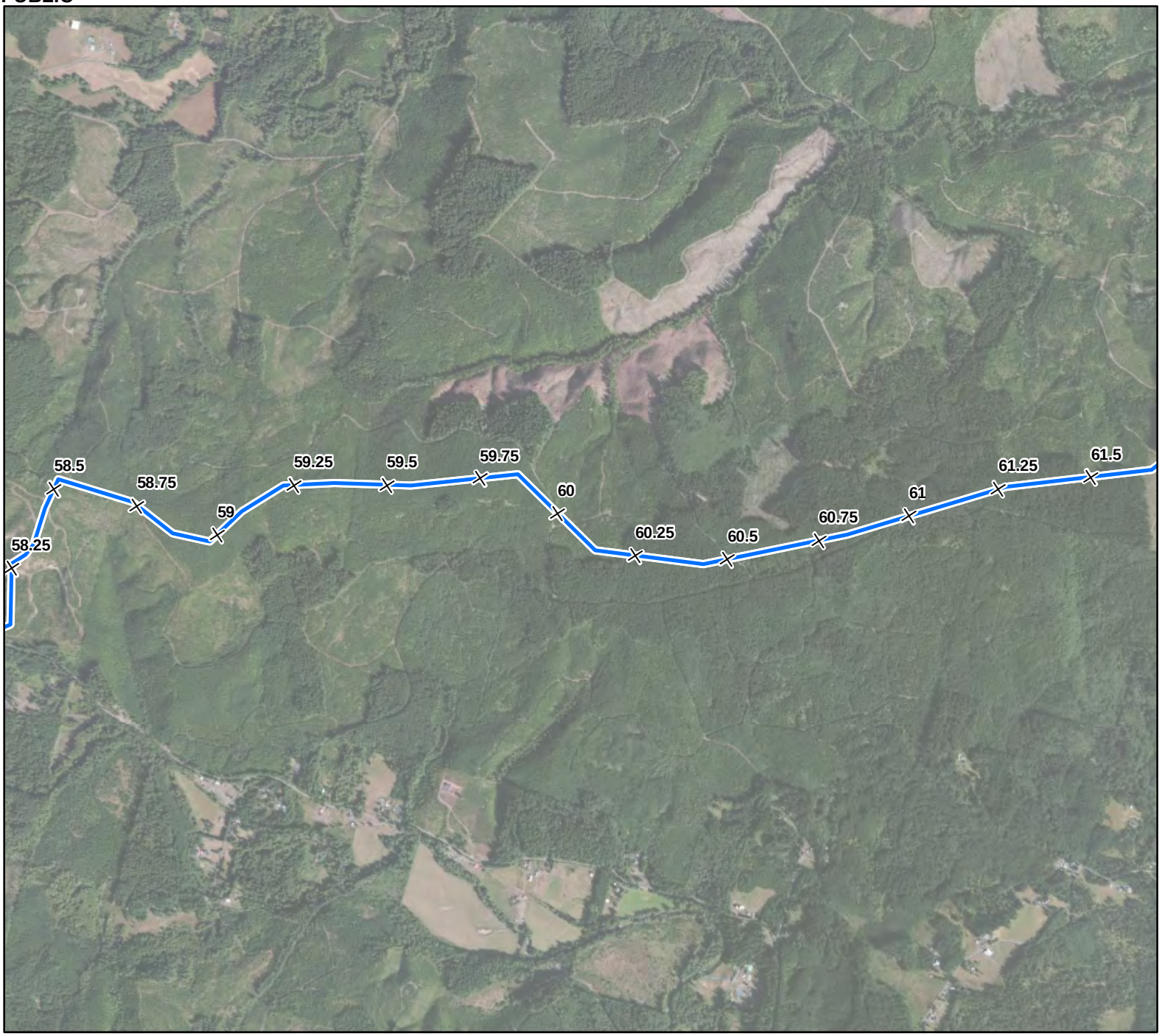

Appendix 10C

Figure 1-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

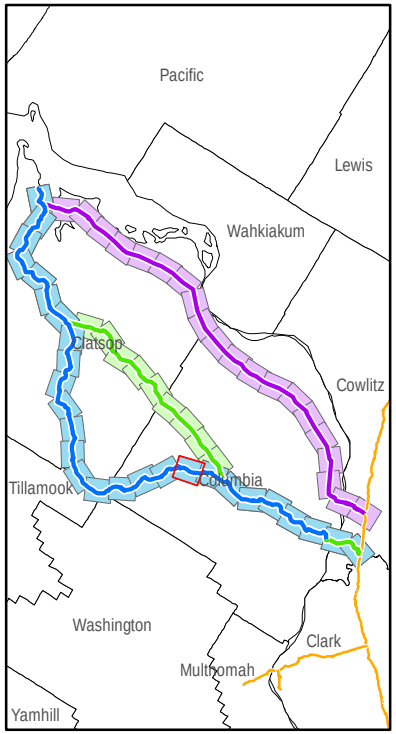

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Figure 1-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

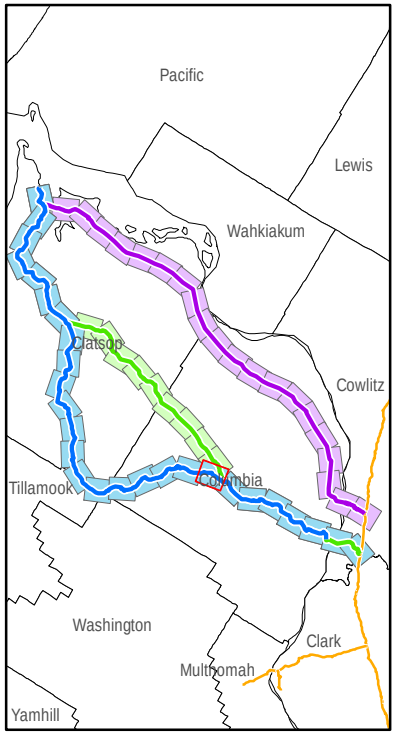

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Figure 1-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

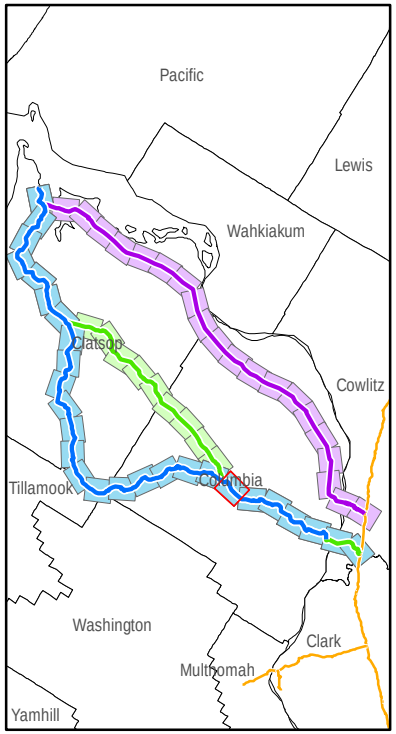

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Figure 1-22

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

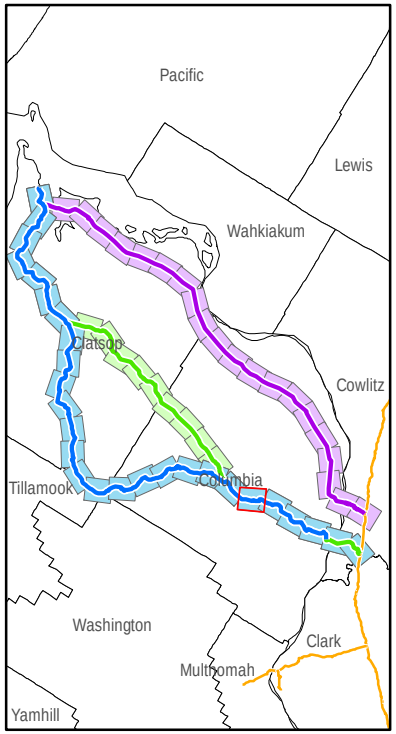

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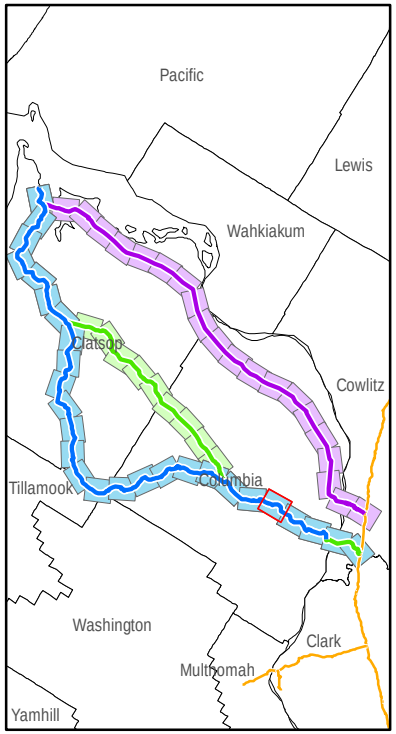
Figure 1-23

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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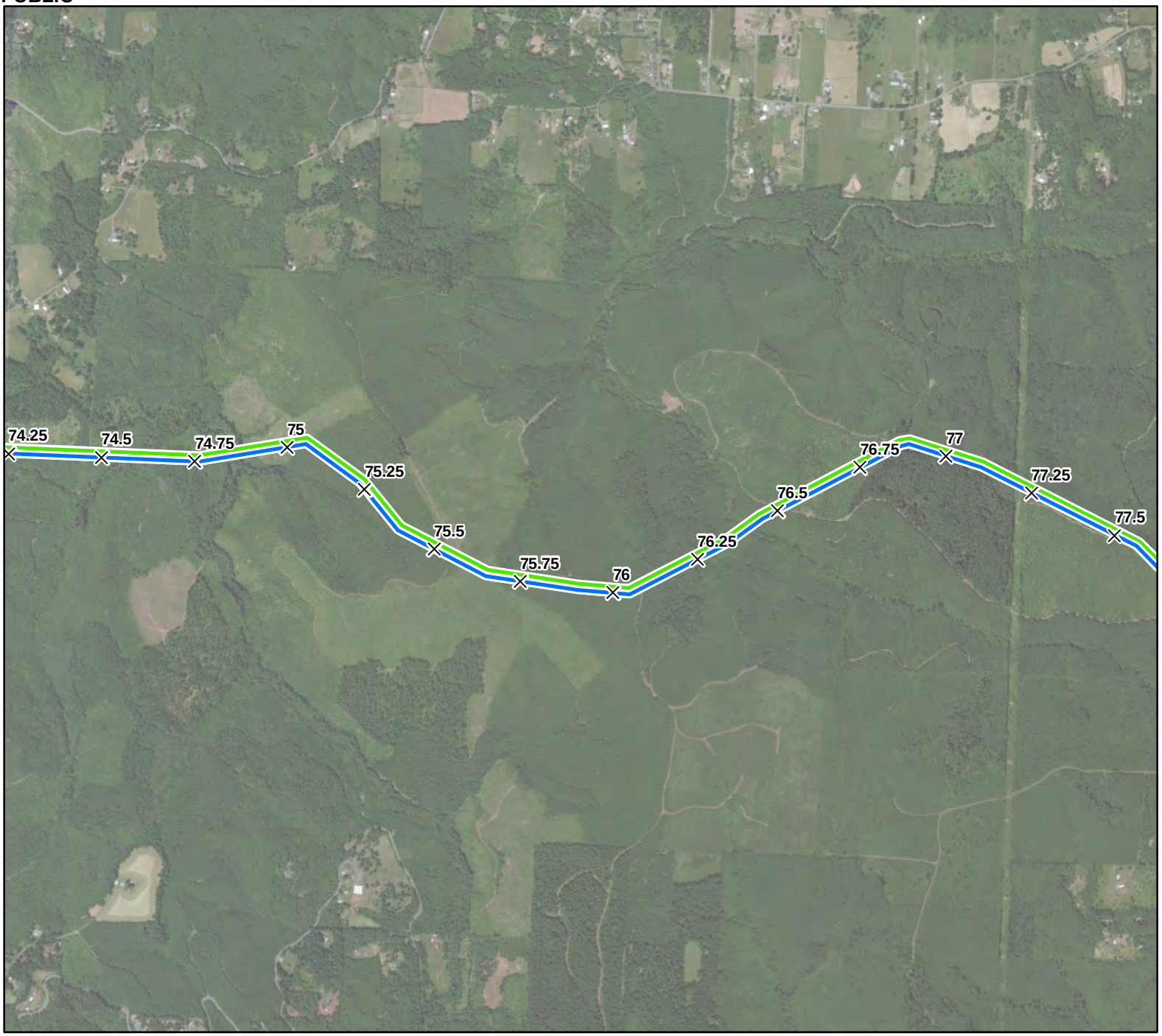


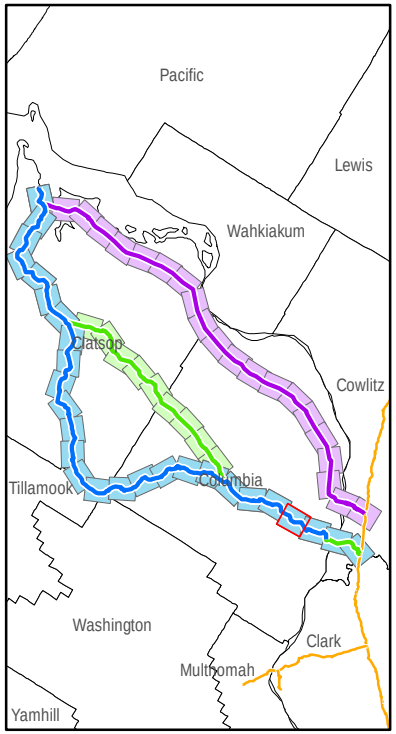
Appendix 10C

Figure 1-24

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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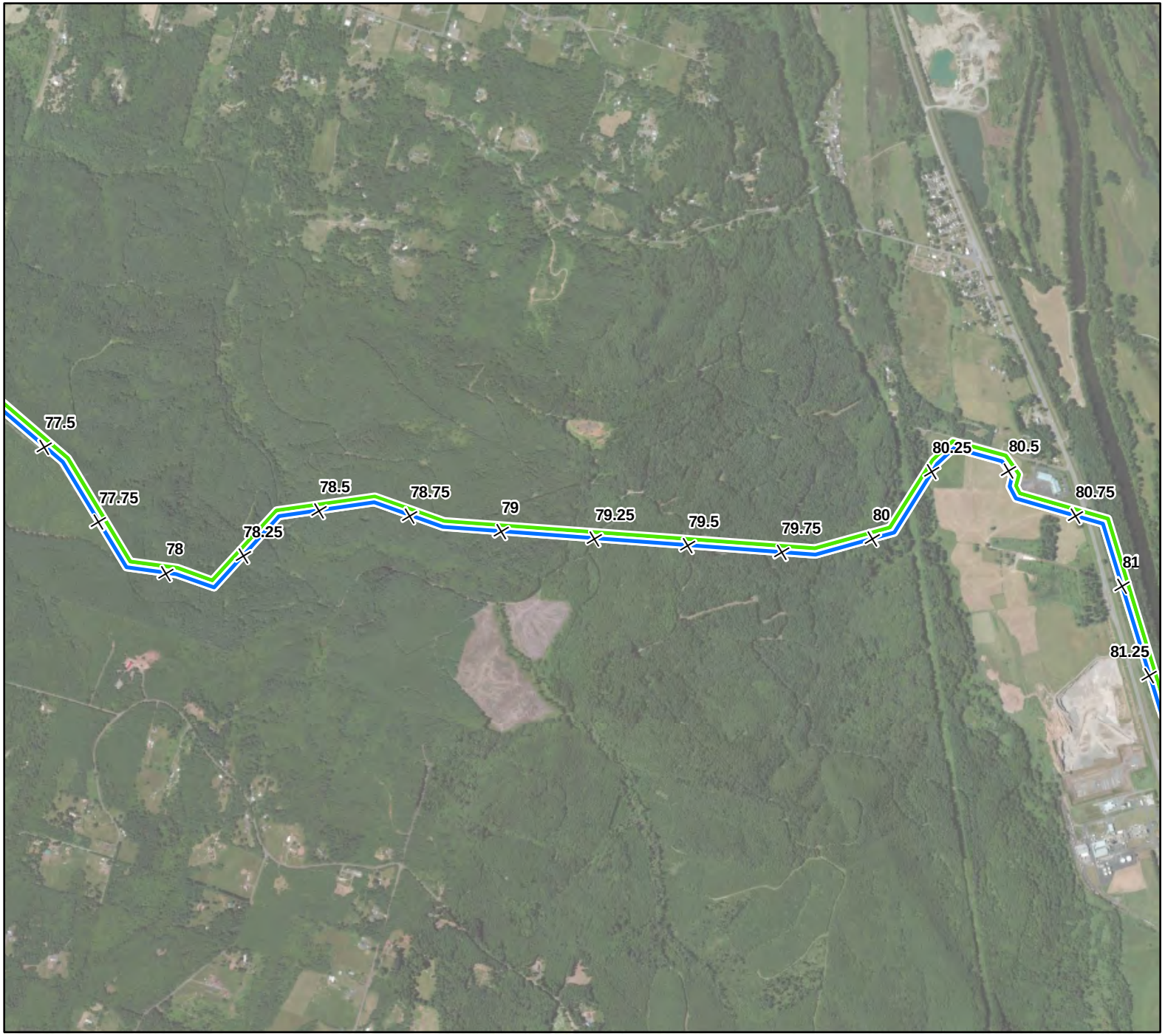

Appendix 10C

Figure 1-25

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

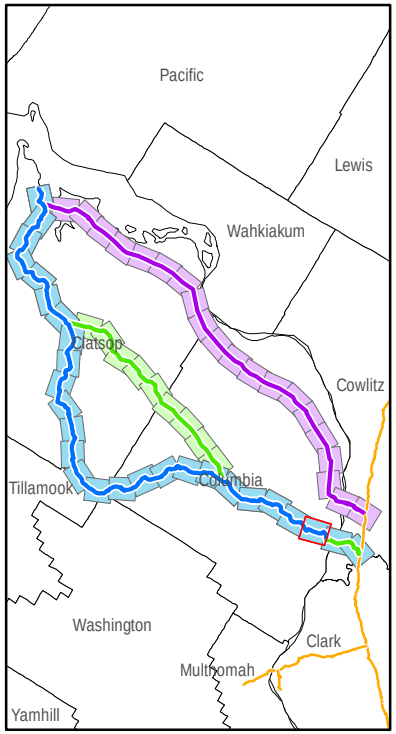

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Figure 1-26

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

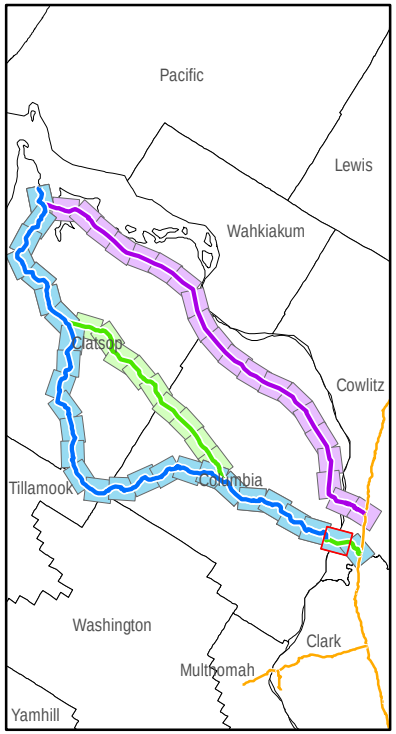

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Figure 1-27

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

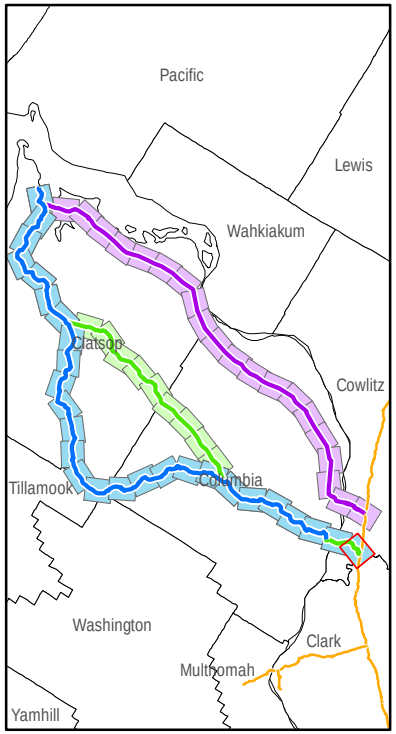

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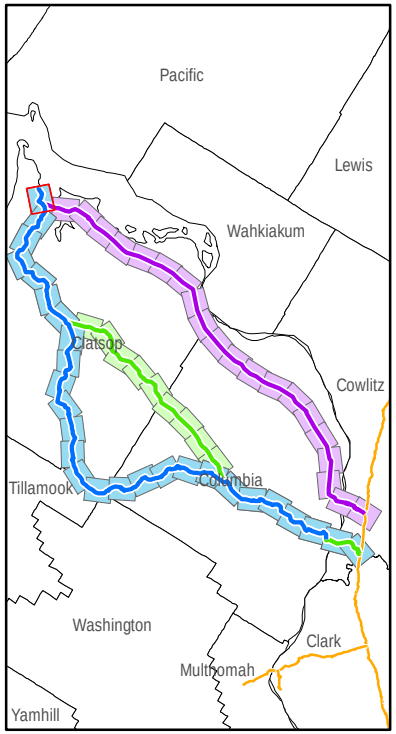
Figure 2-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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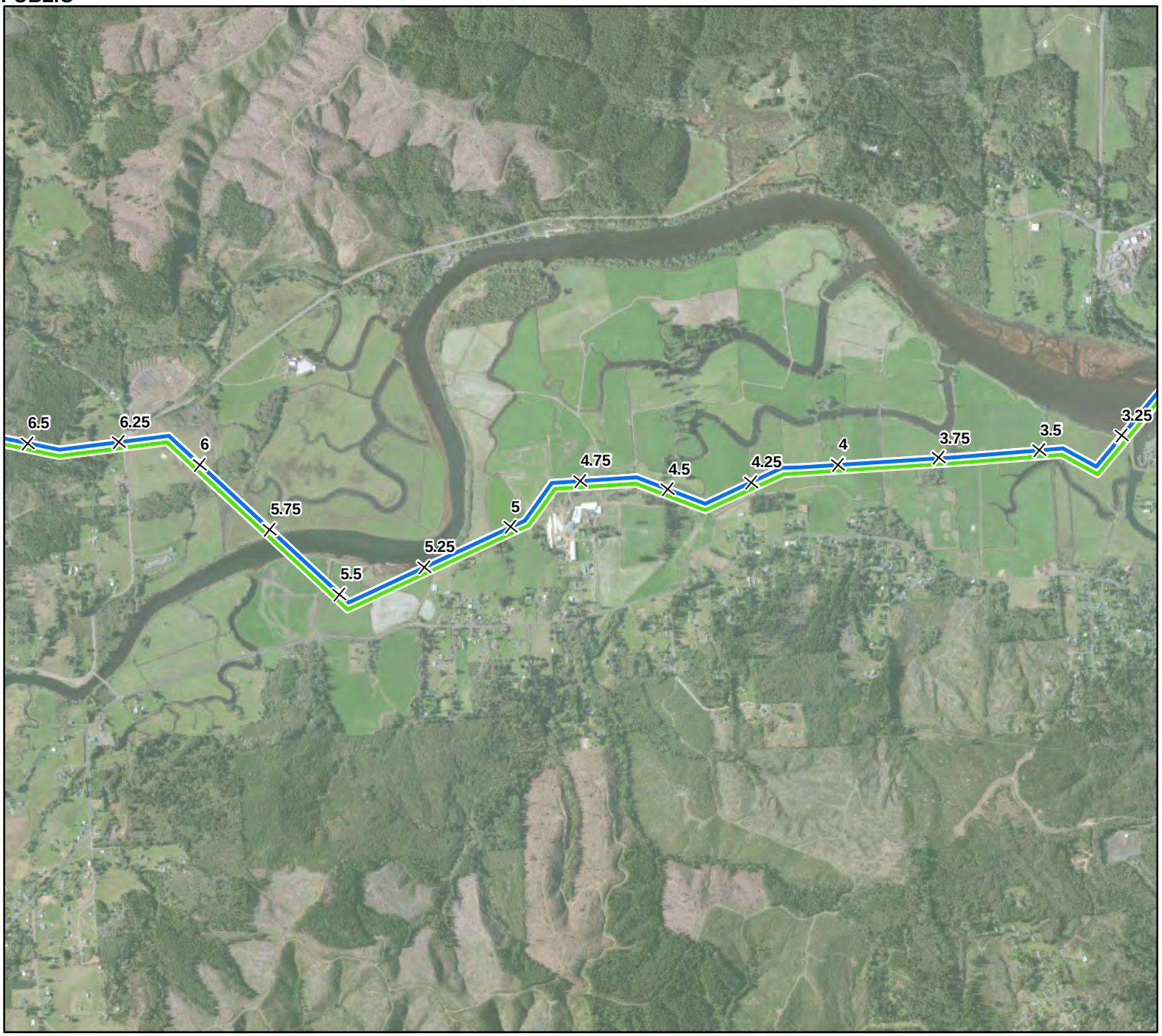

Appendix 10C

Figure 2-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

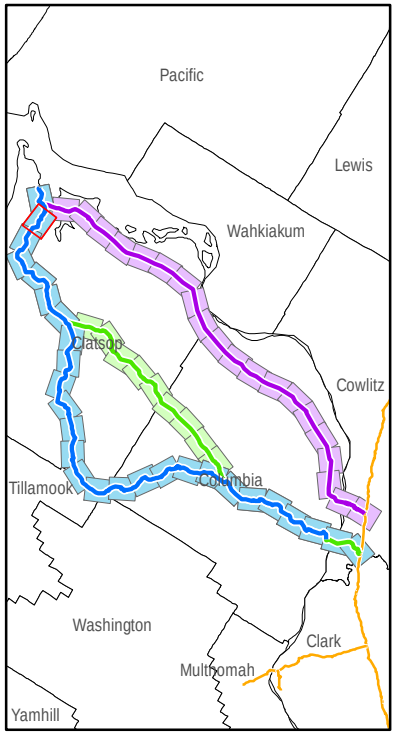

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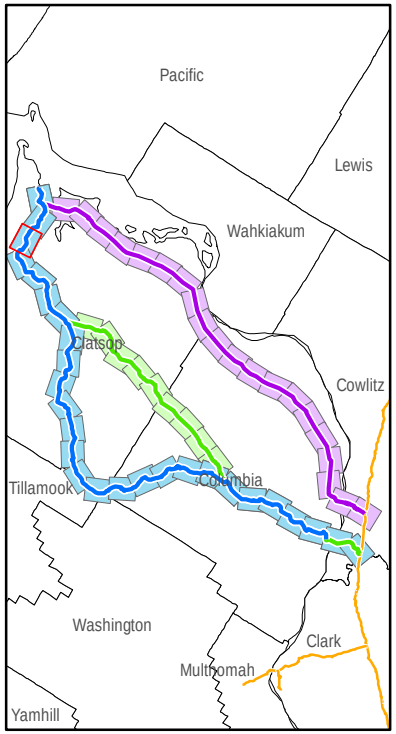
Figure 2-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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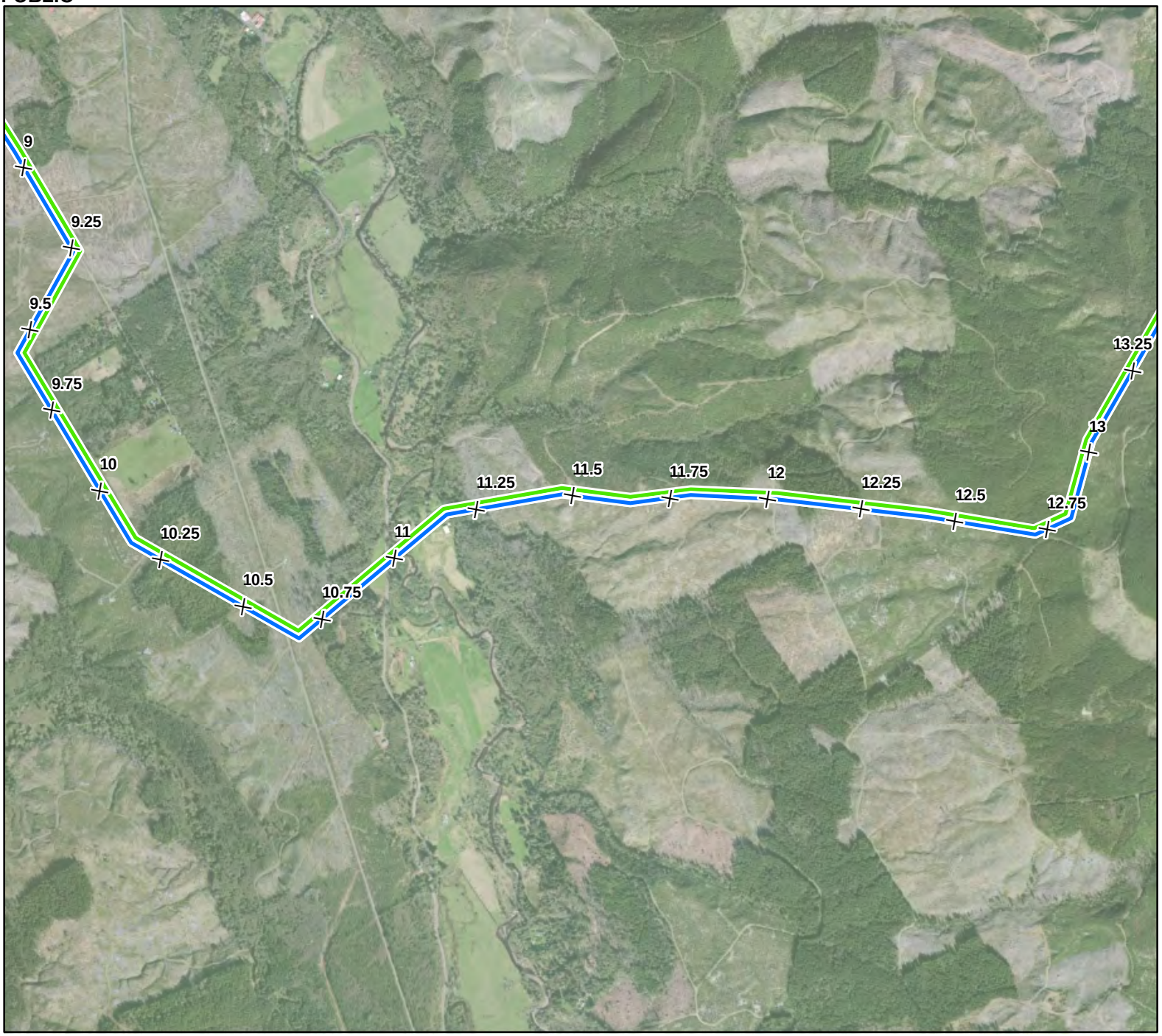


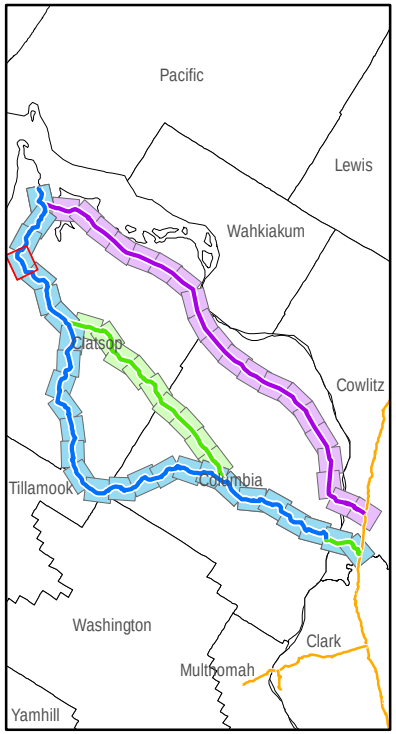
Appendix 10C

Figure 2-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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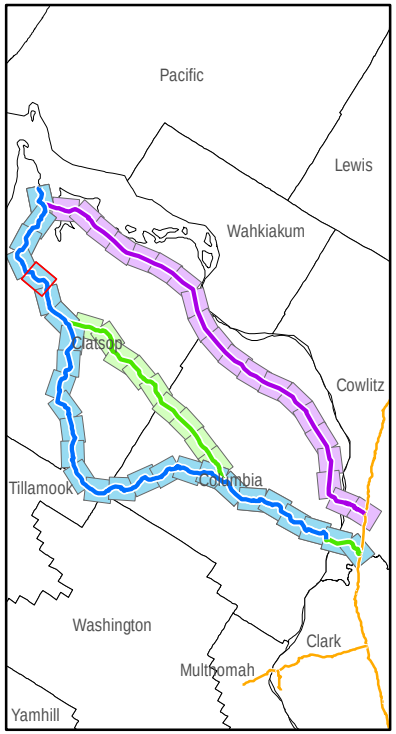
Appendix 10C

Figure 2-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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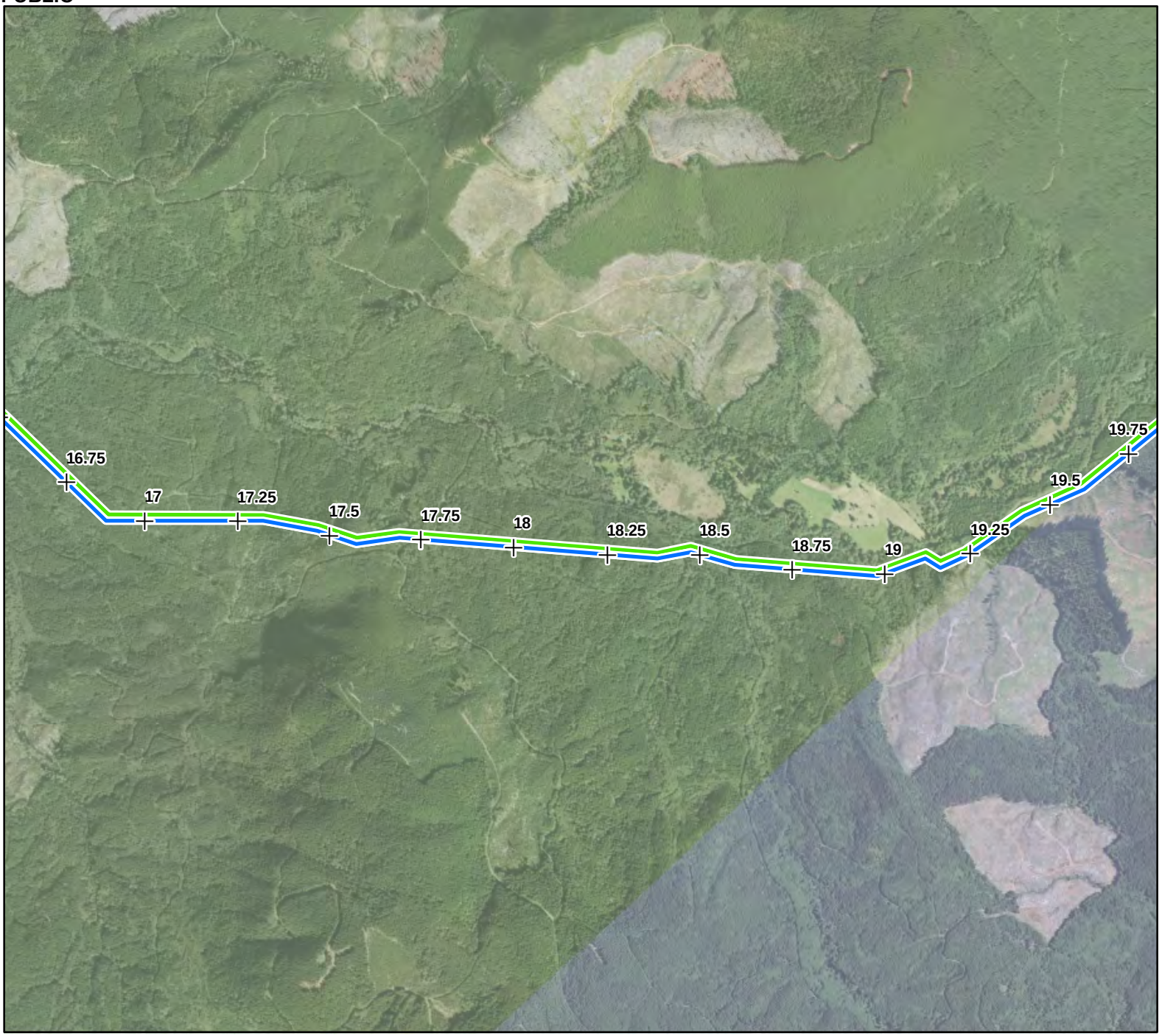

Appendix 10C

Figure 2-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

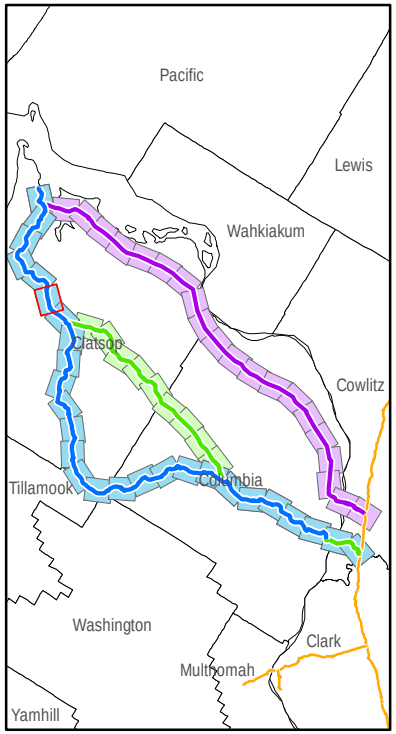

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Figure 2-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

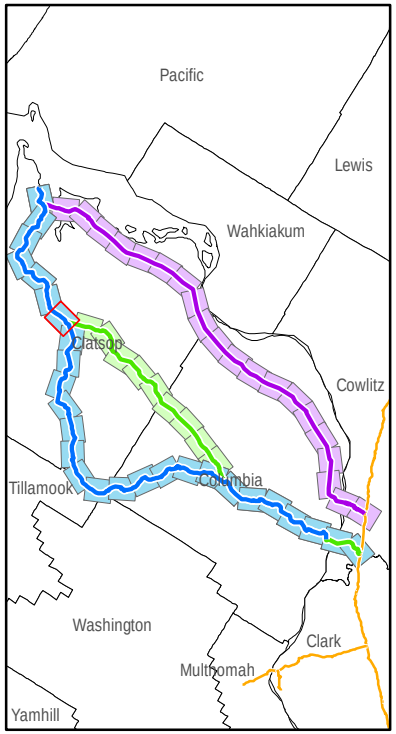

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Figure 2-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

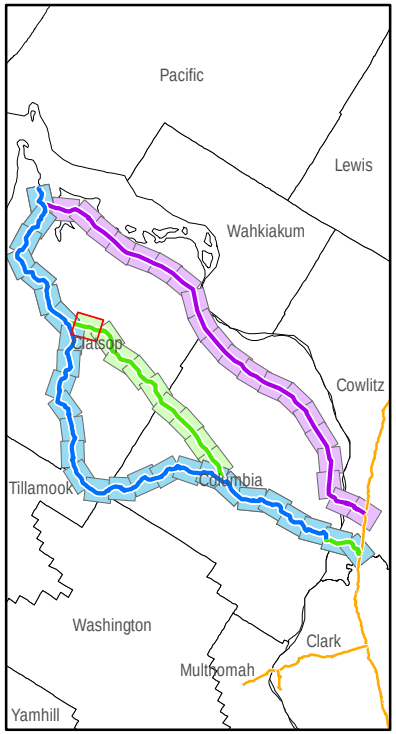

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Figure 2-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

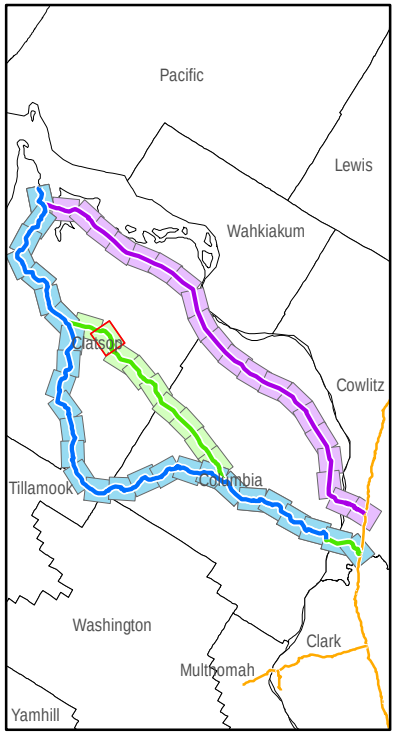

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Figure 2-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

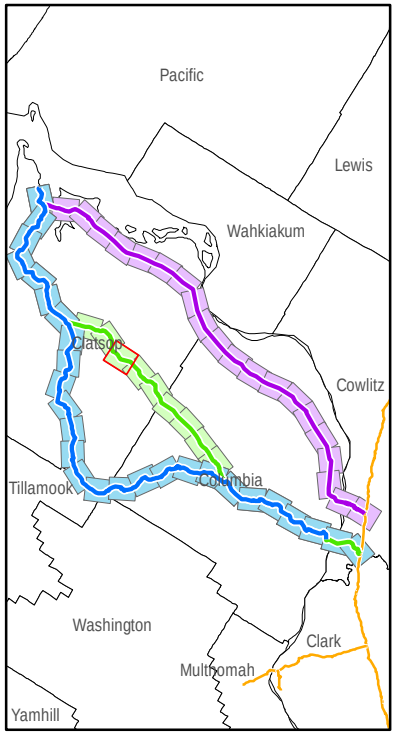

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Figure 2-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

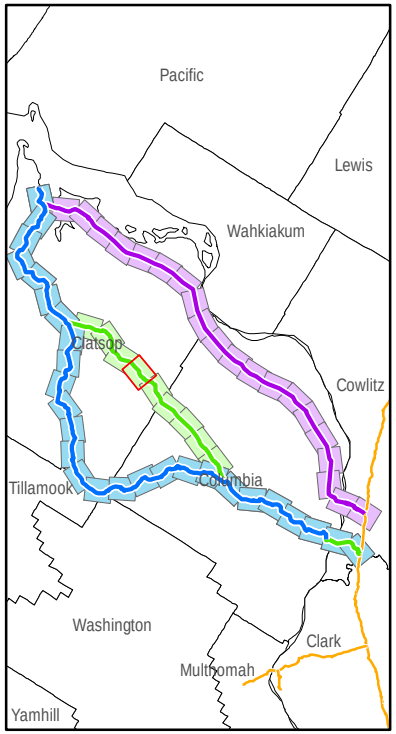

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Figure 2-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

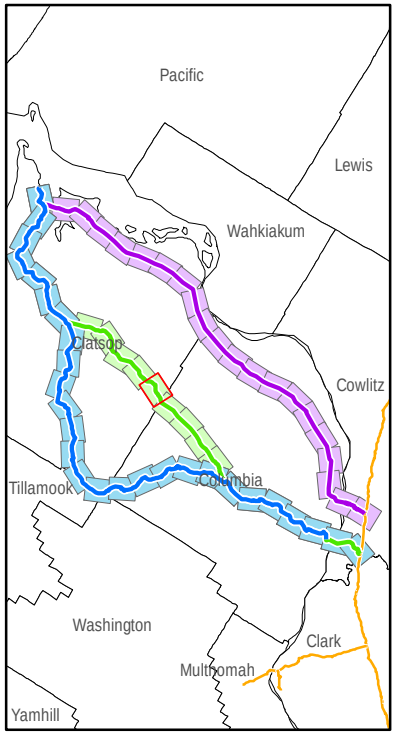

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Figure 2-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

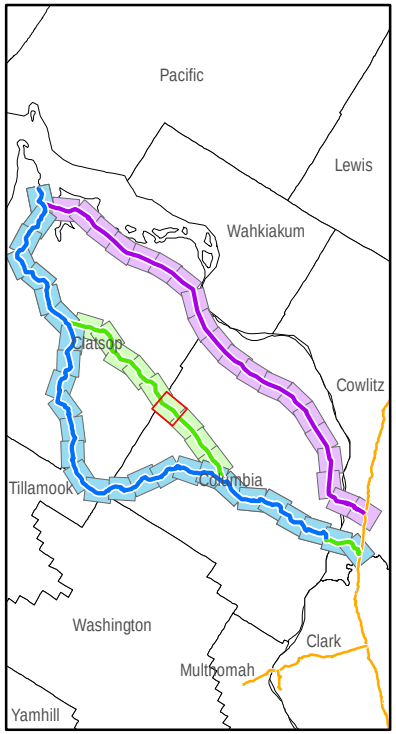

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Figure 2-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

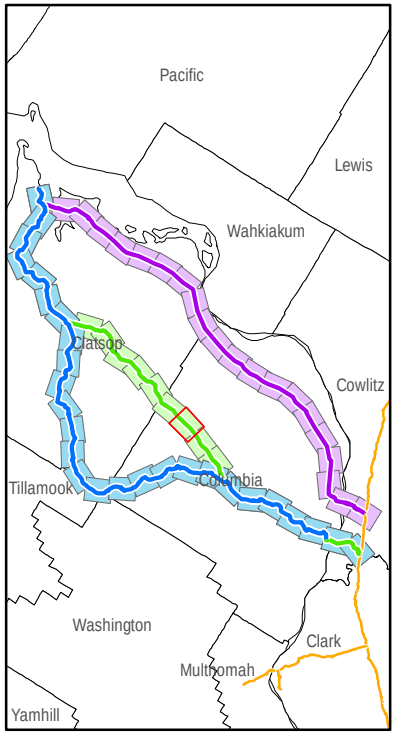

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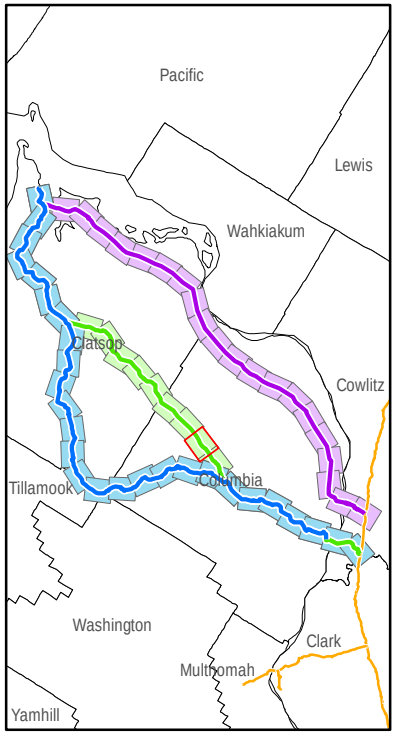
Figure 2-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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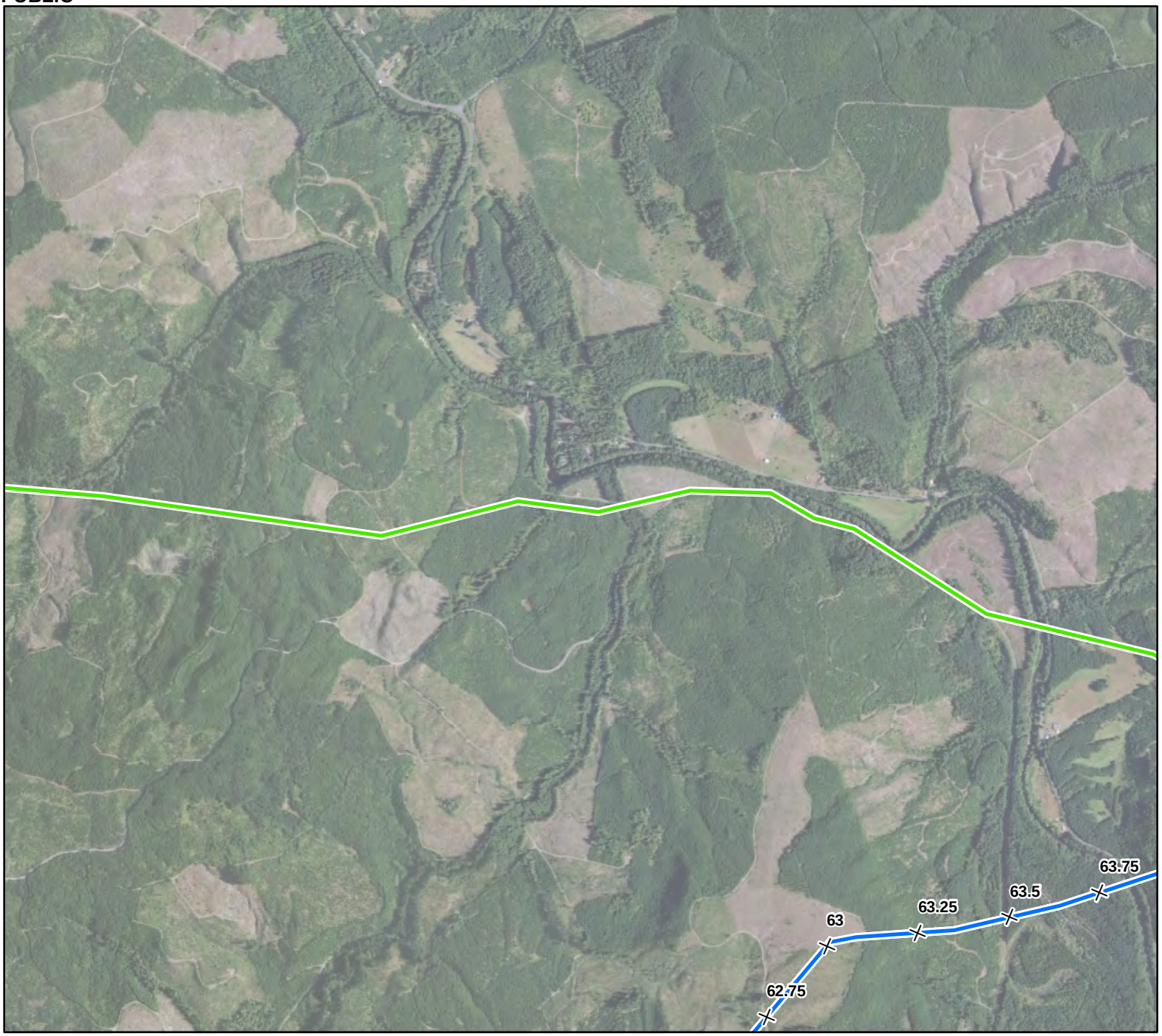

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Figure 2-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

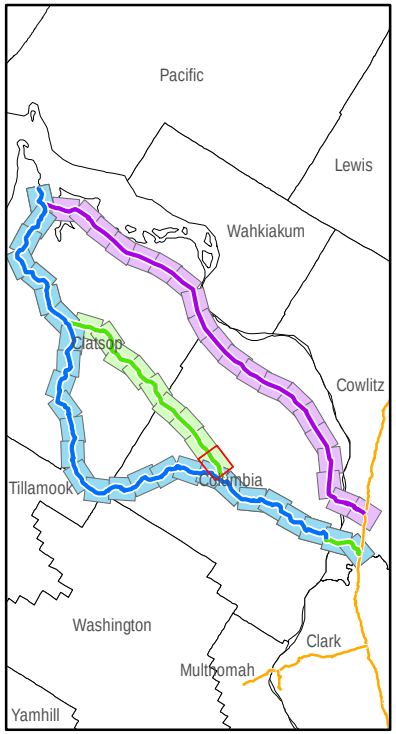

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Figure 2-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

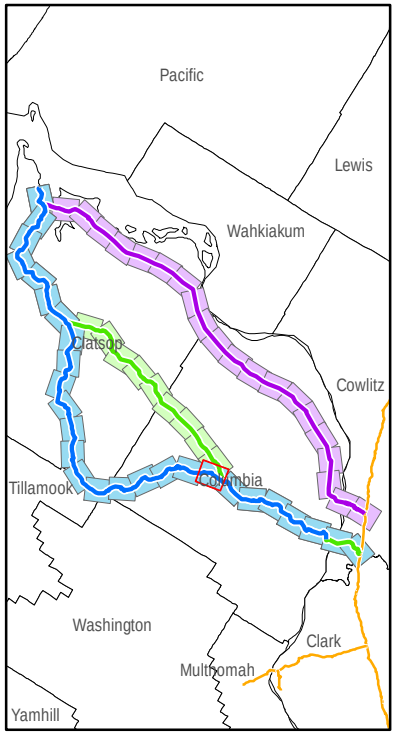

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Figure 2-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

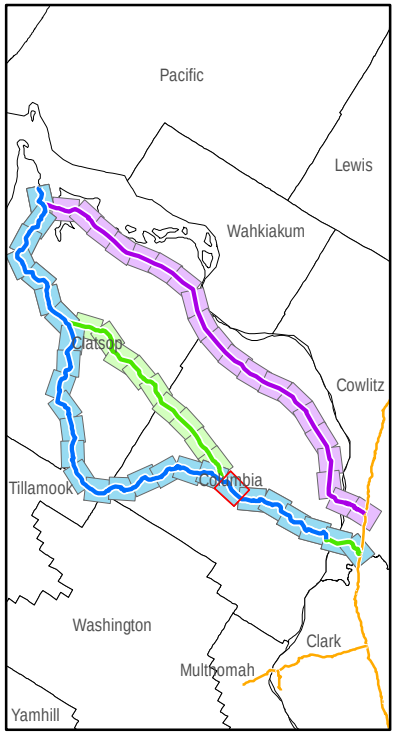

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Figure 2-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

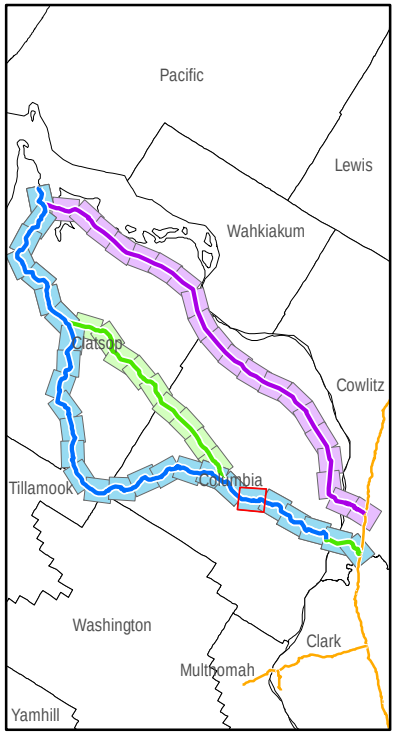

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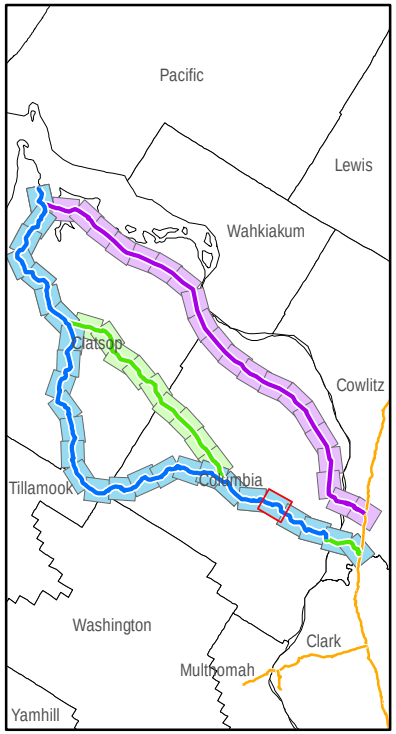
Figure 2-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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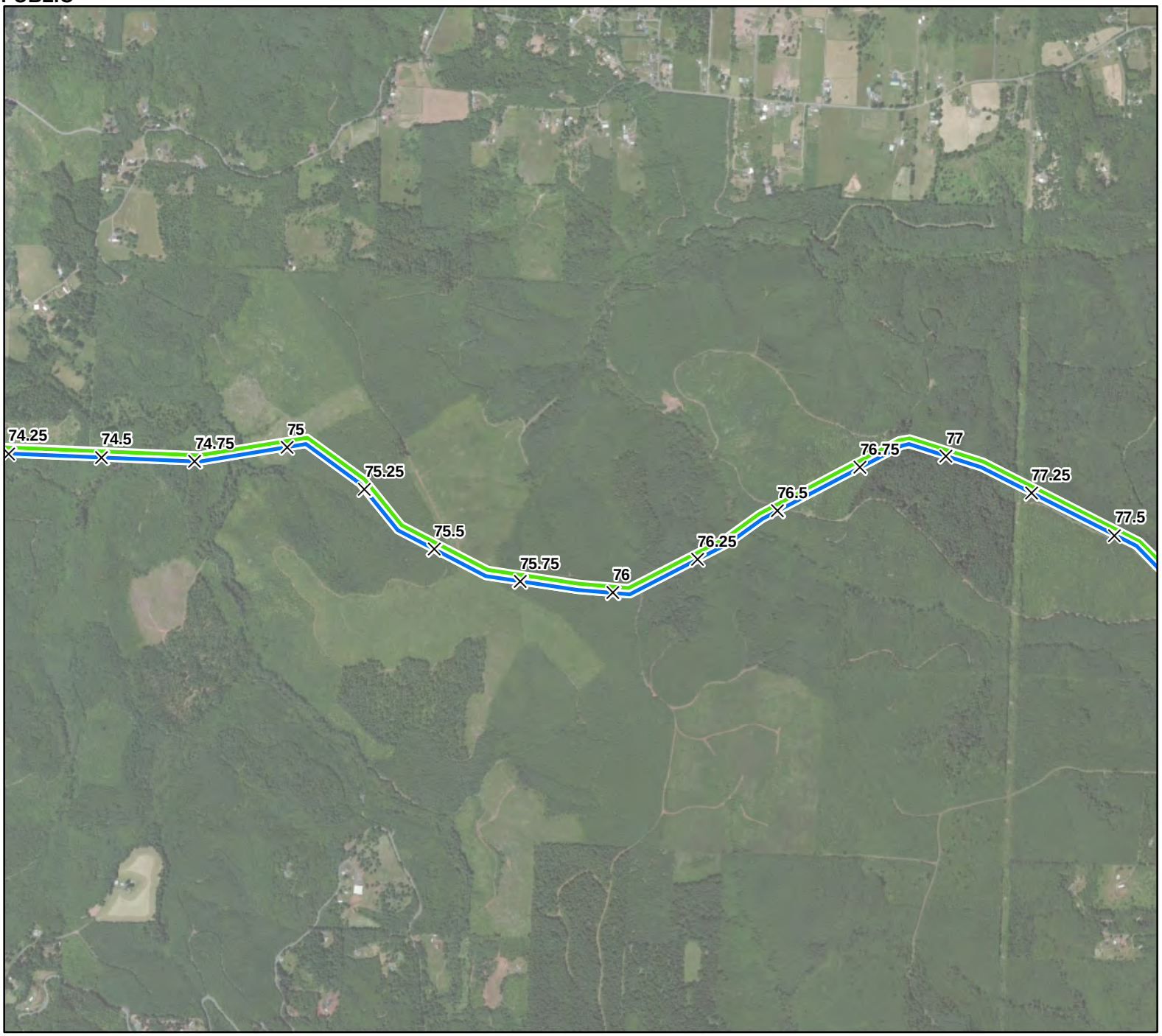

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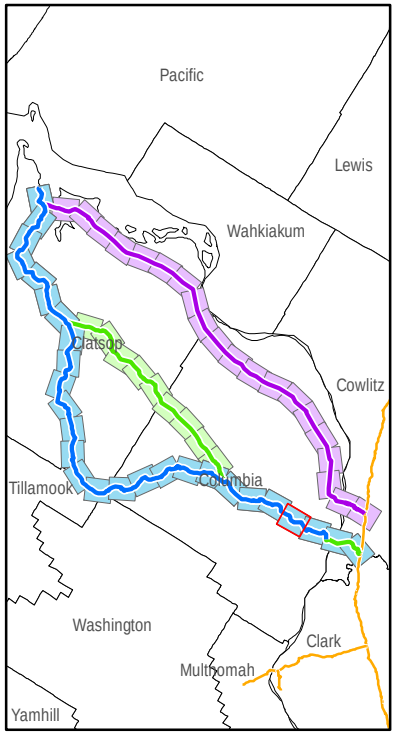
Figure 2-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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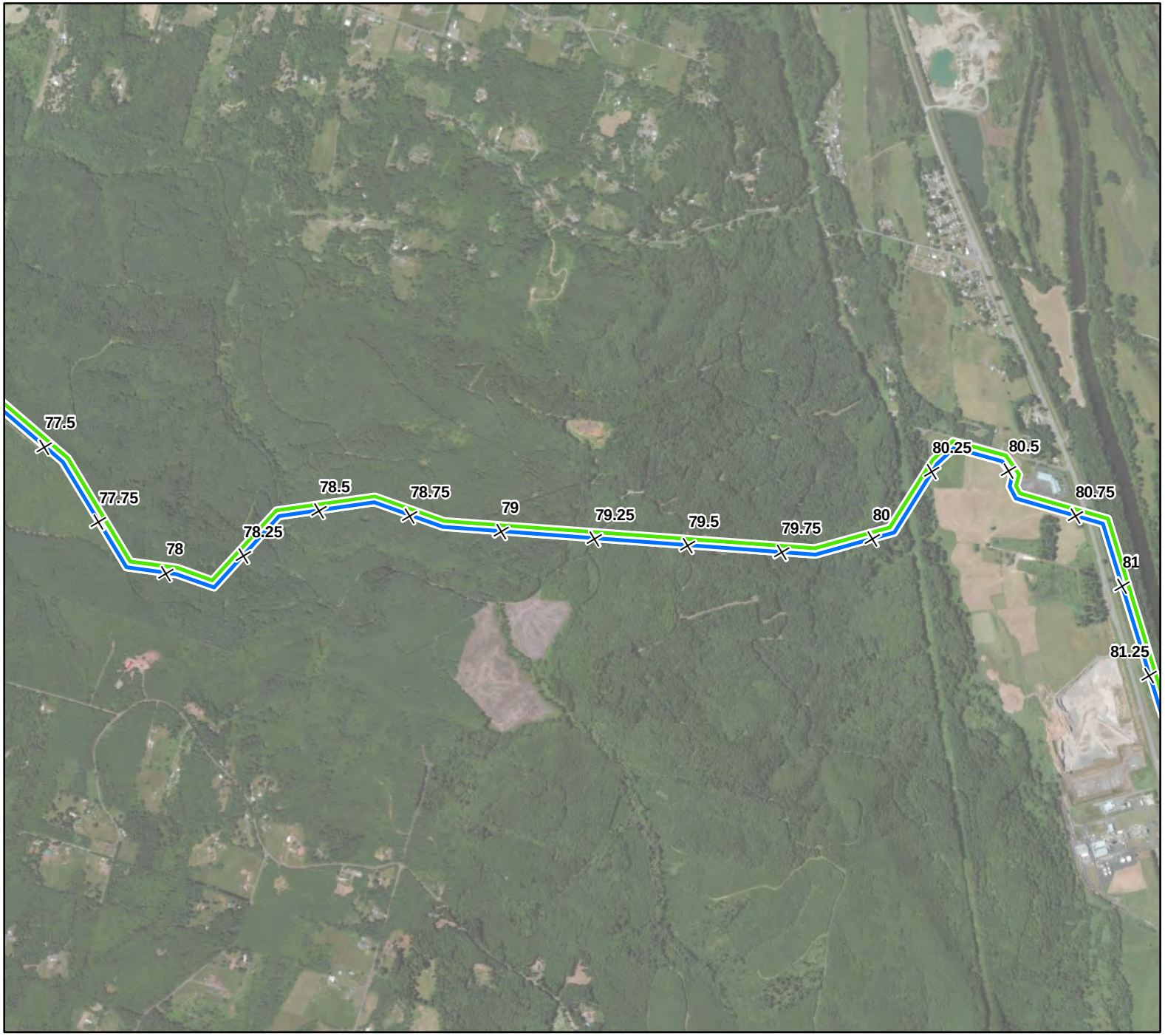

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Figure 2-22

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

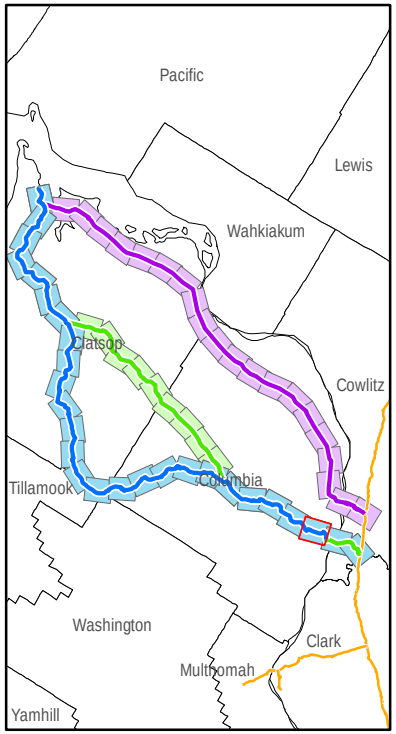

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Figure 2-23

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

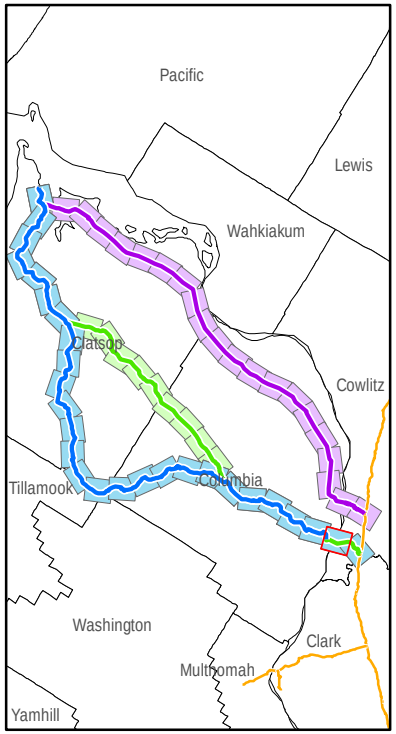

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Figure 2-24

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

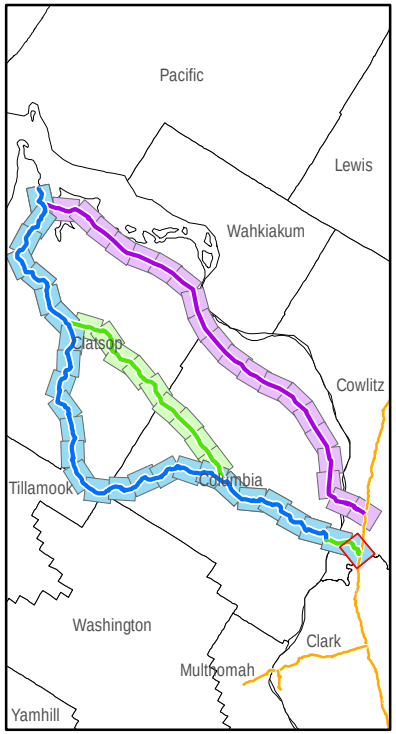

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Figure 3-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

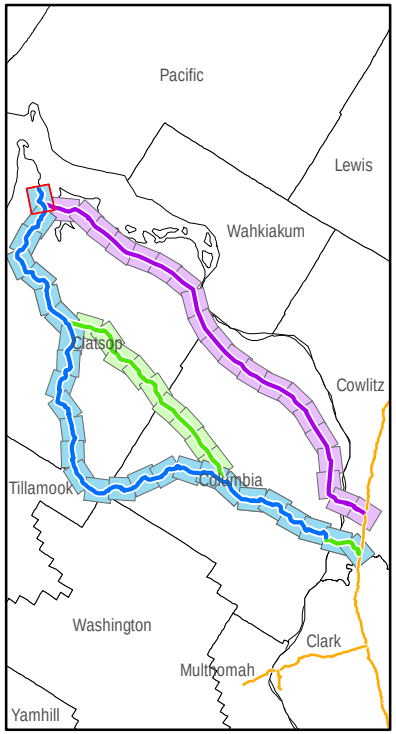

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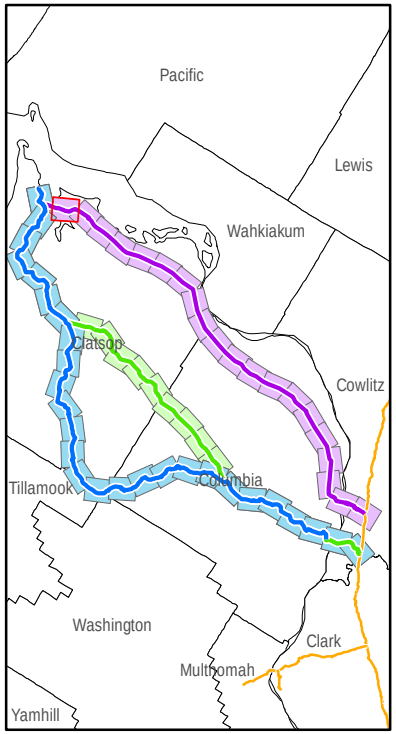
Figure 3-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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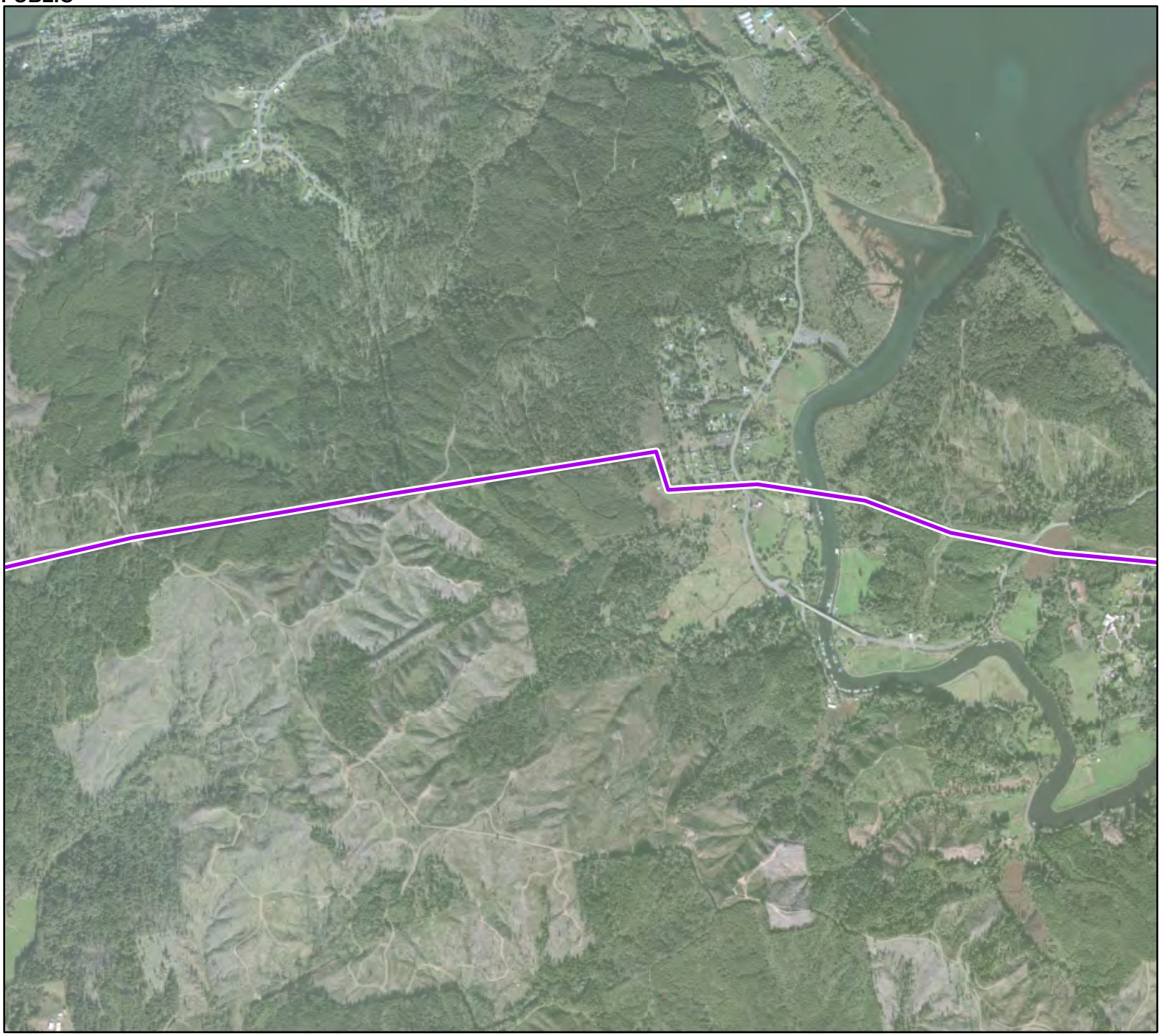


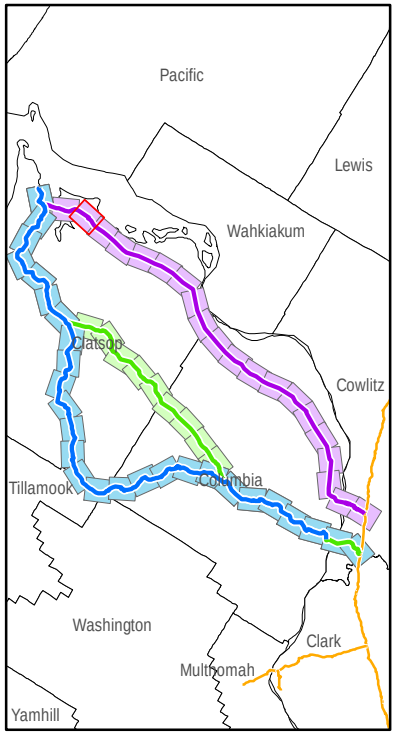
Appendix 10C

Figure 3-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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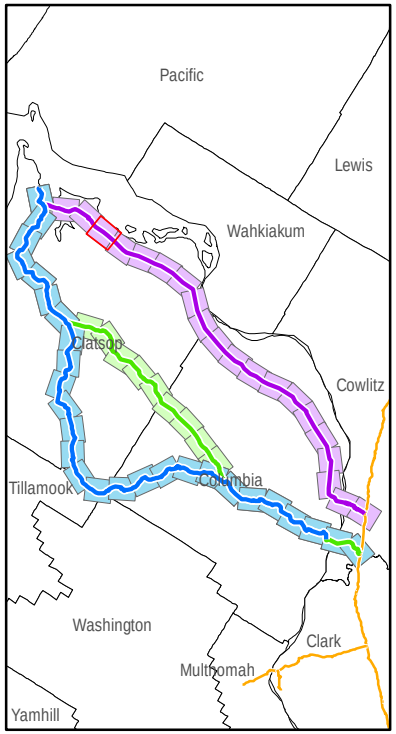
Appendix 10C

Figure 3-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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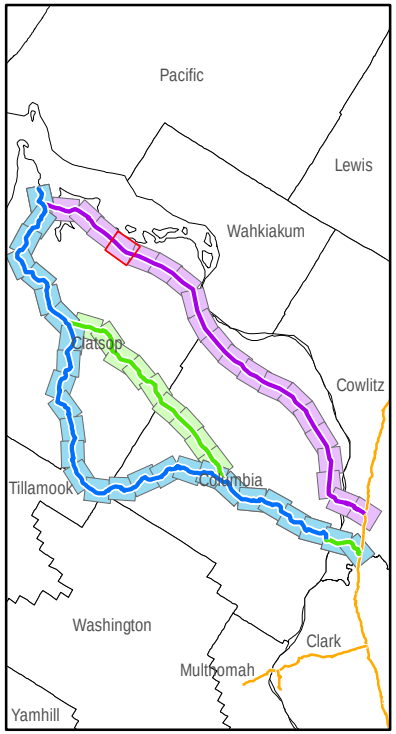
Appendix 10C

Figure 3-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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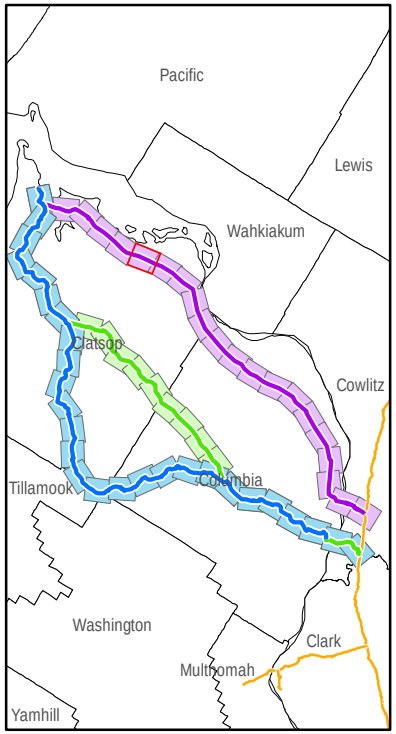
Appendix 10C

Figure 3-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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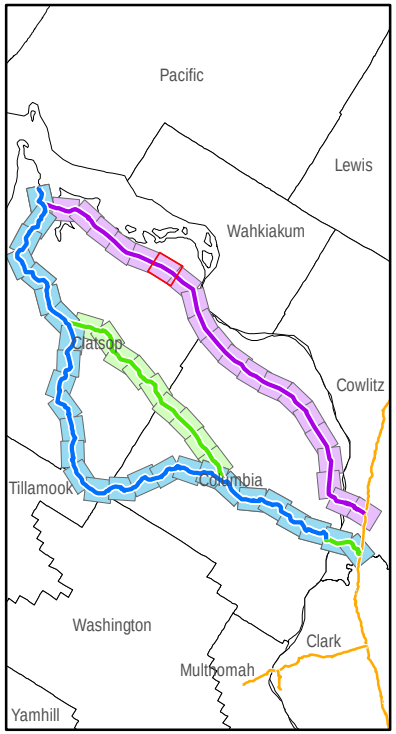
Appendix 10C

Figure 3-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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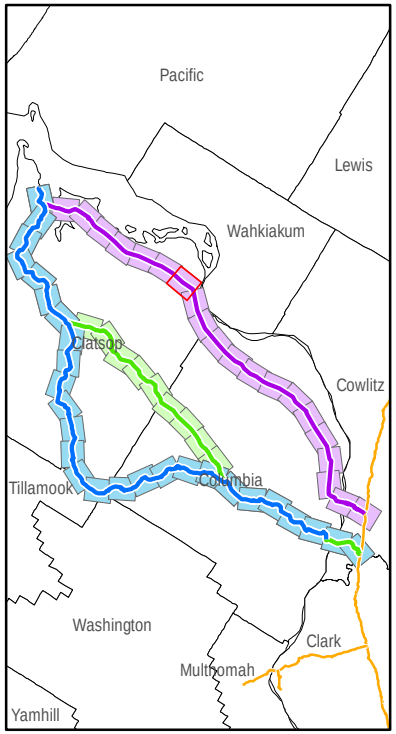
Appendix 10C

Figure 3-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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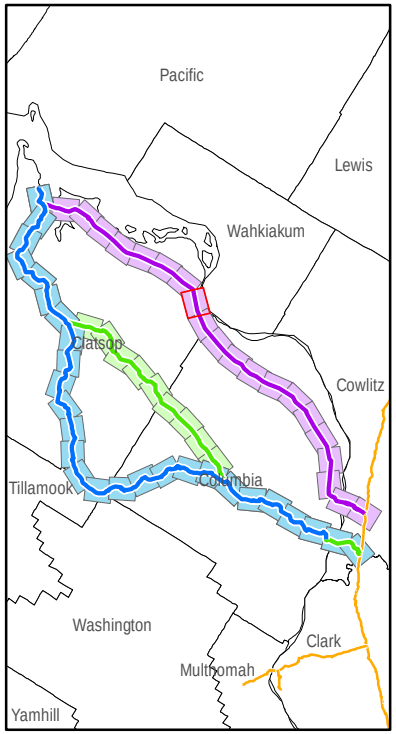
Appendix 10C

Figure 3-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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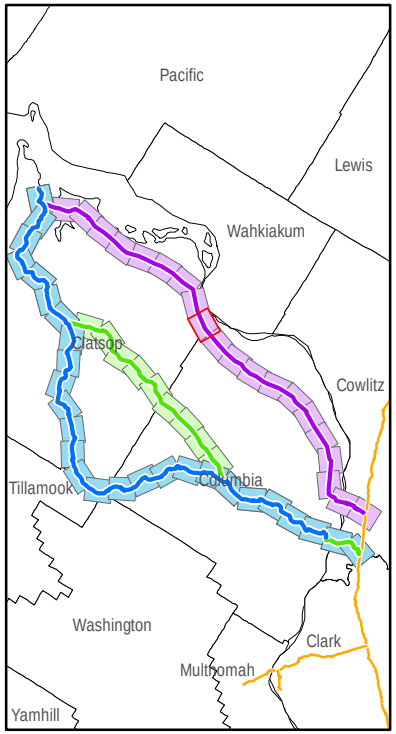
Appendix 10C

Figure 3-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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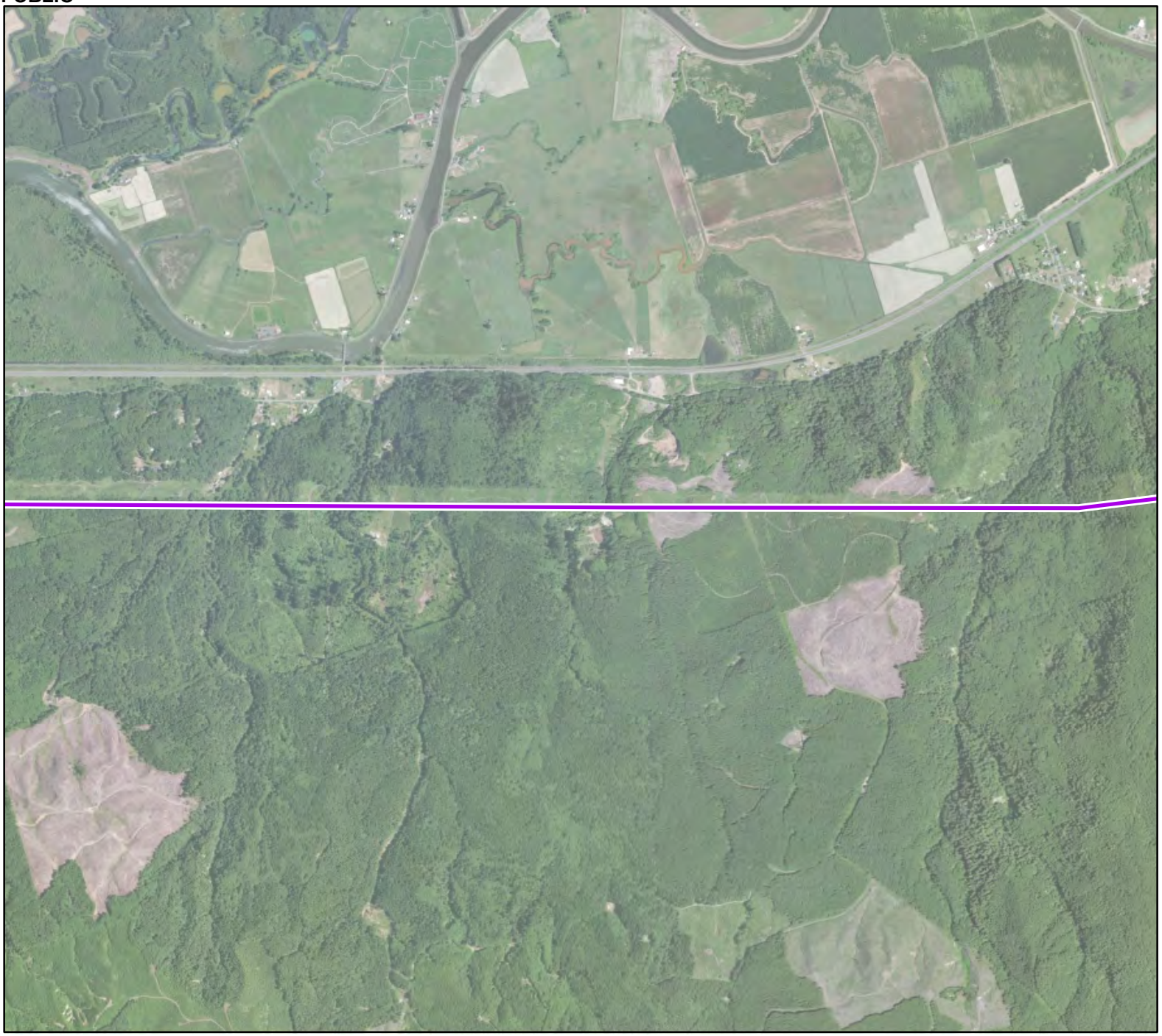


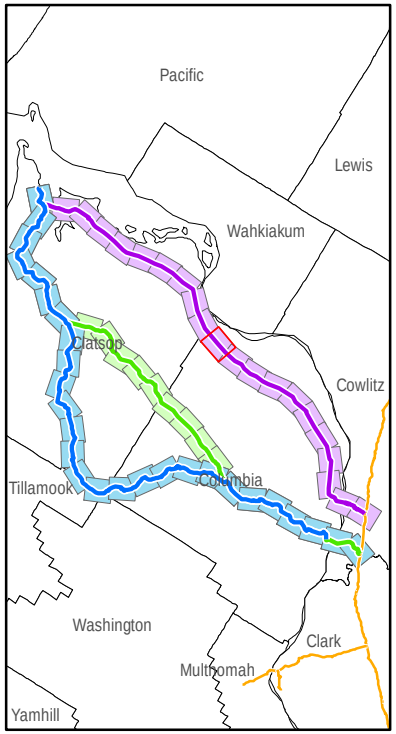
Appendix 10C

Figure 3-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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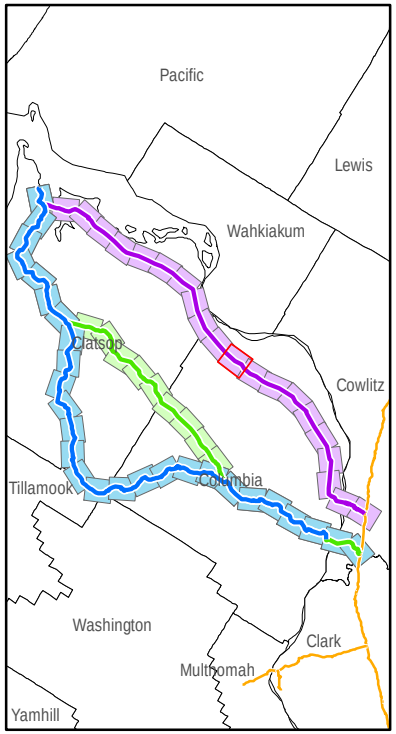
Appendix 10C

Figure 3-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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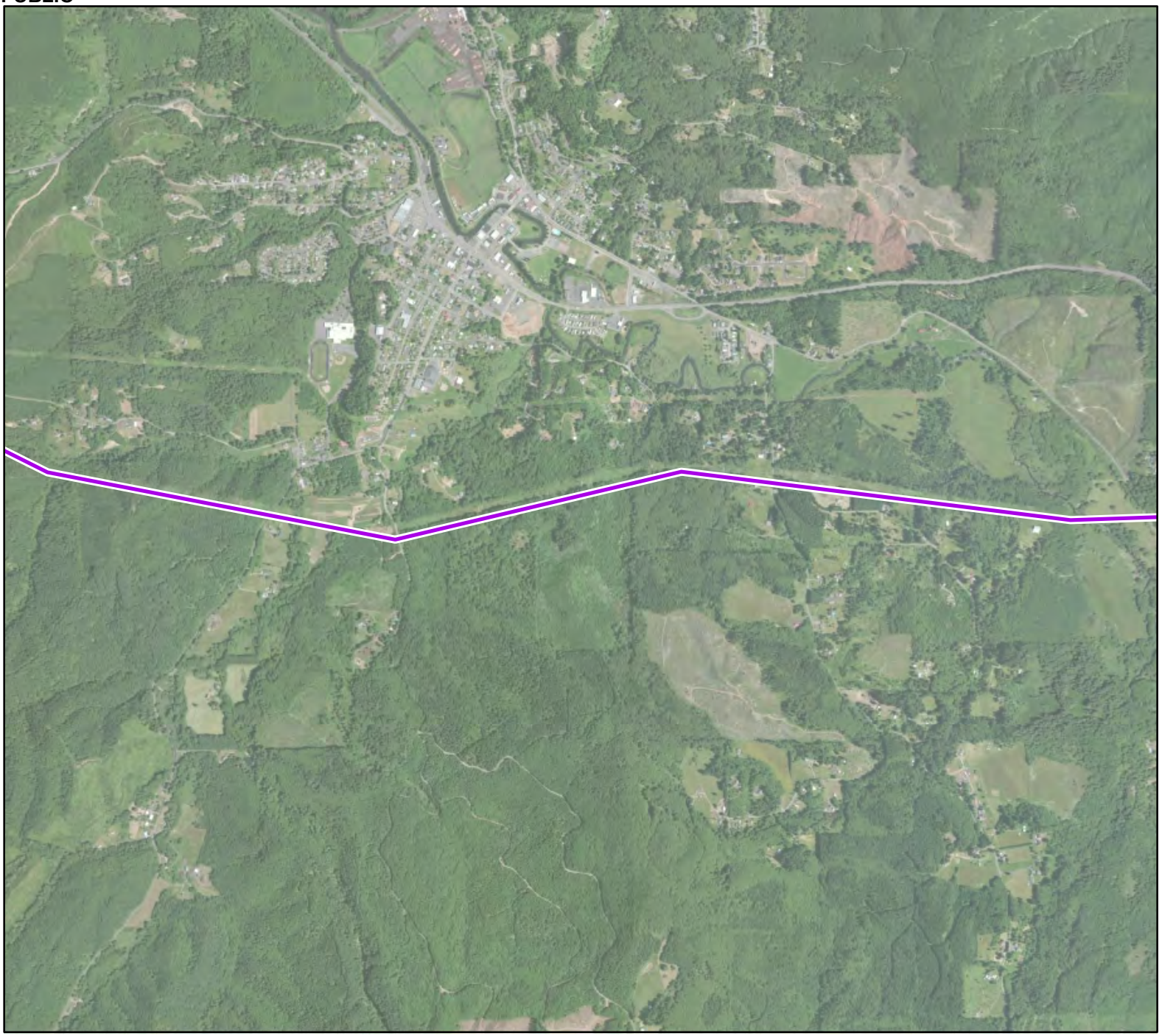


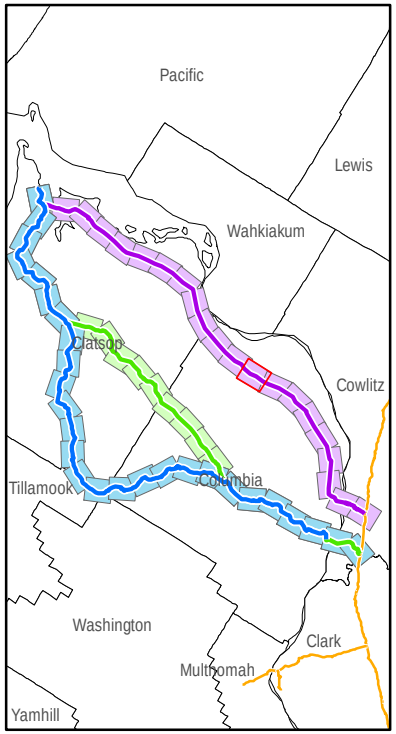
Appendix 10C

Figure 3-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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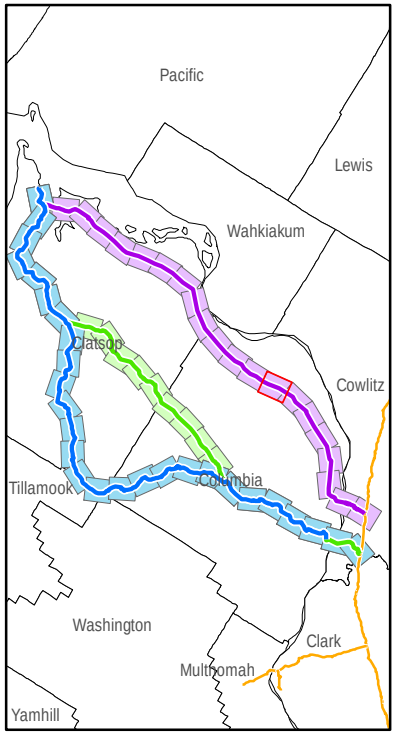
Appendix 10C

Figure 3-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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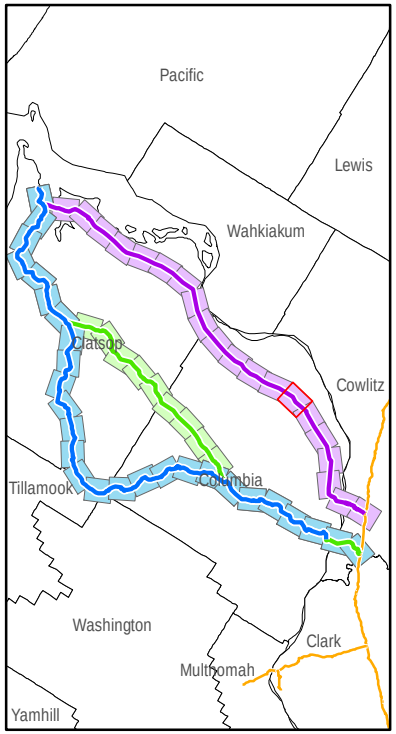
Appendix 10C

Figure 3-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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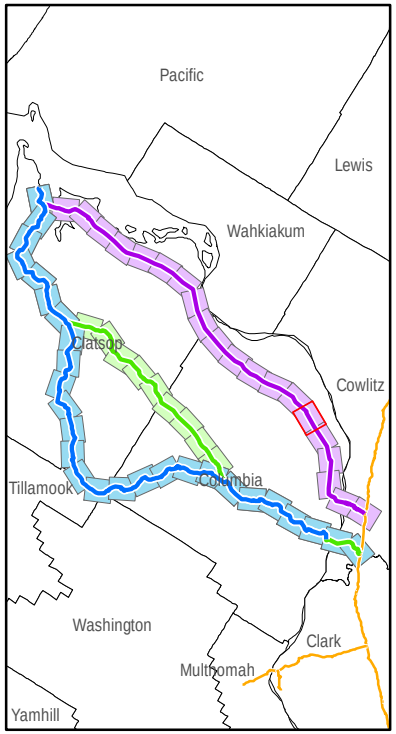
Appendix 10C

Figure 3-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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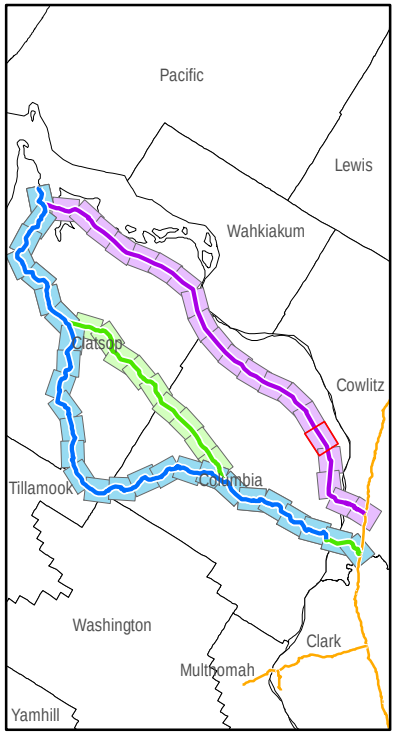
Appendix 10C

Figure 3-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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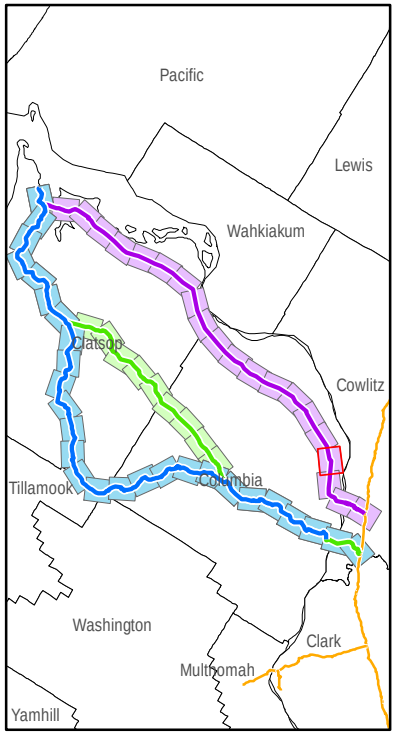
Appendix 10C

Figure 3-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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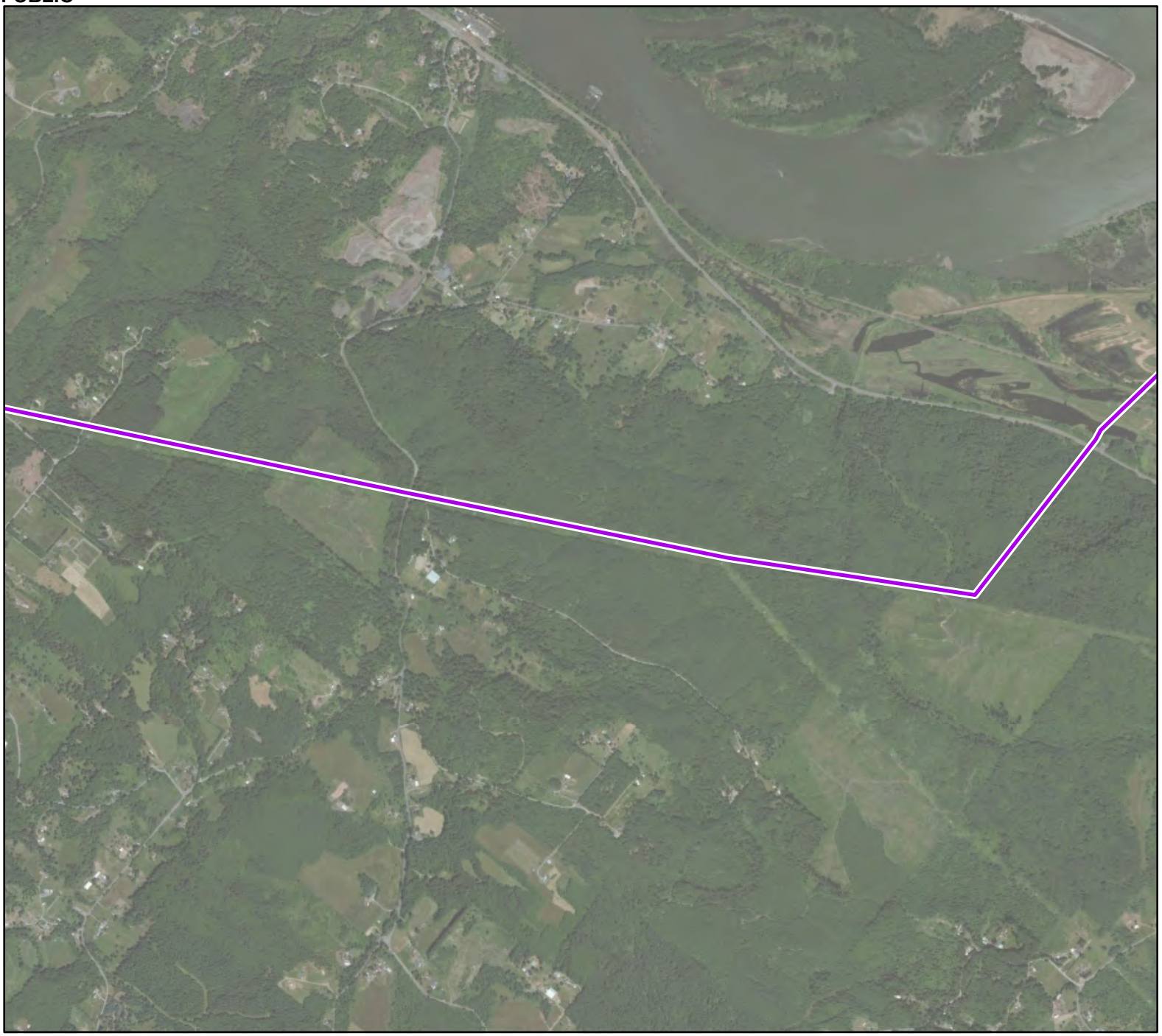


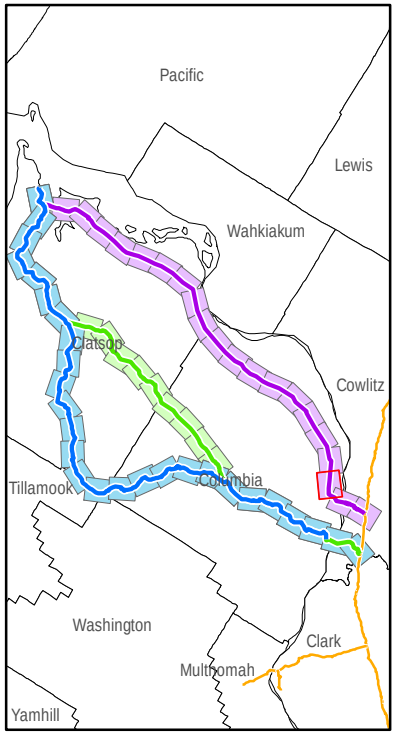
Appendix 10C

Figure 3-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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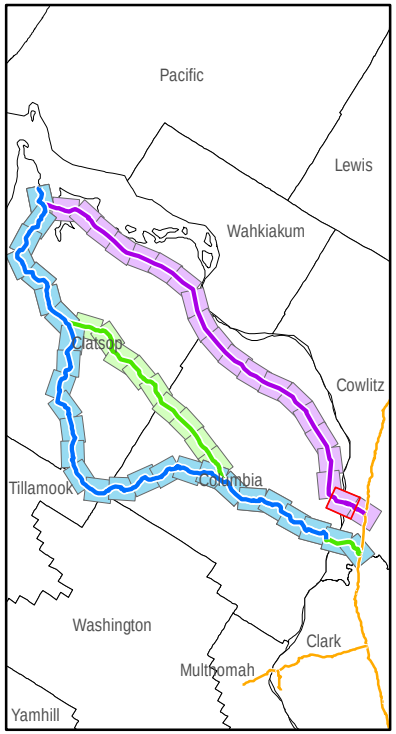
Appendix 10C

Figure 3-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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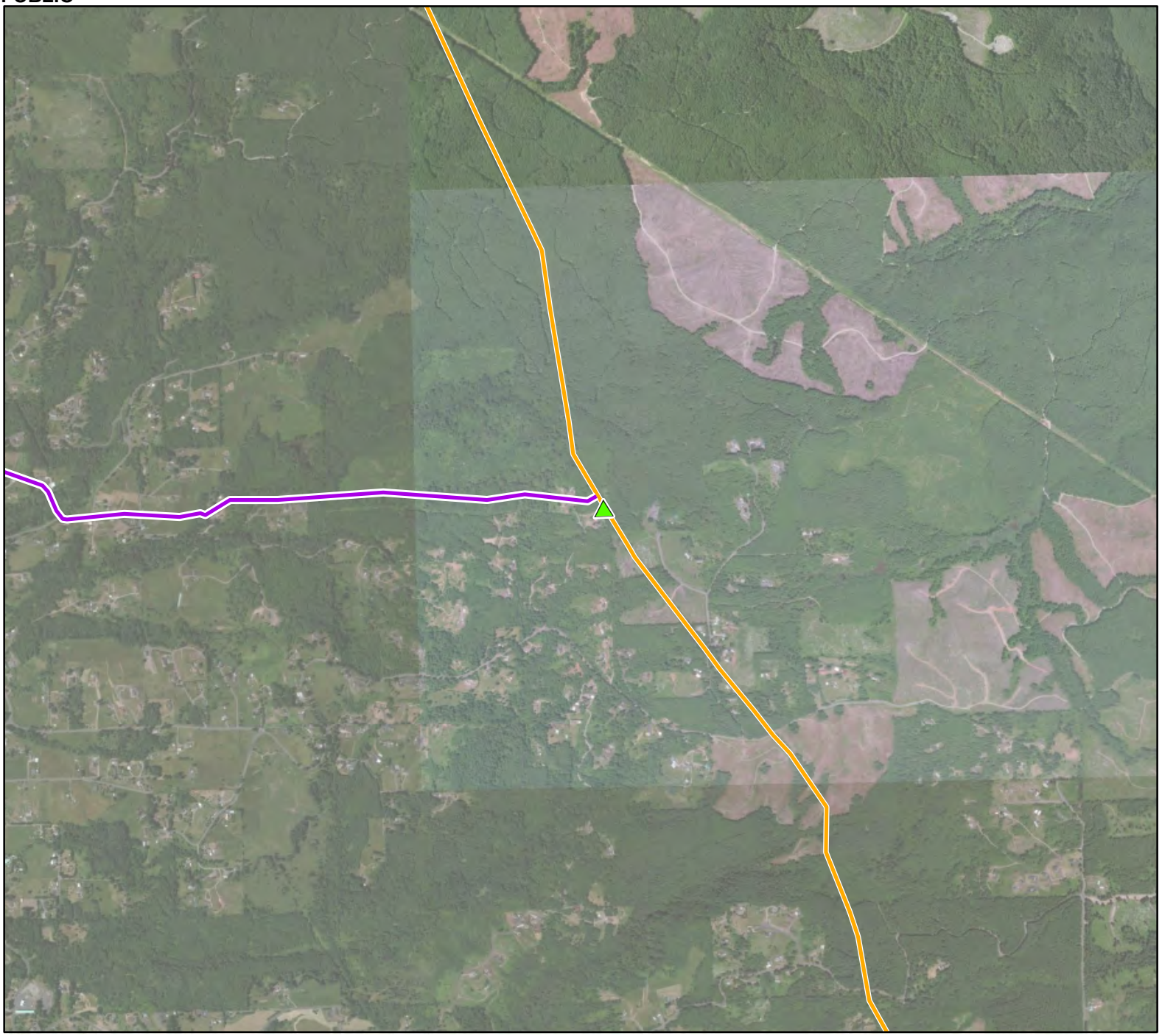


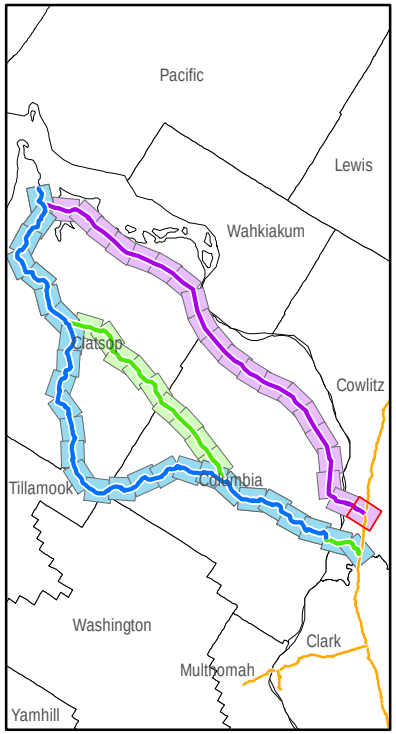
Appendix 10C

Figure 3-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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Appendix 10D
Major Pipeline Route Alternatives
[on USGS Topographic Maps]

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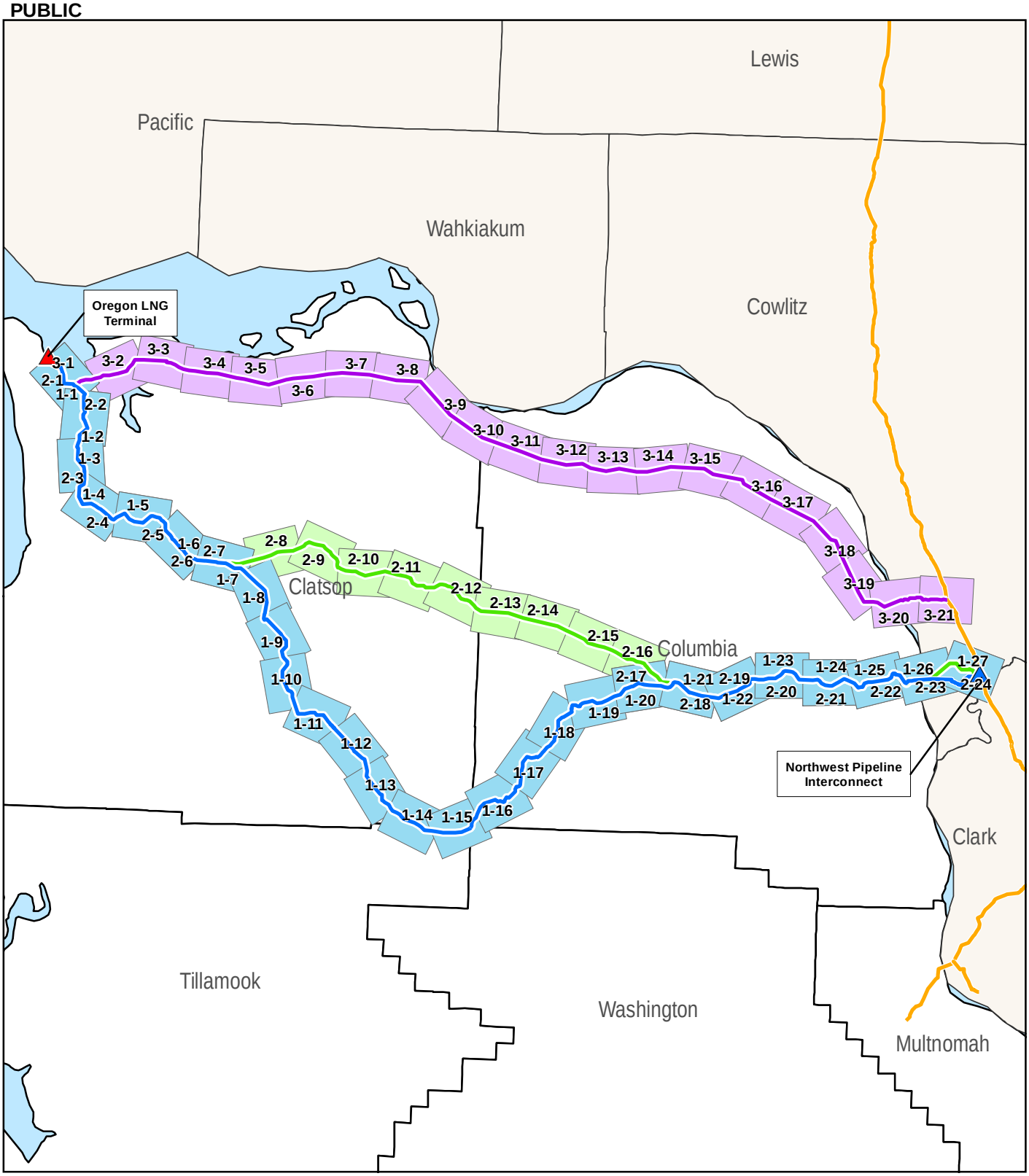

Legend

- Northwest Pipeline Interconnect
- Oregon LNG Terminal - Warrenton, Oregon
- sde_OregonLNG_PDX.DBO.Preferred_Pipeline_Route
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline
- Proposed Pipeline Route
- Alternative 1
- Alternative 2

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Appendix 10D

Major Pipeline Route Alternatives - Topographic

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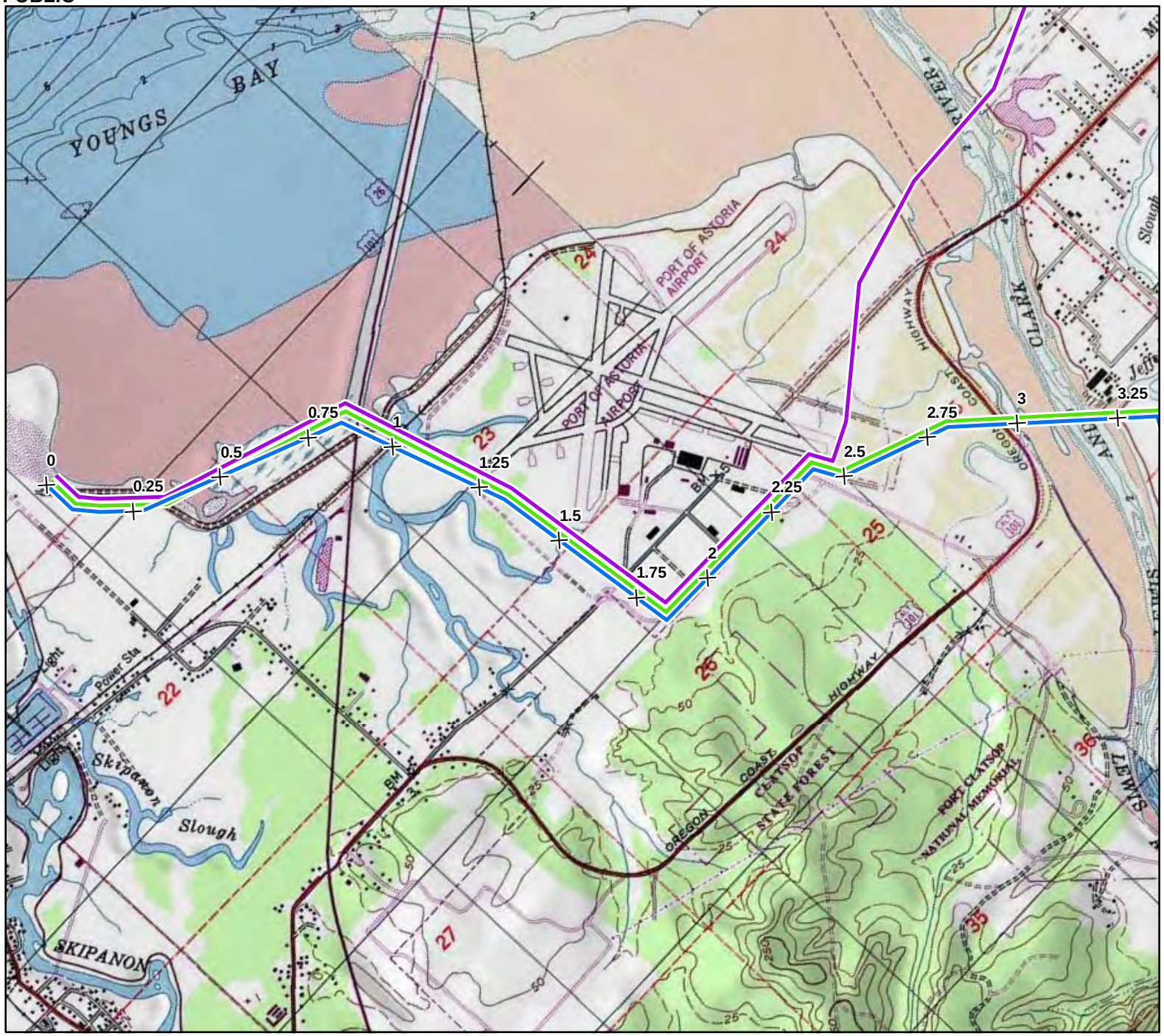


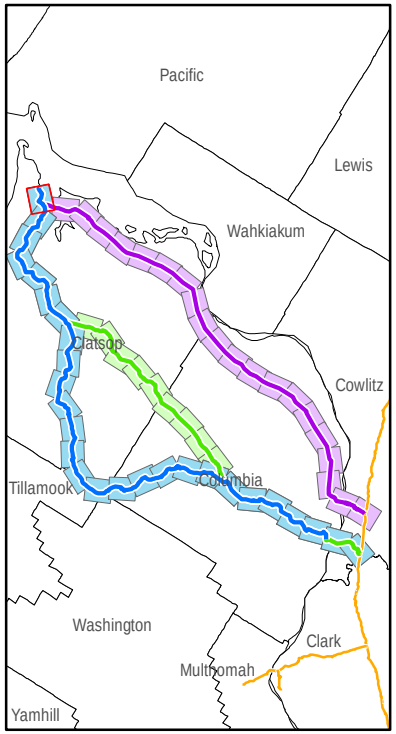
Appendix 10D

Figure 1-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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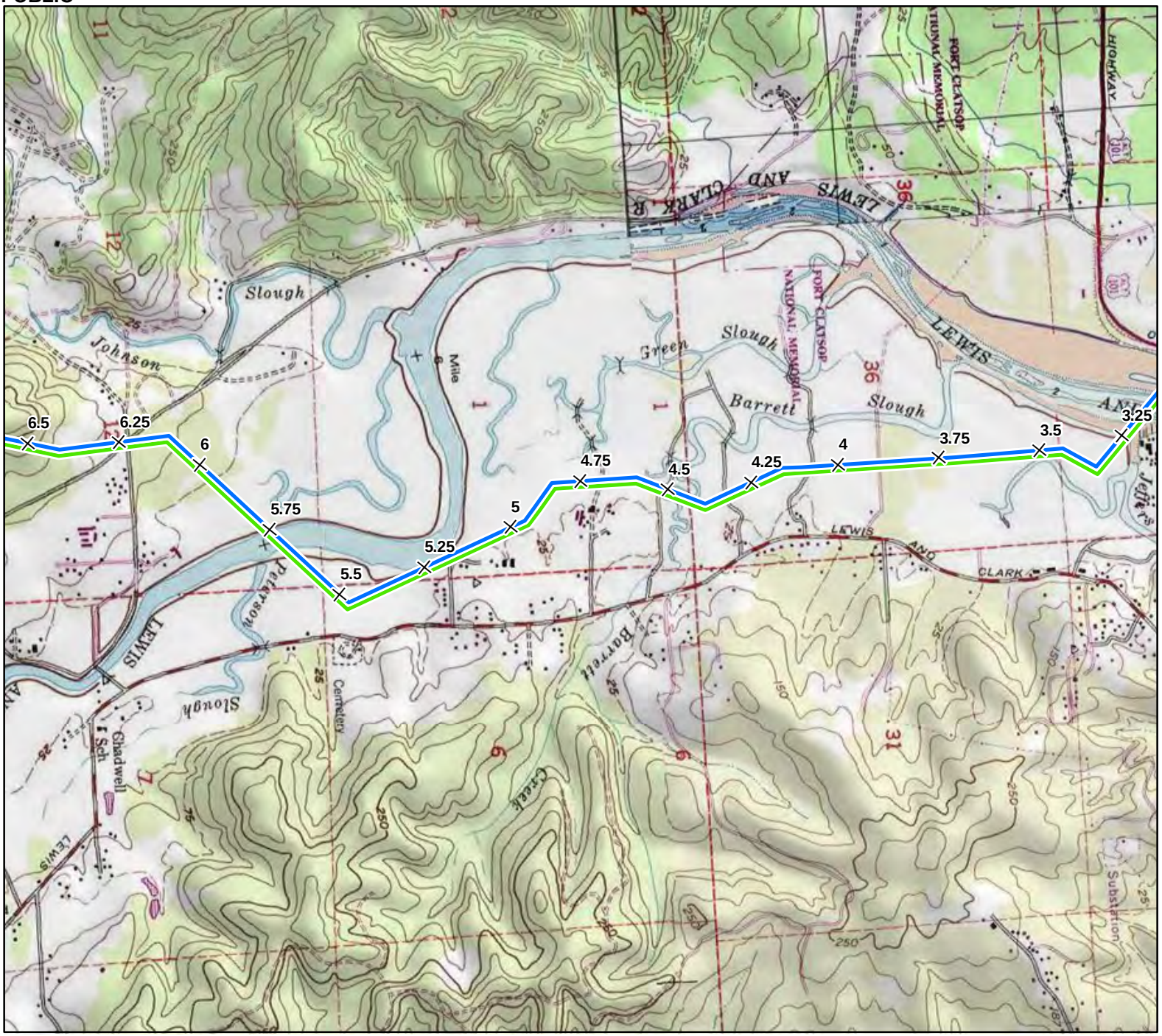

Appendix 10D

Figure 1-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

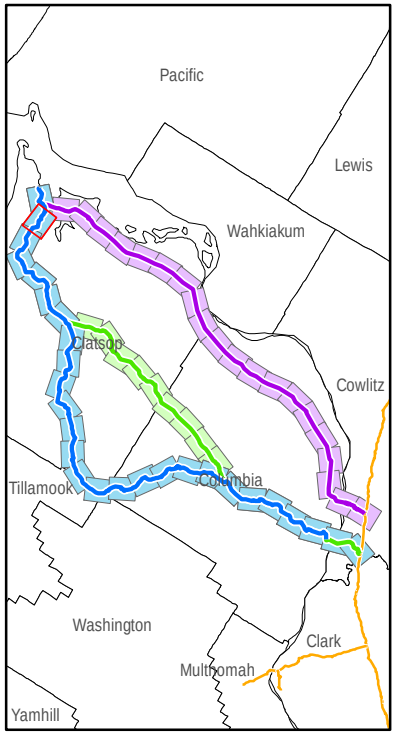

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Figure 1-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

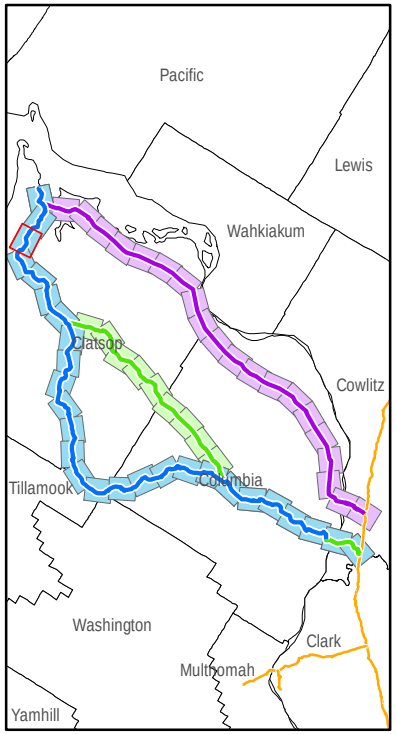

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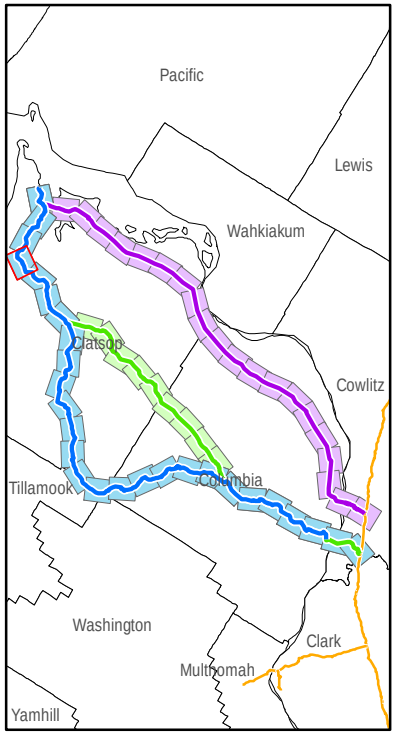
Figure 1-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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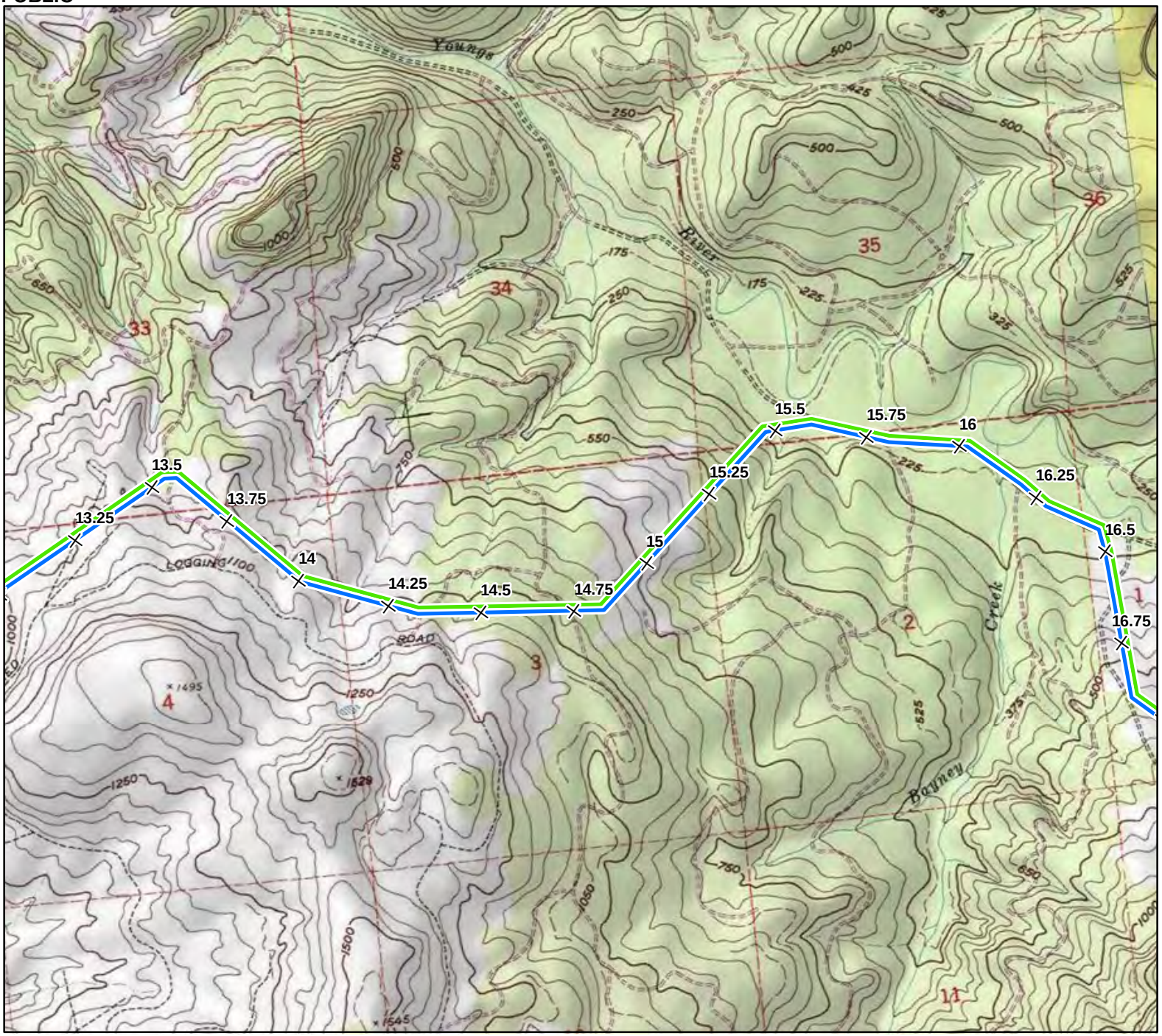


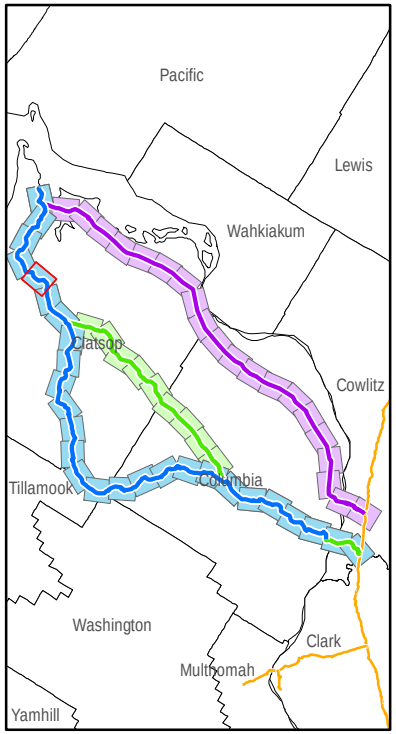
Appendix 10D

Figure 1-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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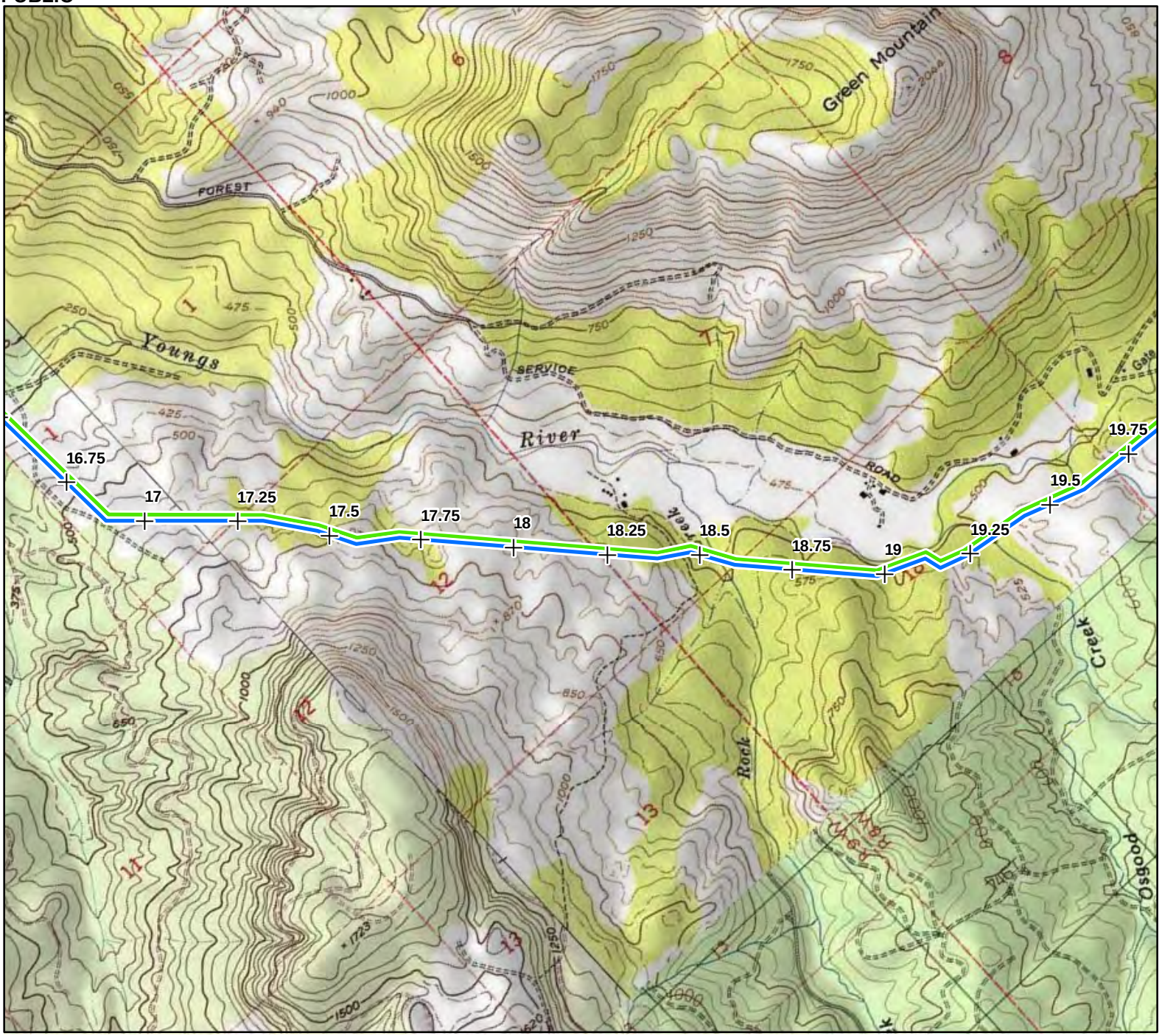

Appendix 10D

Figure 1-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

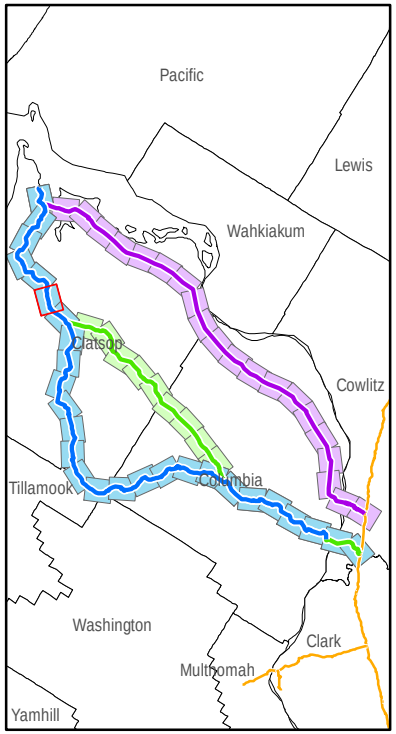

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Figure 1-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

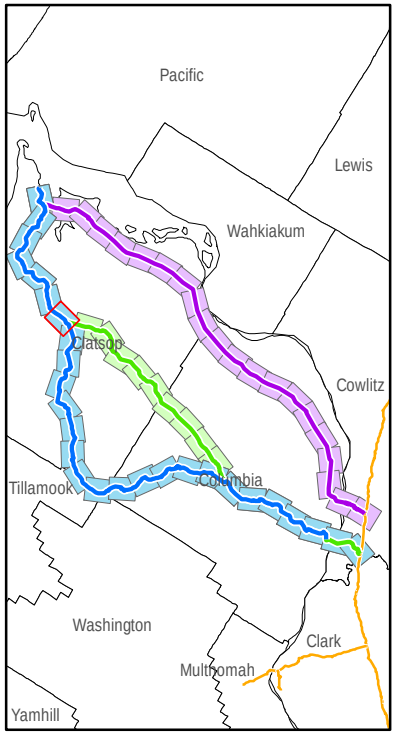

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Figure 1-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

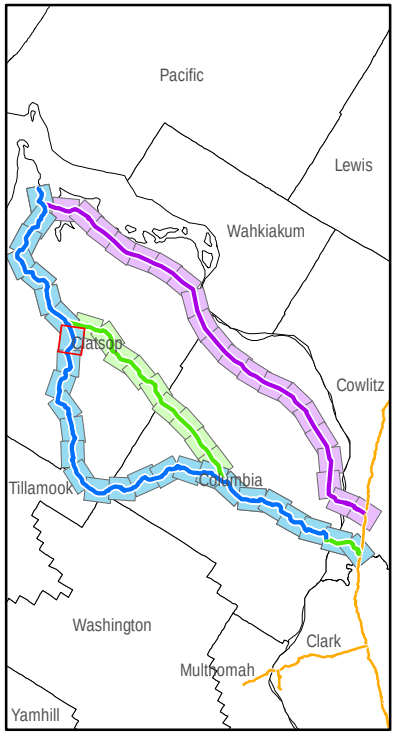

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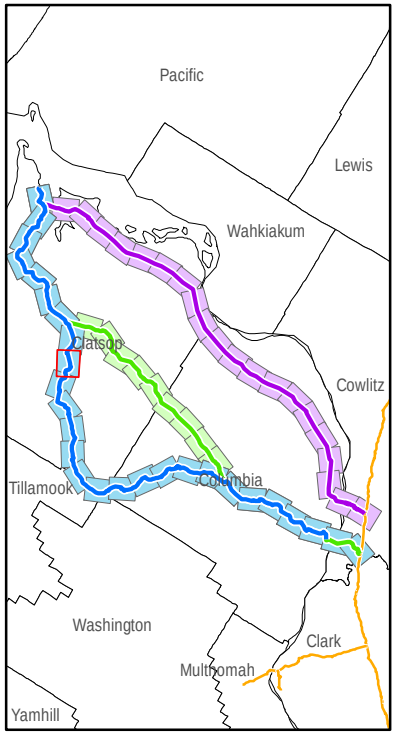
Figure 1-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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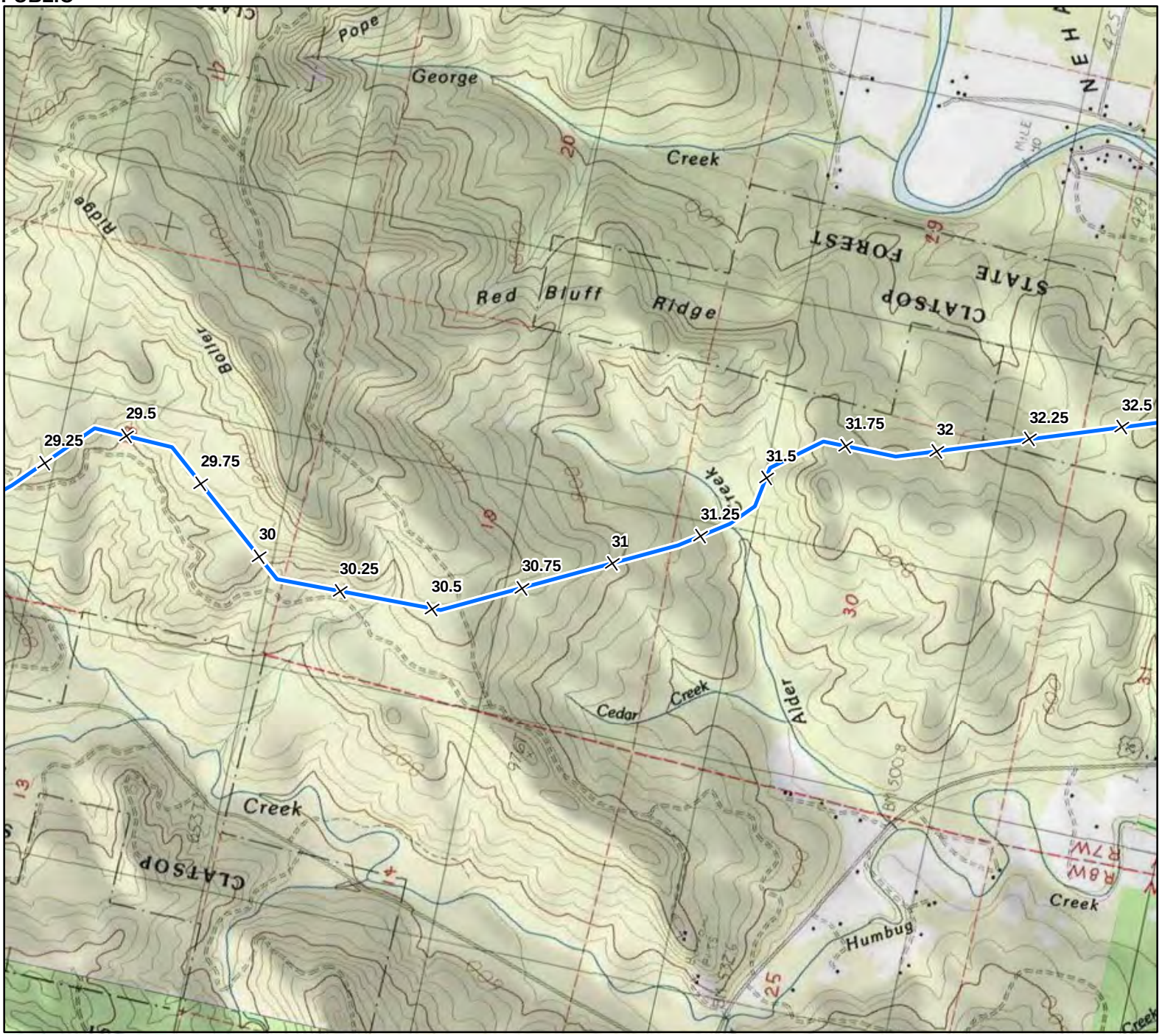

Appendix 10D

Figure 1-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

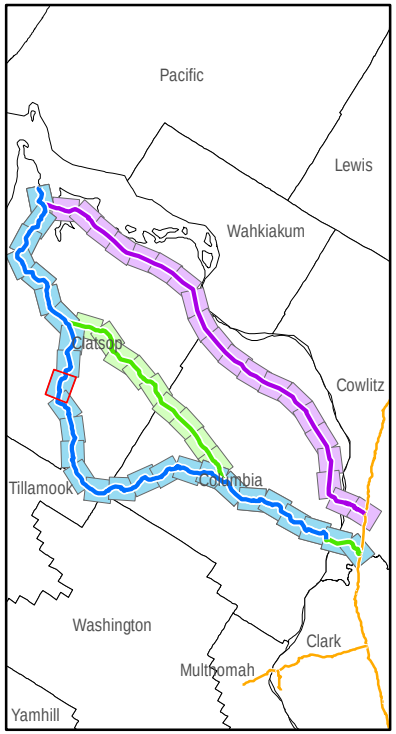

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Figure 1-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

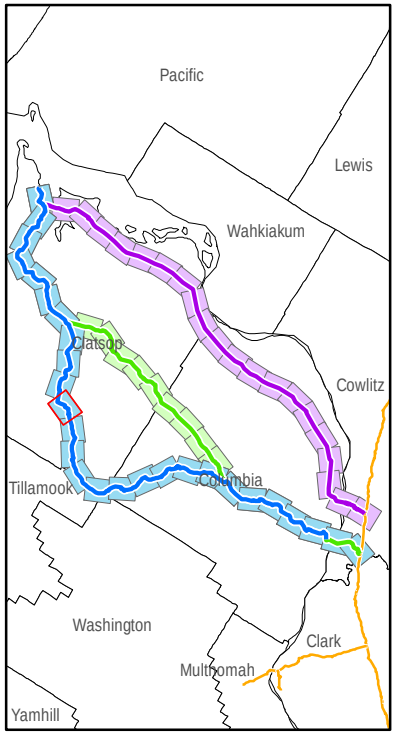

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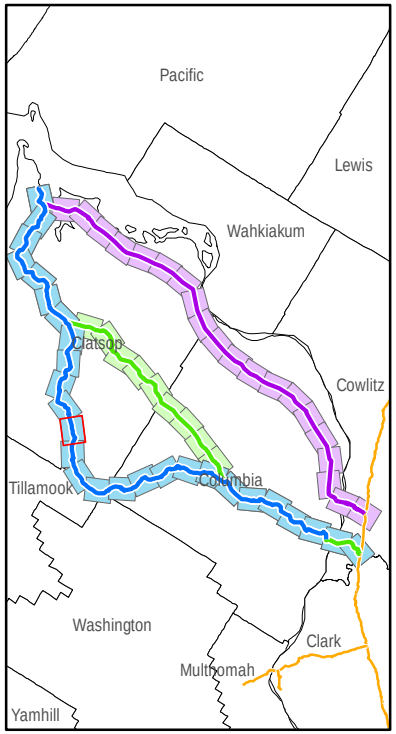
Figure 1-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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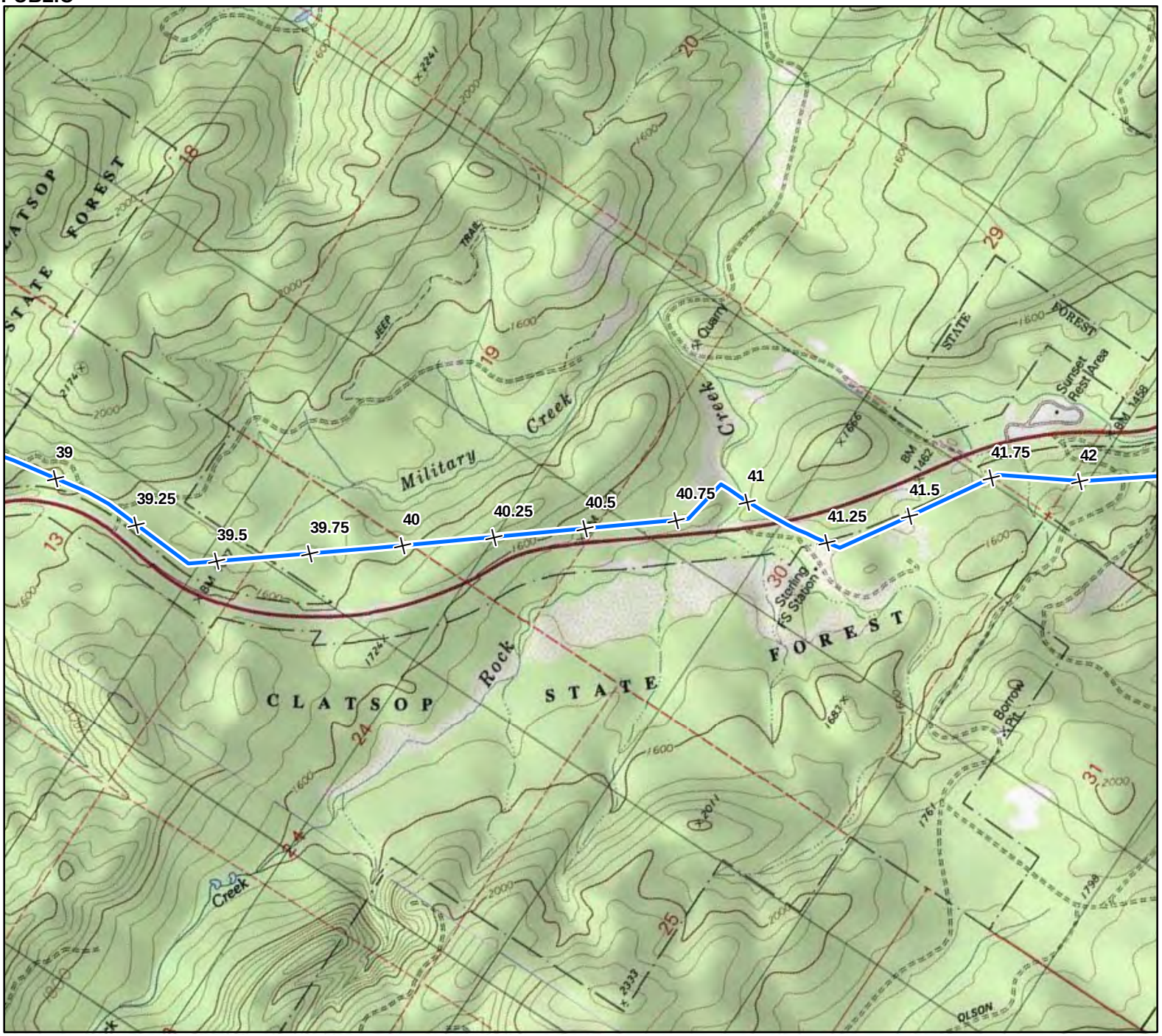


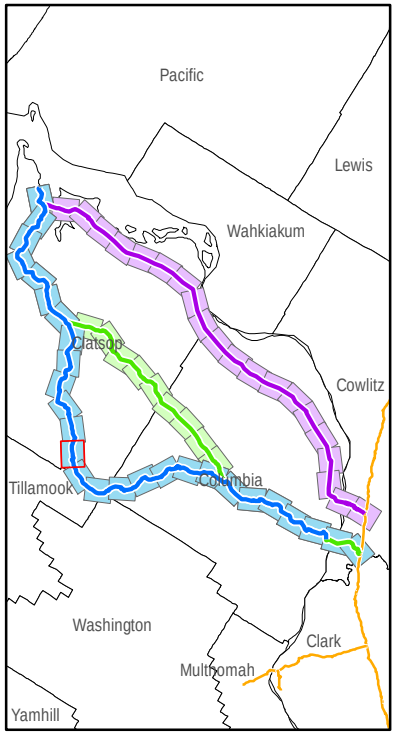
Appendix 10D

Figure 1-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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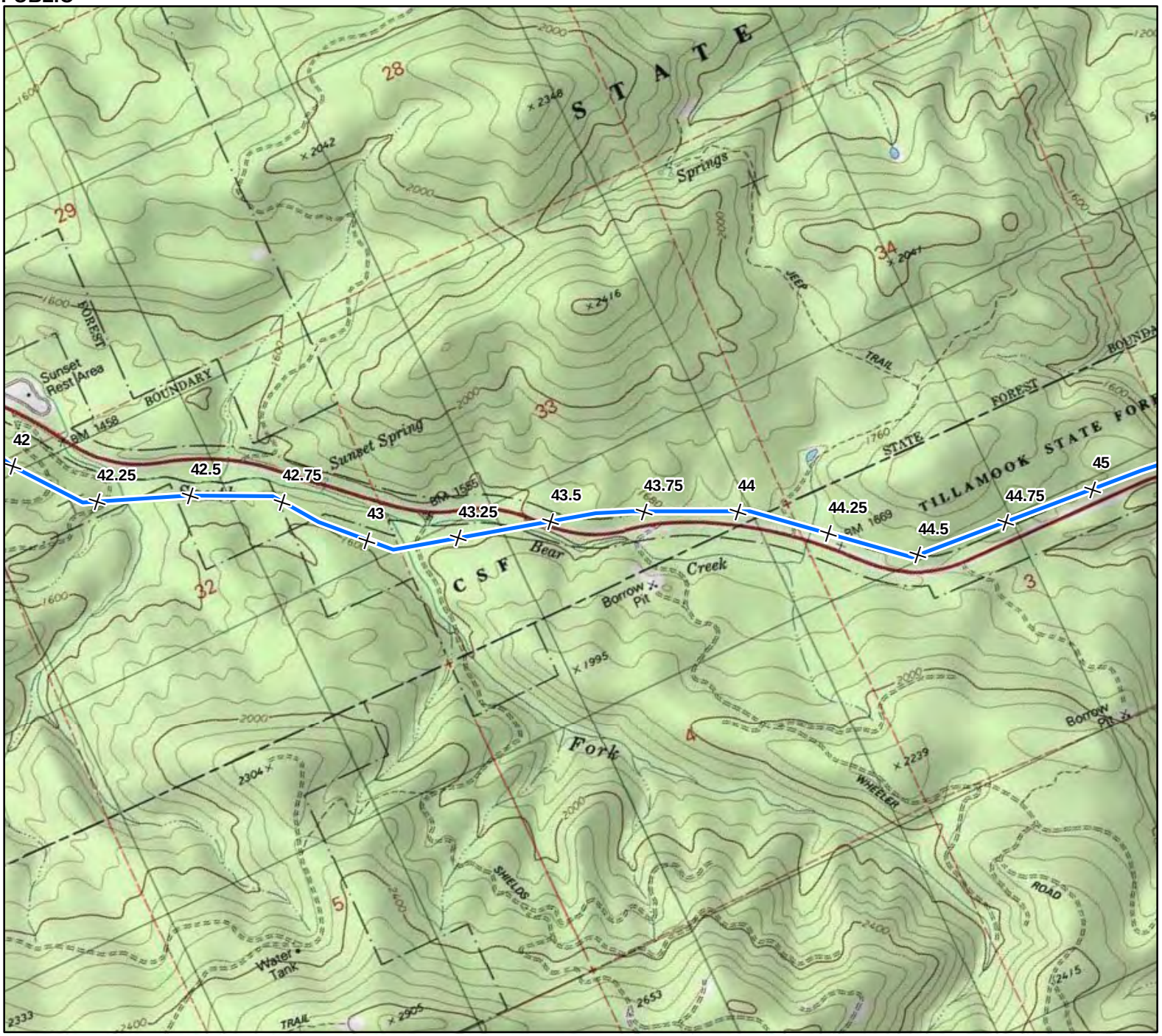


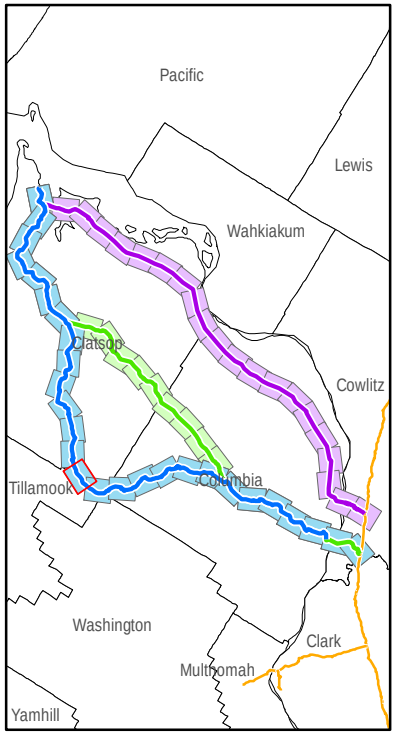
Appendix 10D

Figure 1-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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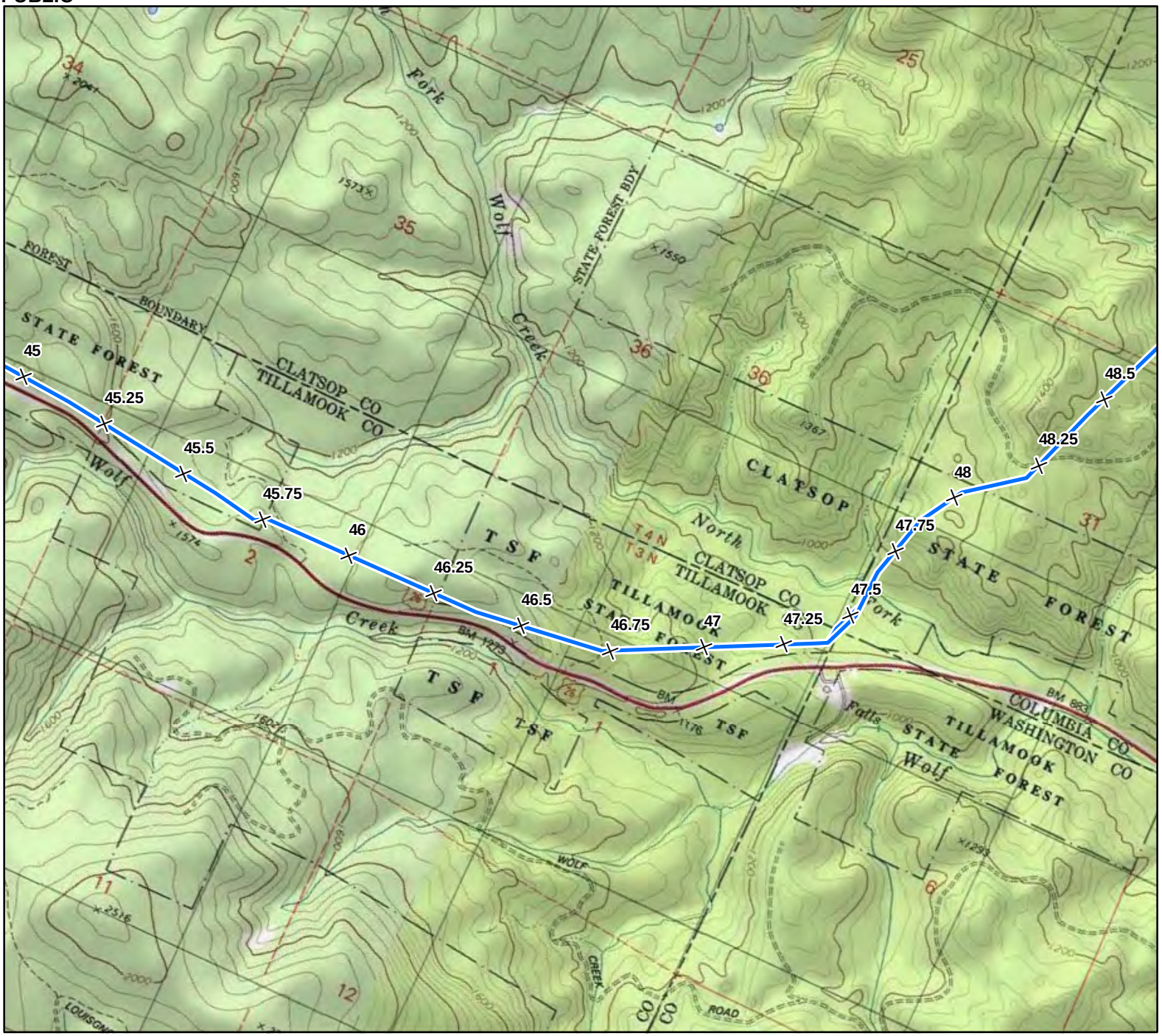


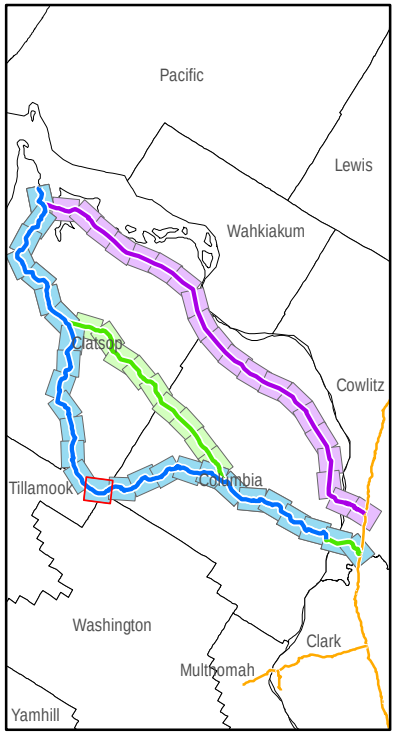
Appendix 10D

Figure 1-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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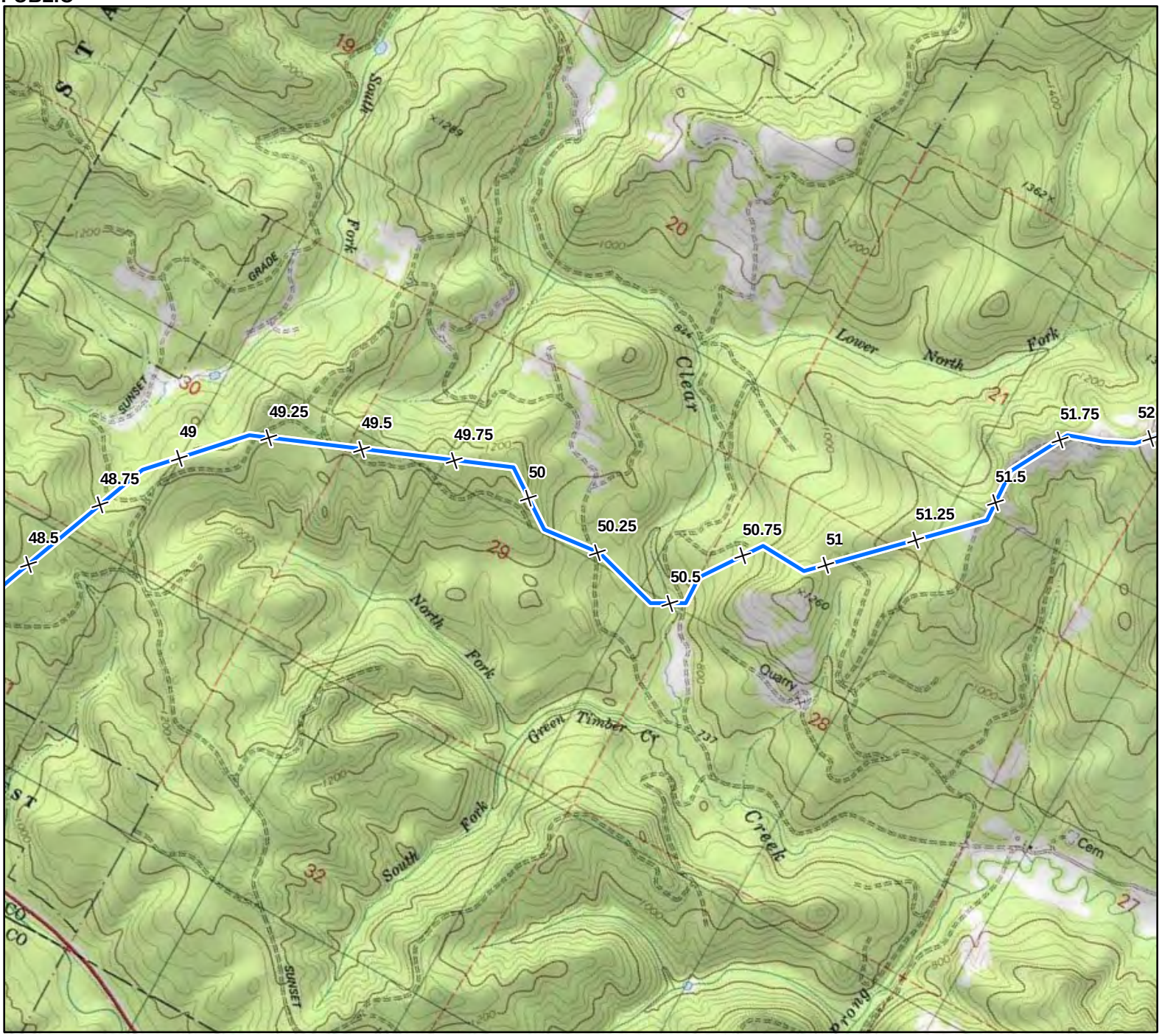

Appendix 10D

Figure 1-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

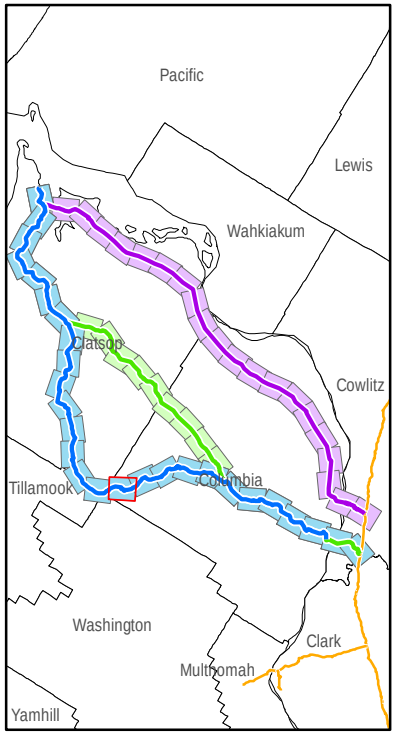

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Figure 1-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

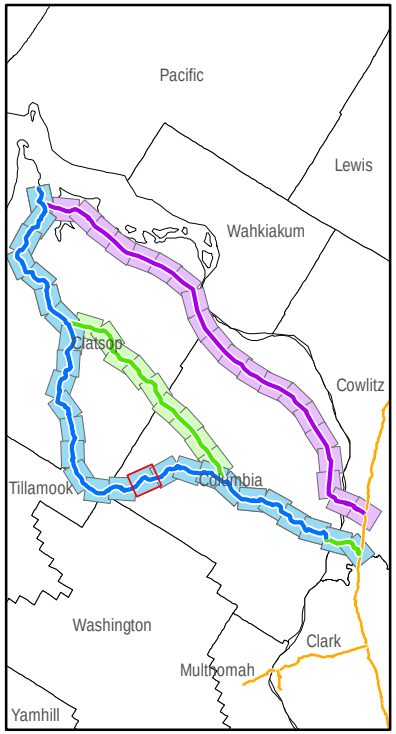

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Figure 1-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

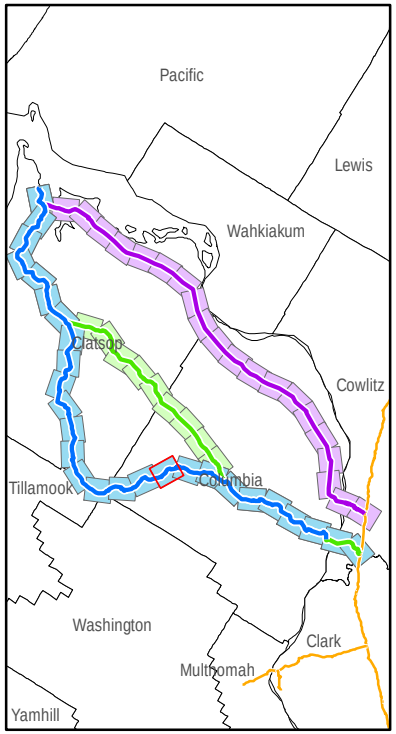

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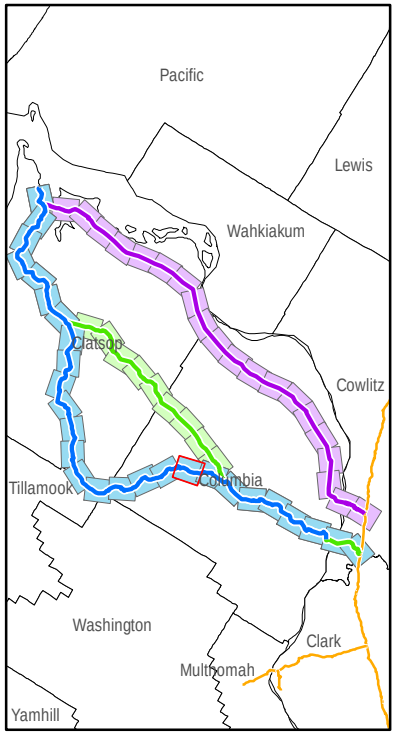
Figure 1-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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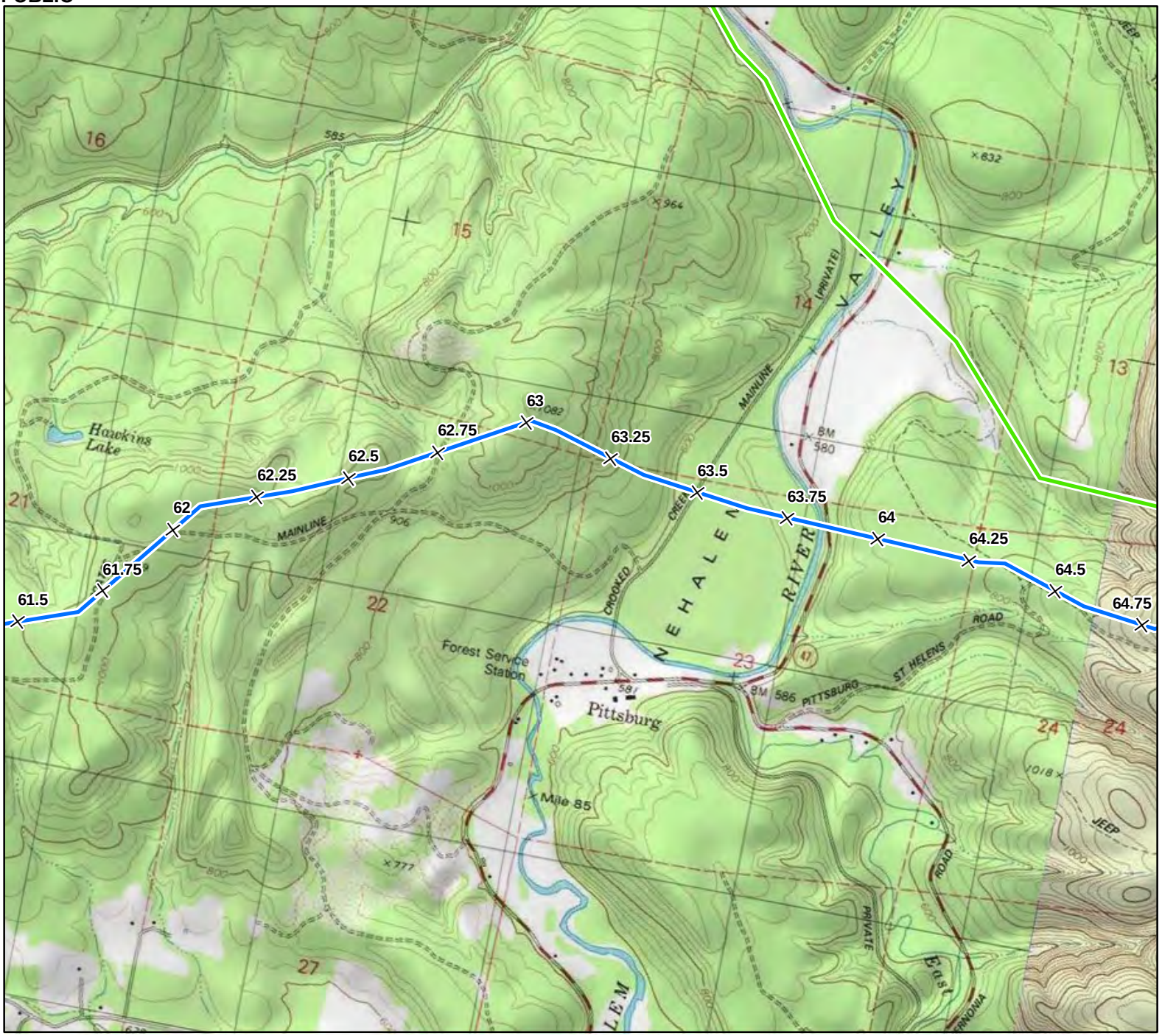


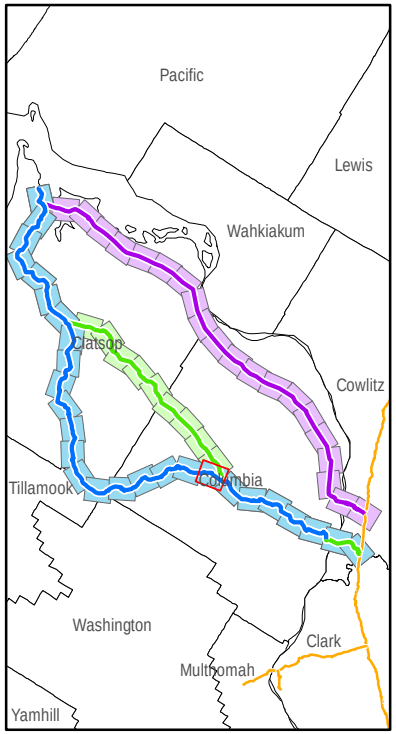
Appendix 10D

Figure 1-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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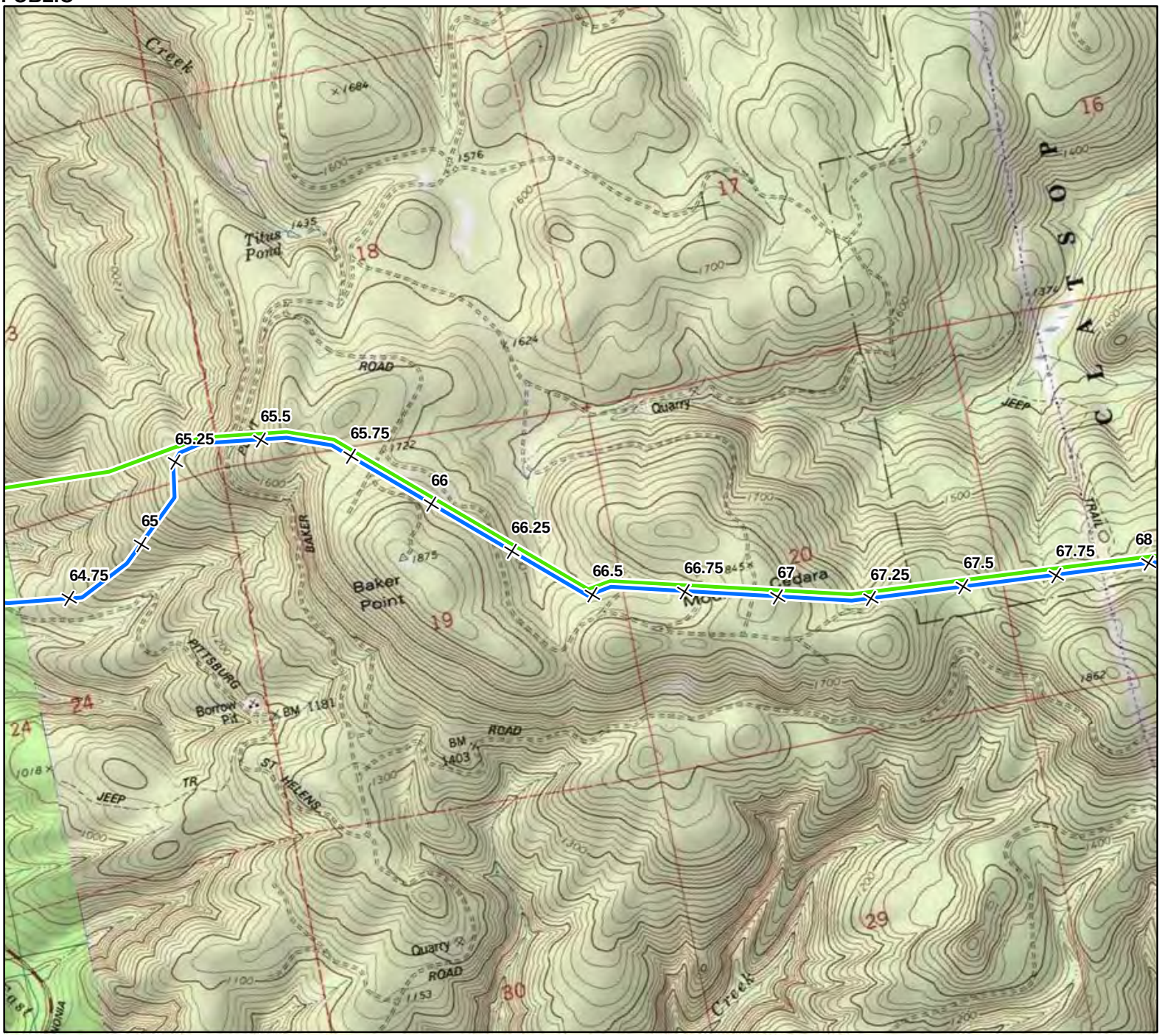


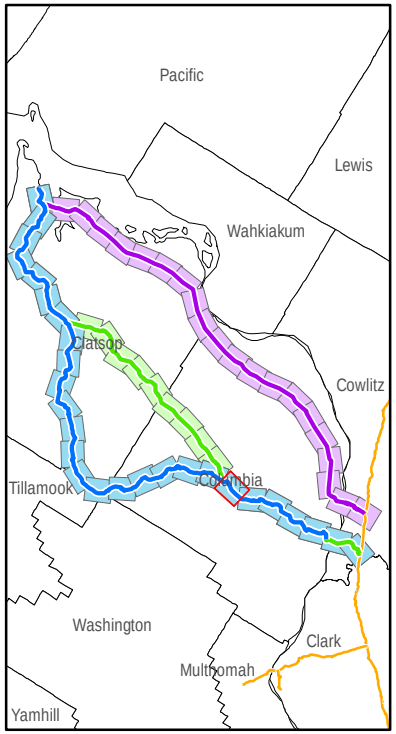
Appendix 10D

Figure 1-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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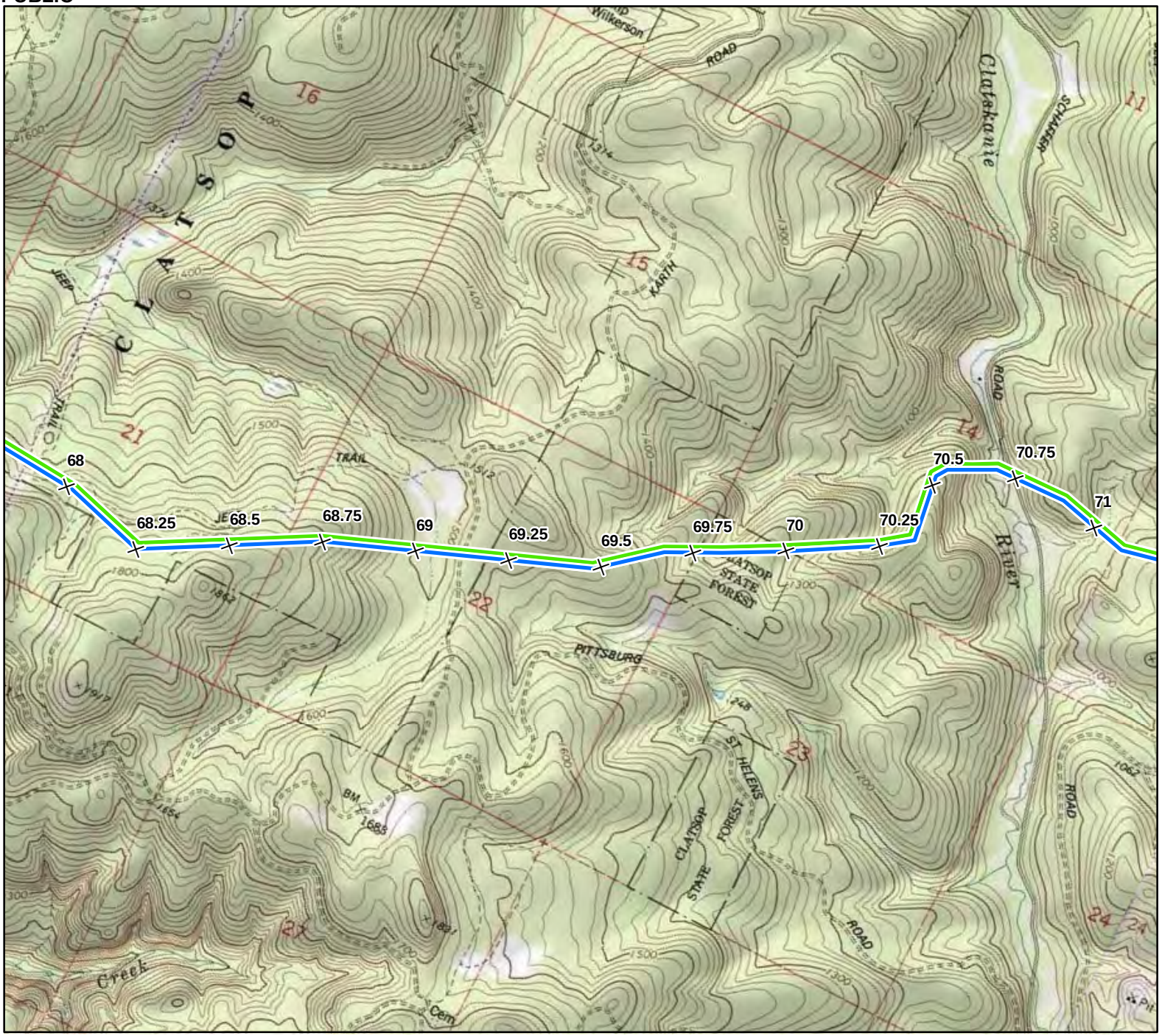


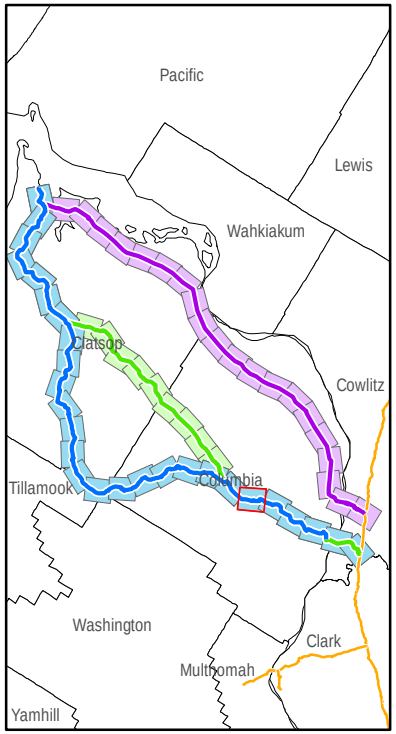
Appendix 10D

Figure 1-22

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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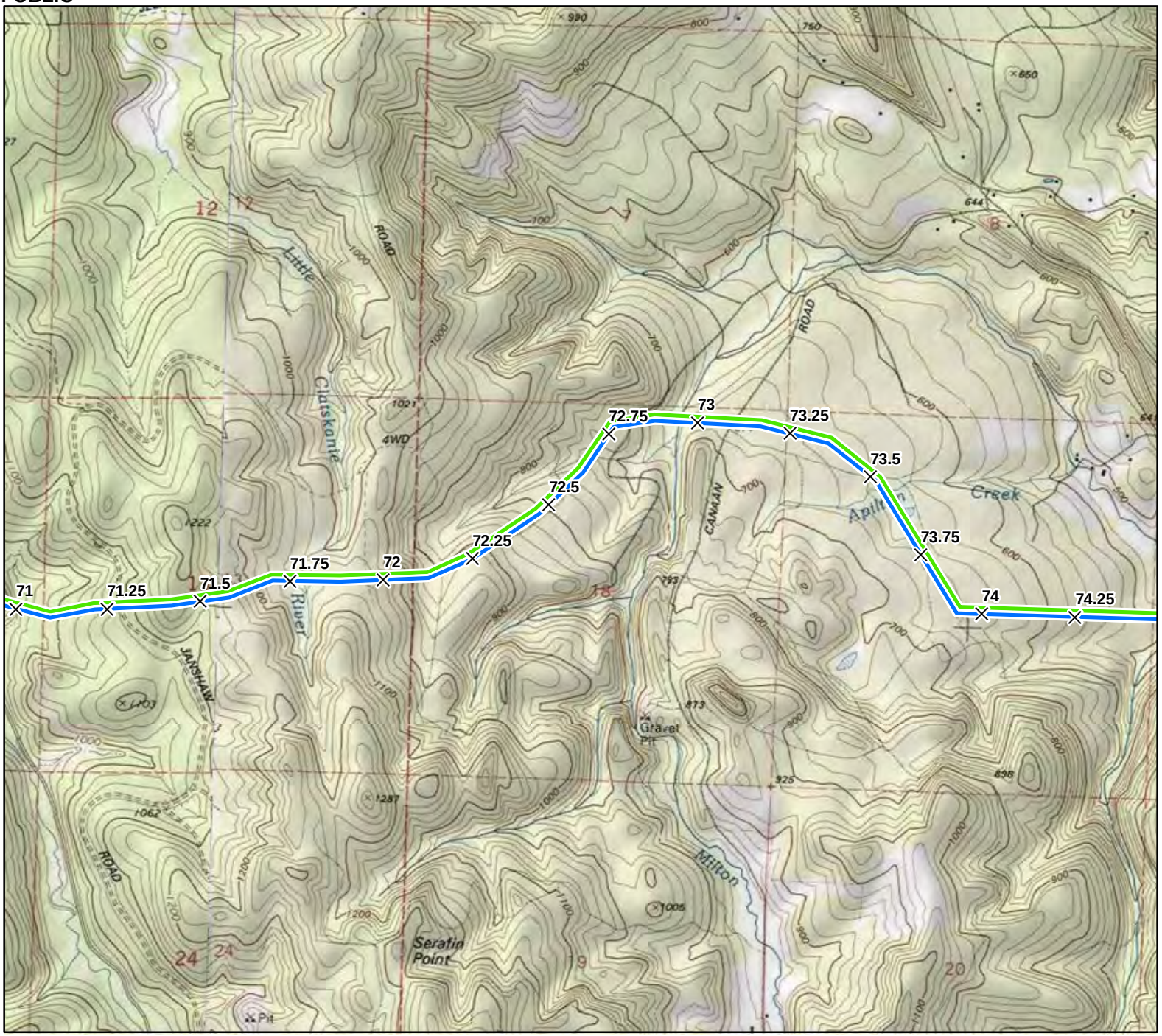


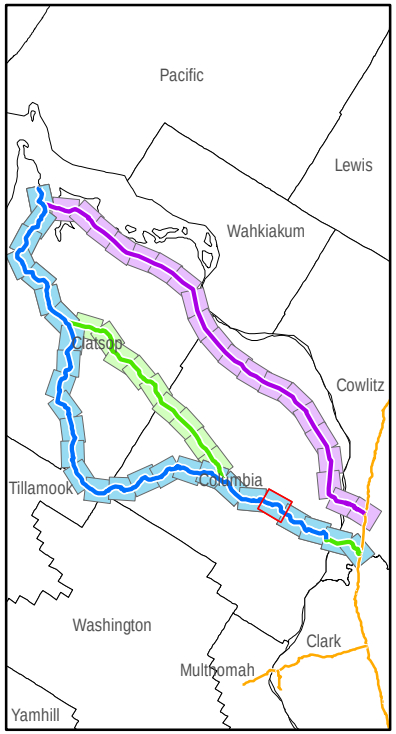
Appendix 10D

Figure 1-23

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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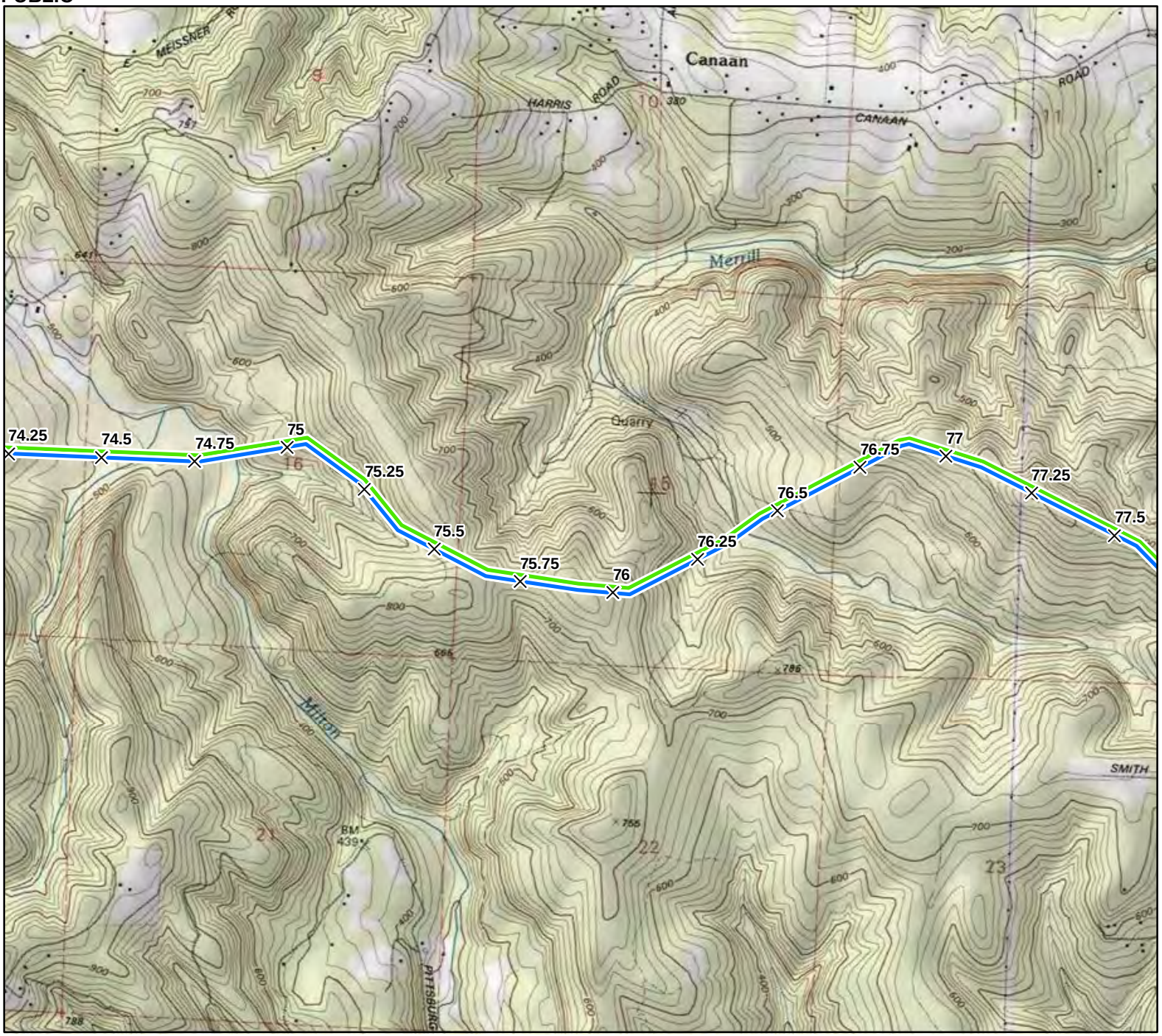


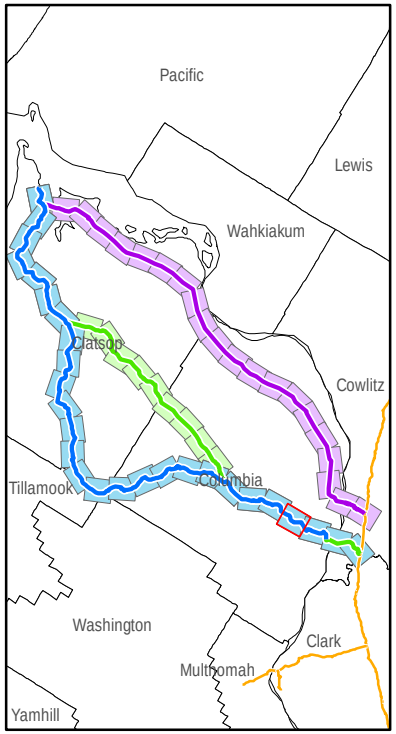
Appendix 10D

Figure 1-24

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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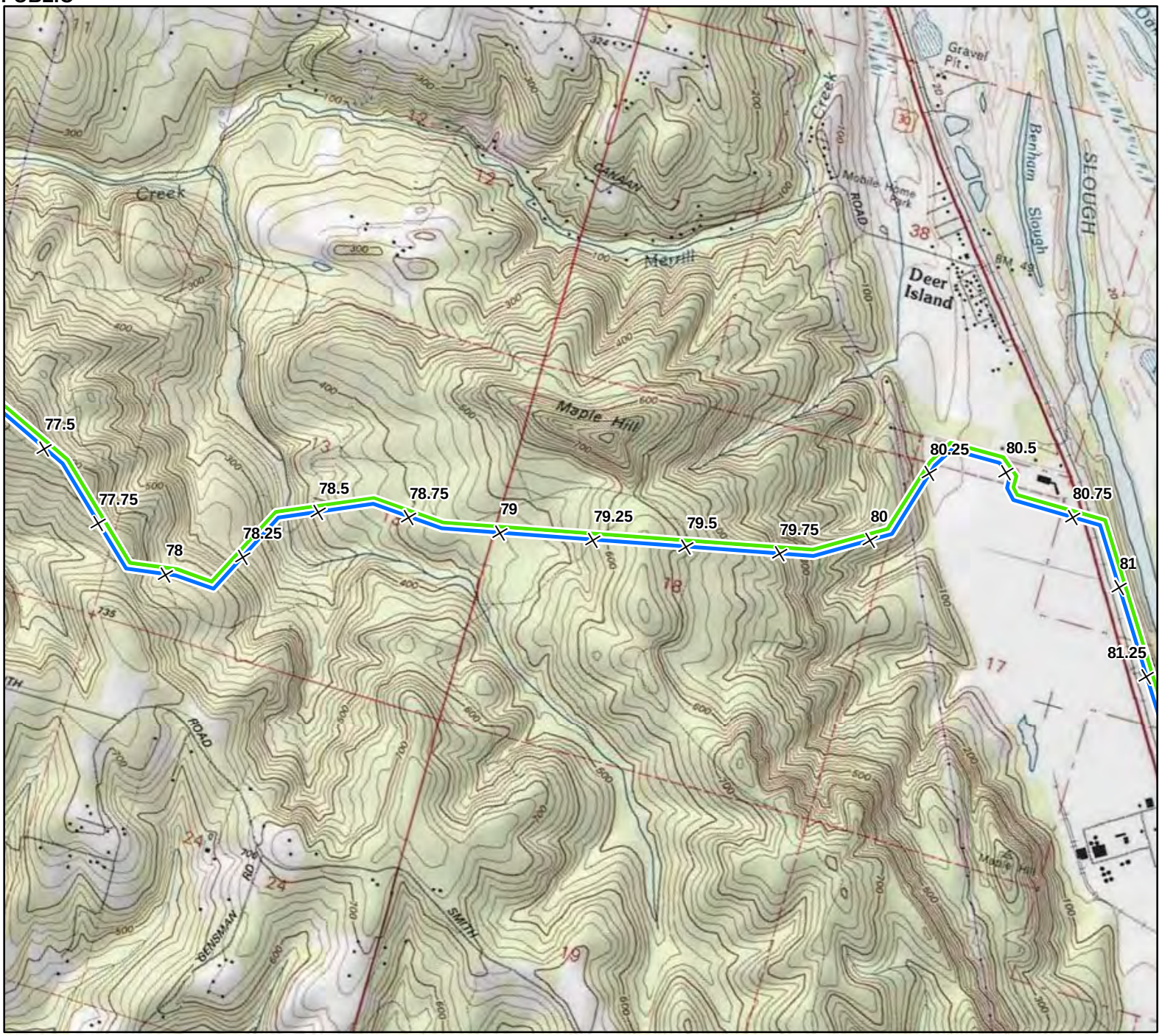


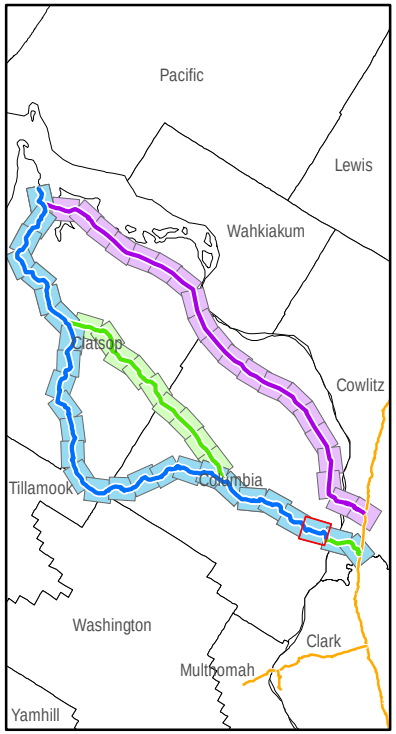
Appendix 10D

Figure 1-25

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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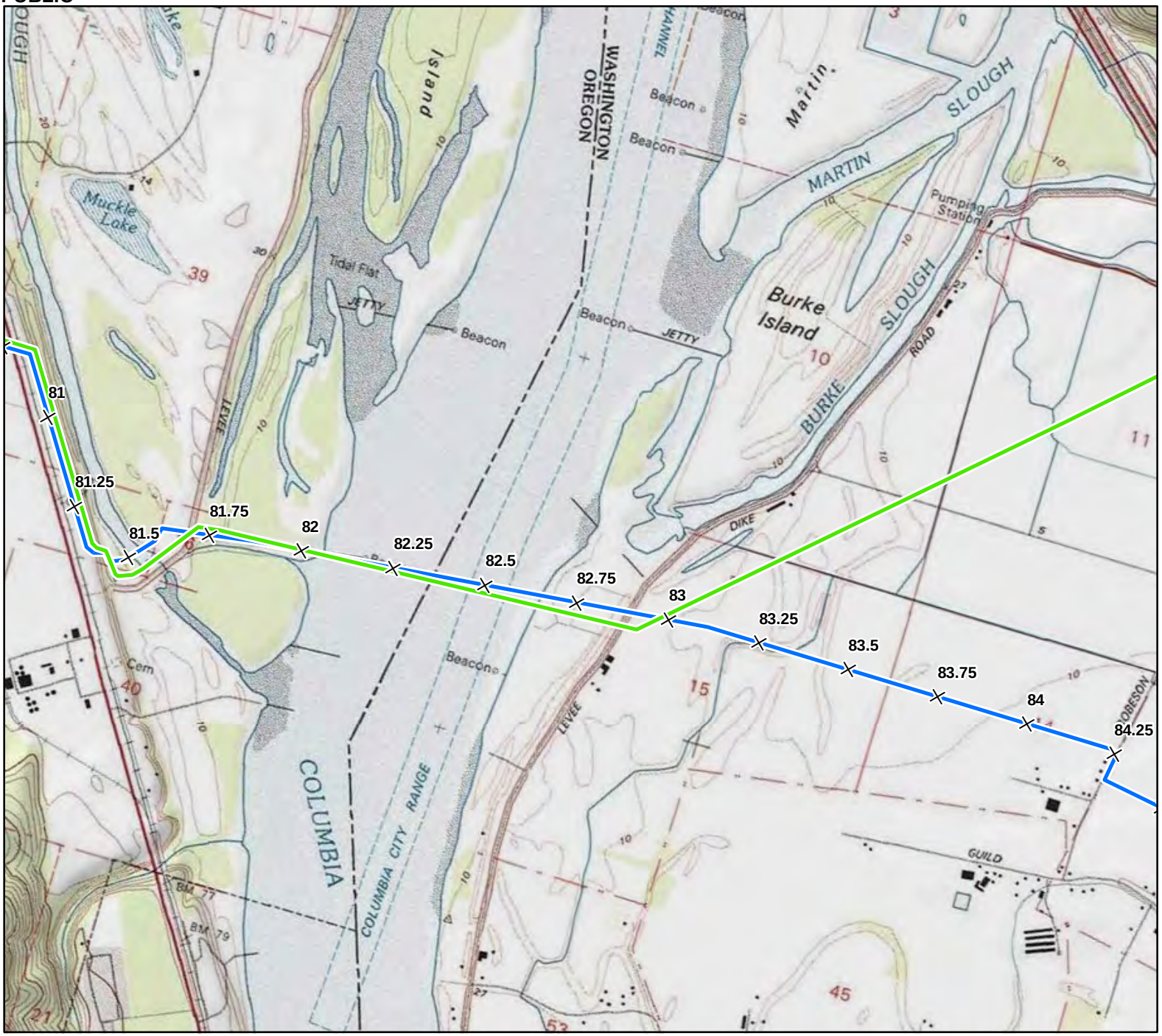


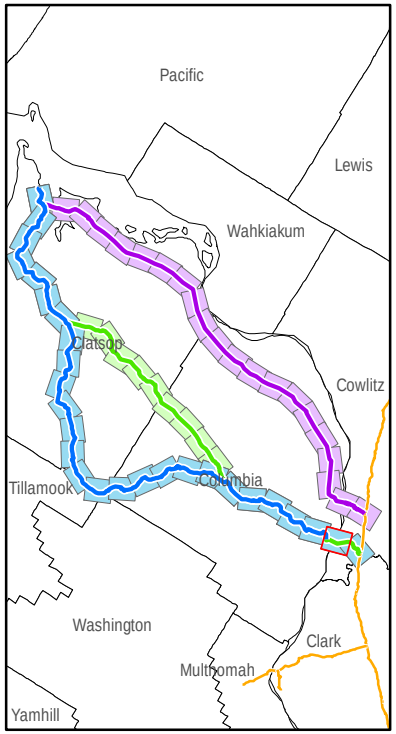
Appendix 10D

Figure 1-26

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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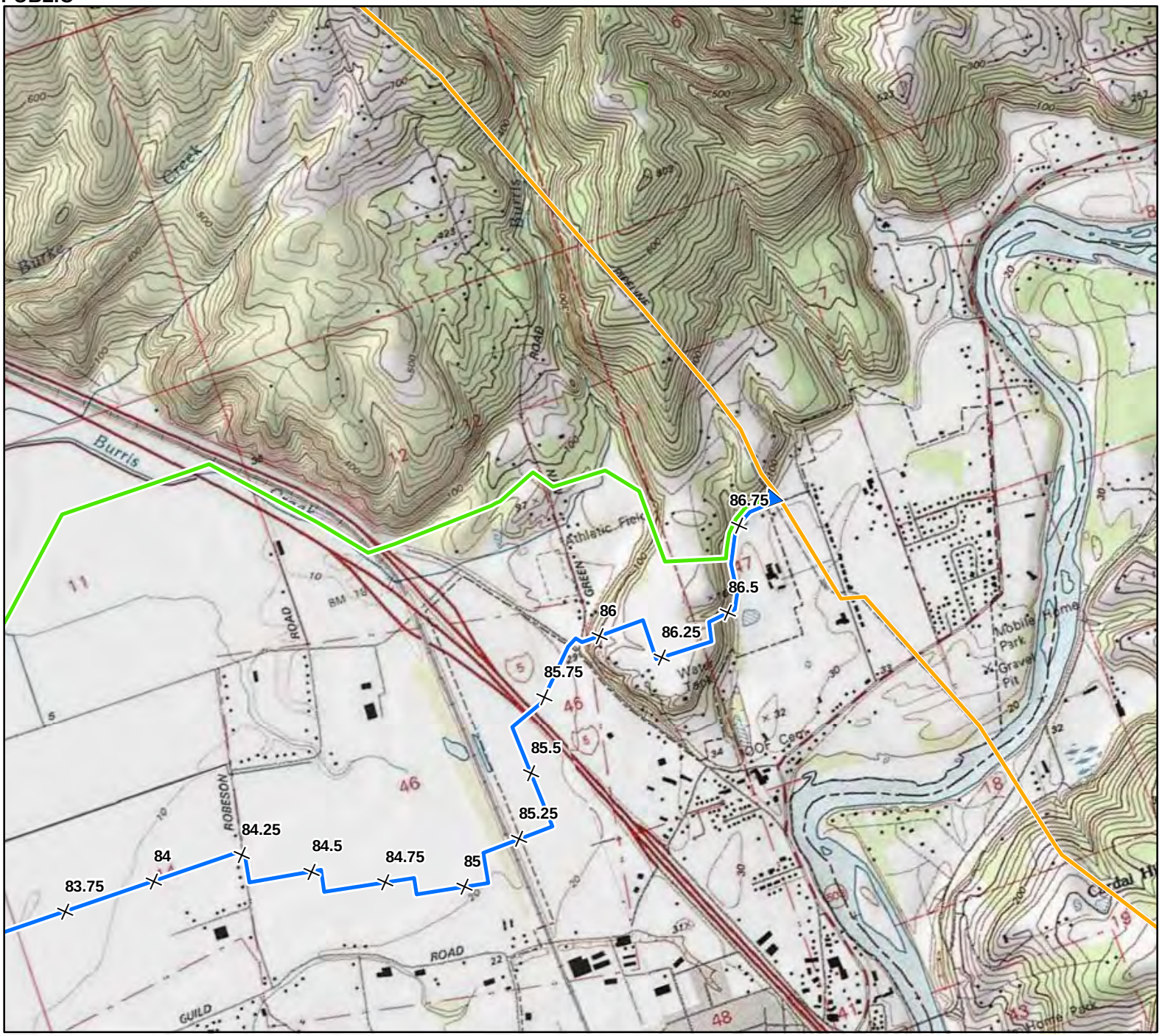


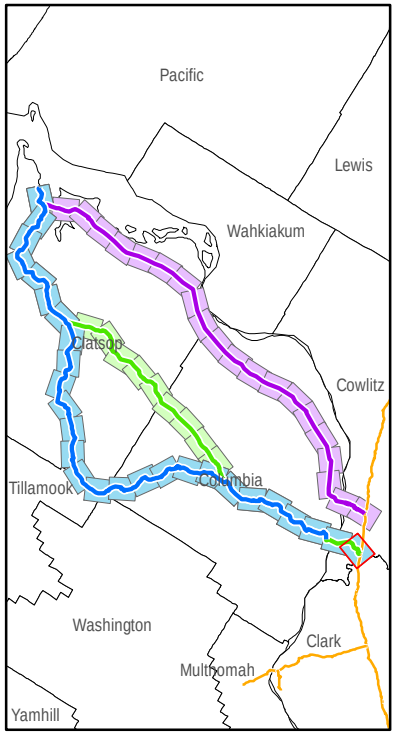
Appendix 10D

Figure 1-27

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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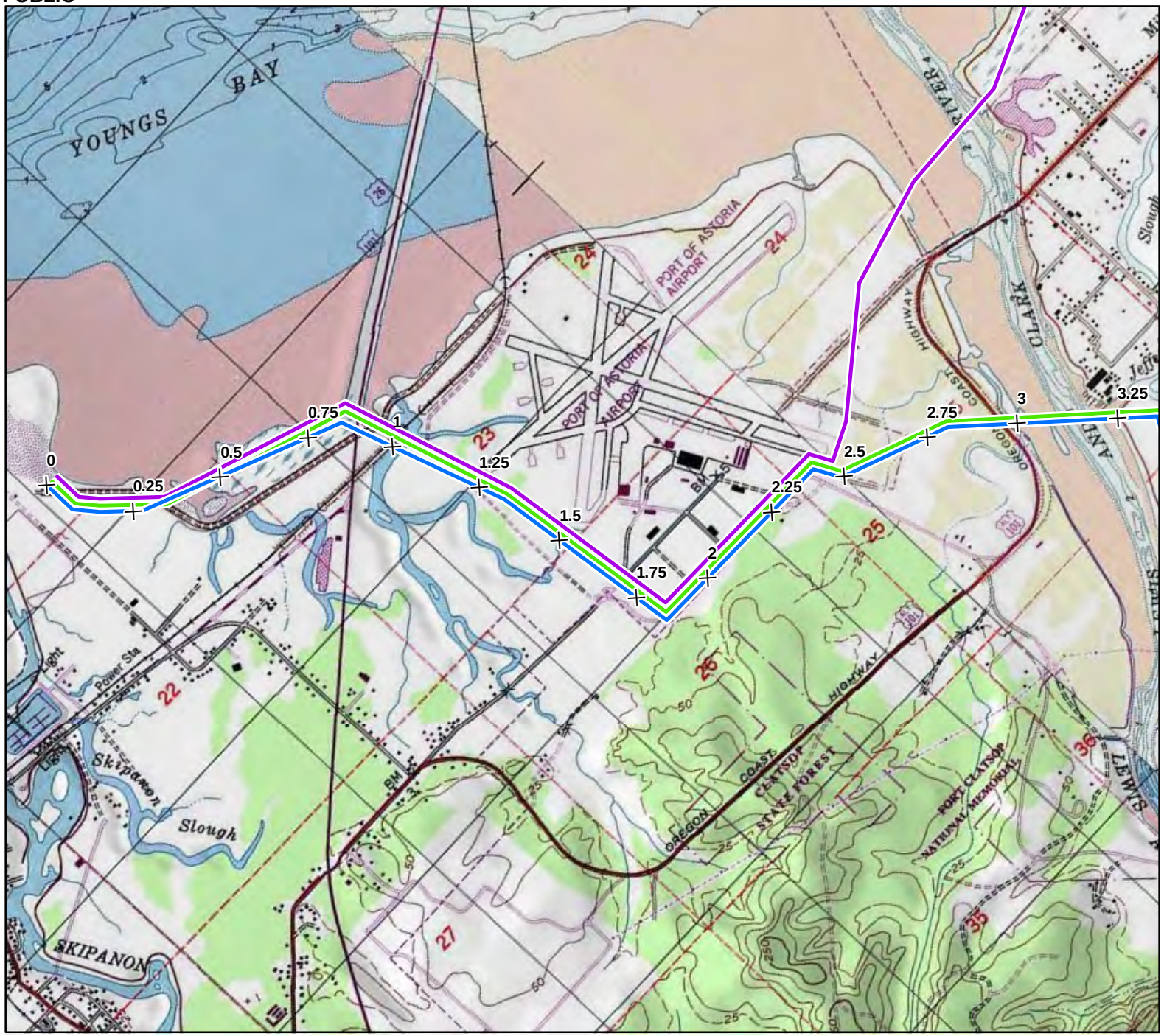


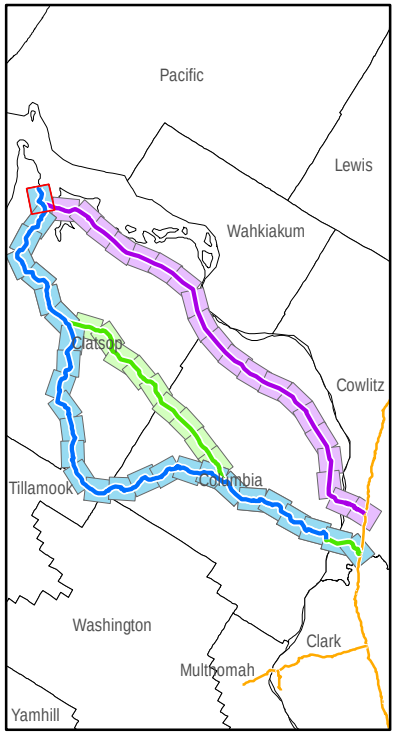
Appendix 10D

Figure 2-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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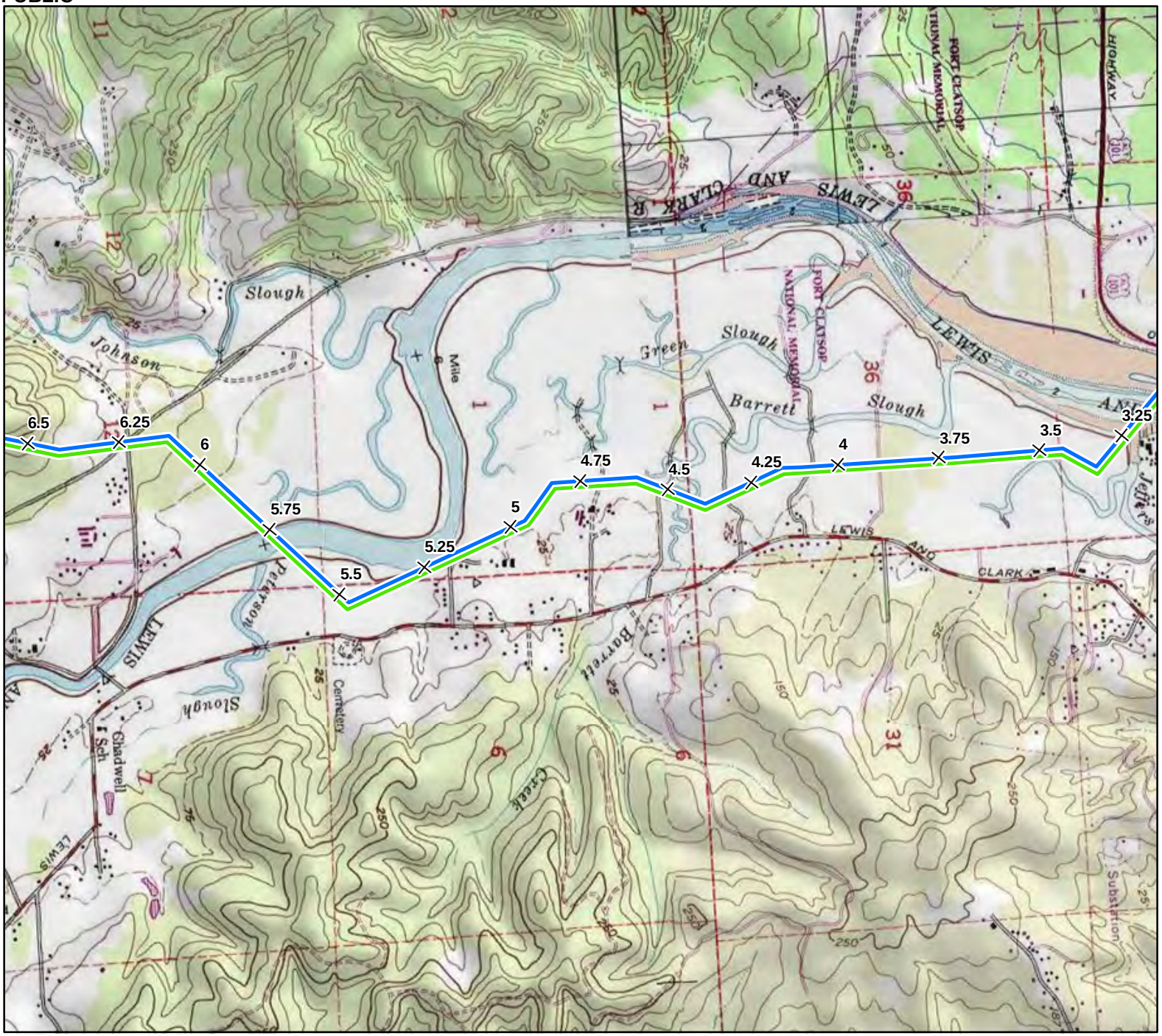


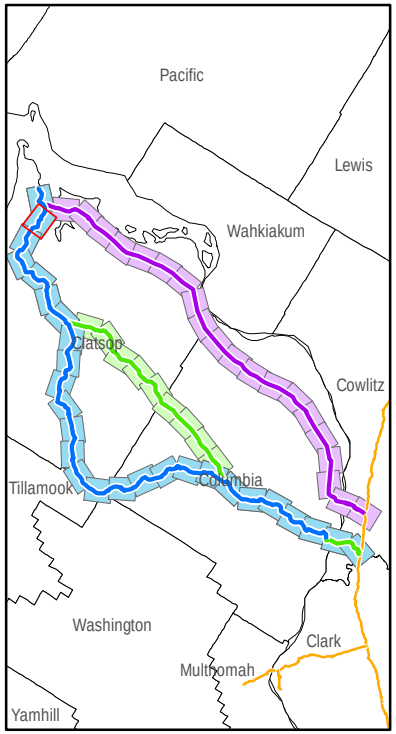
Appendix 10D

Figure 2-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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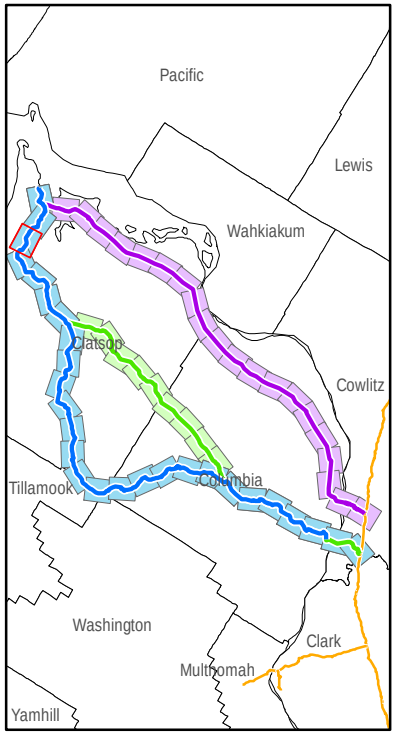
Appendix 10D

Figure 2-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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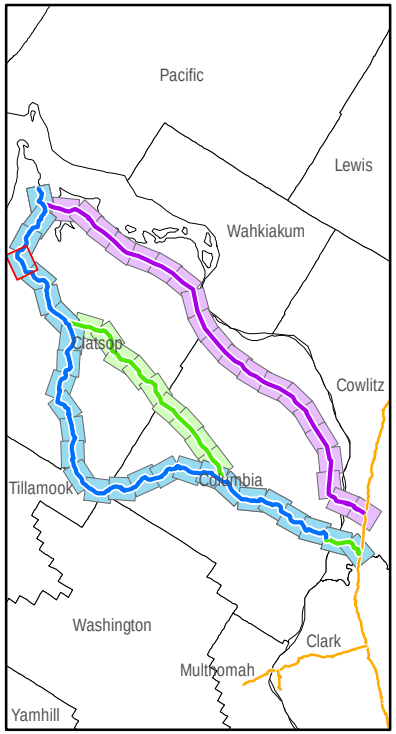
Appendix 10D

Figure 2-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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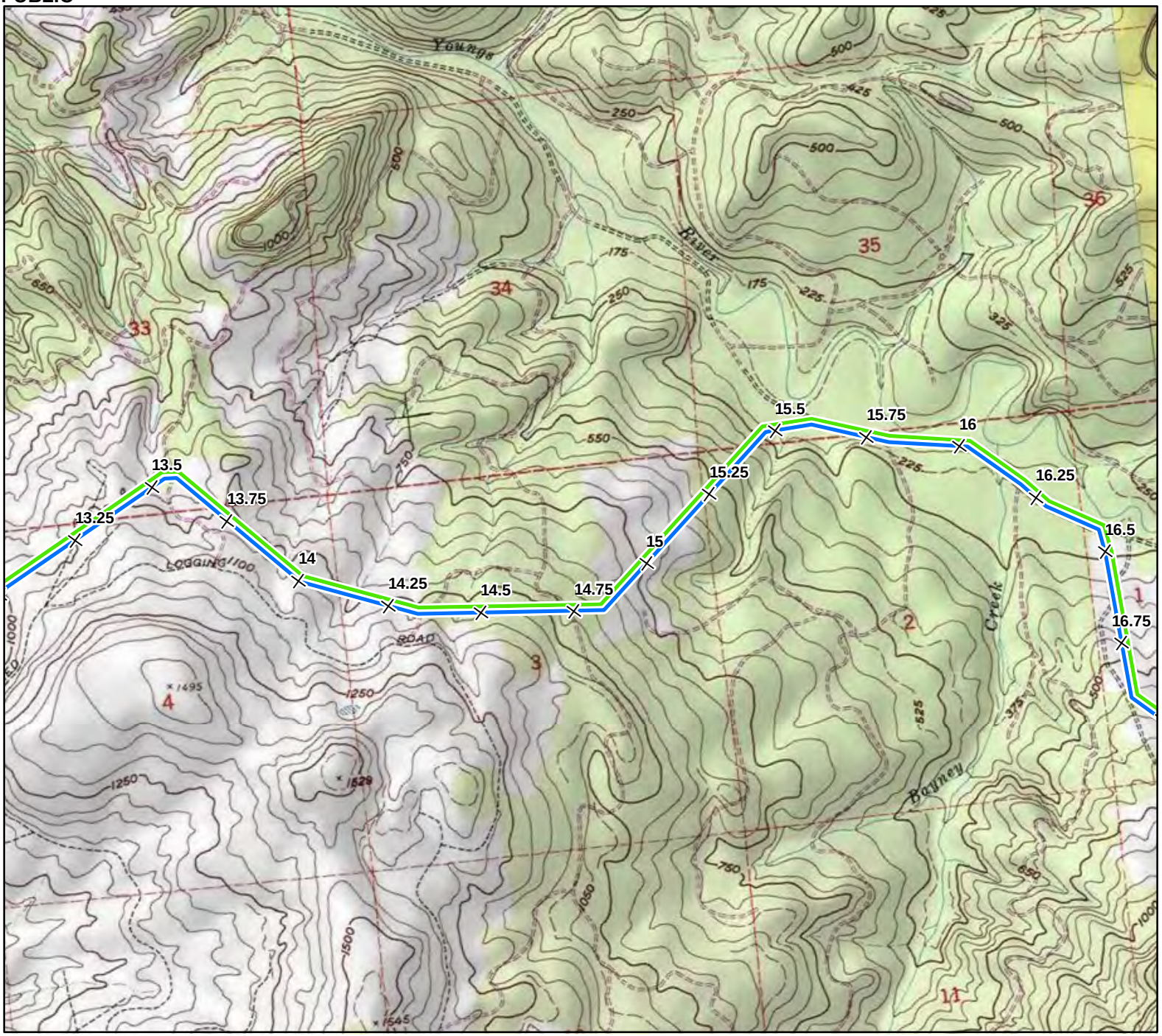


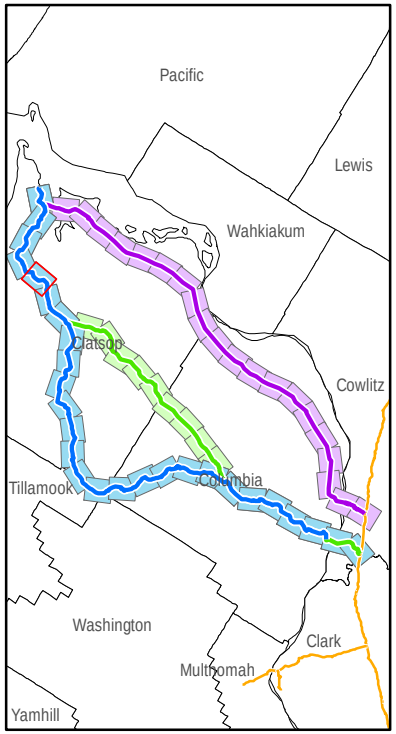
Appendix 10D

Figure 2-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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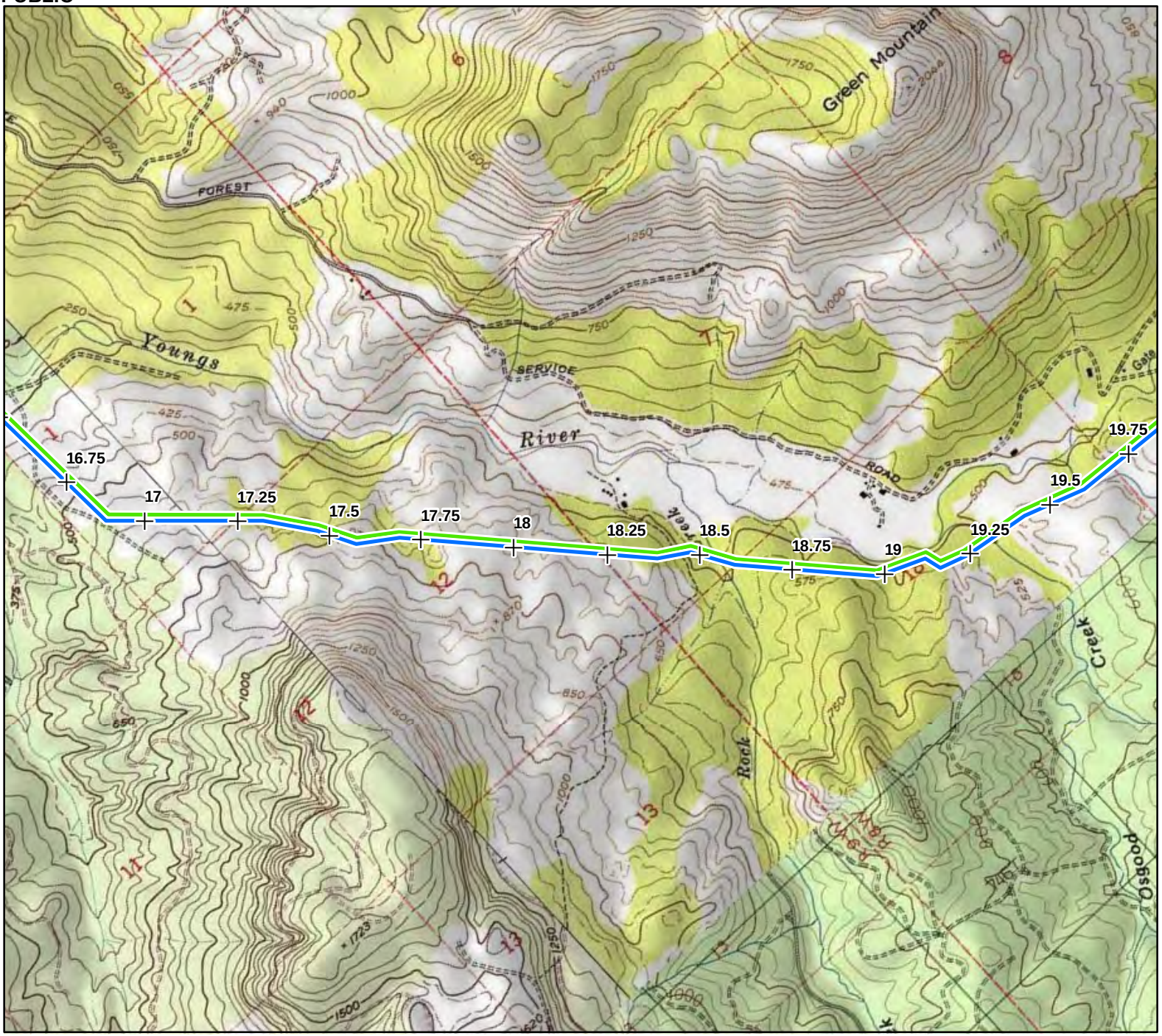

Appendix 10D

Figure 2-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline

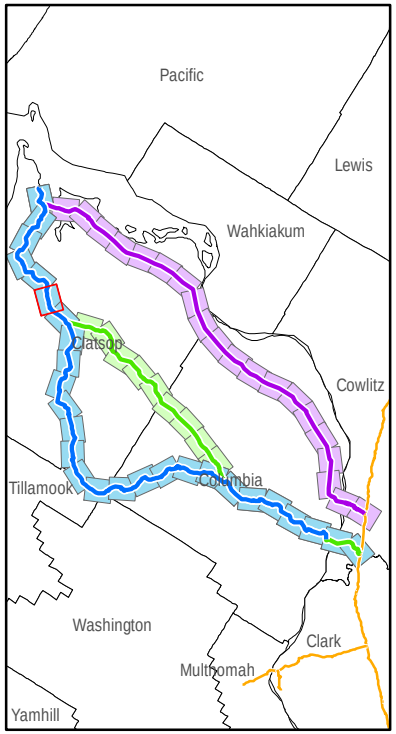

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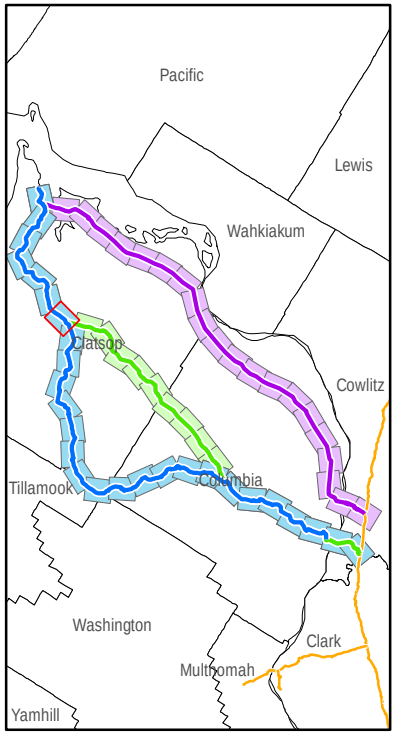
Figure 2-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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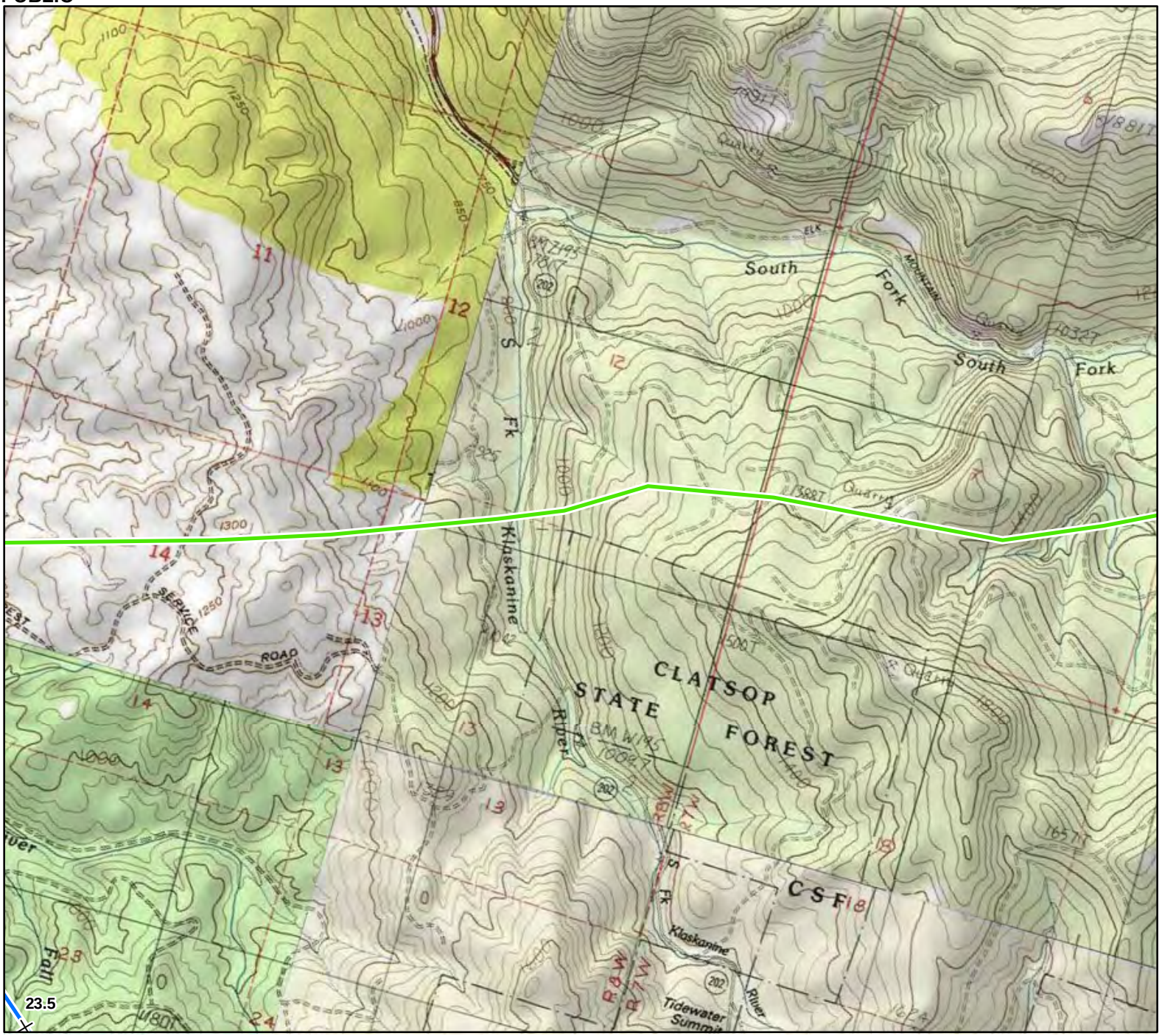


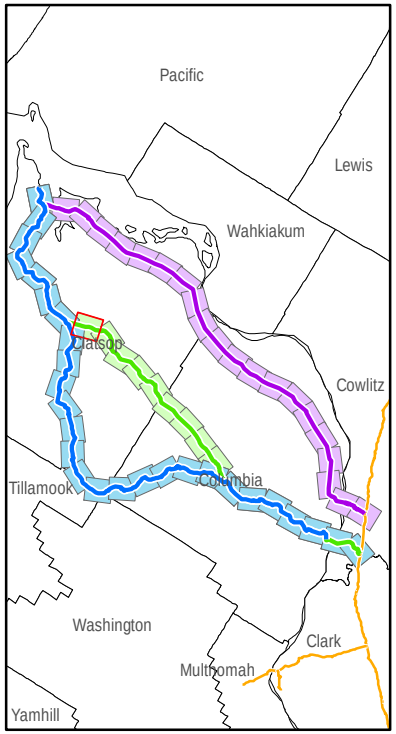
Appendix 10D

Figure 2-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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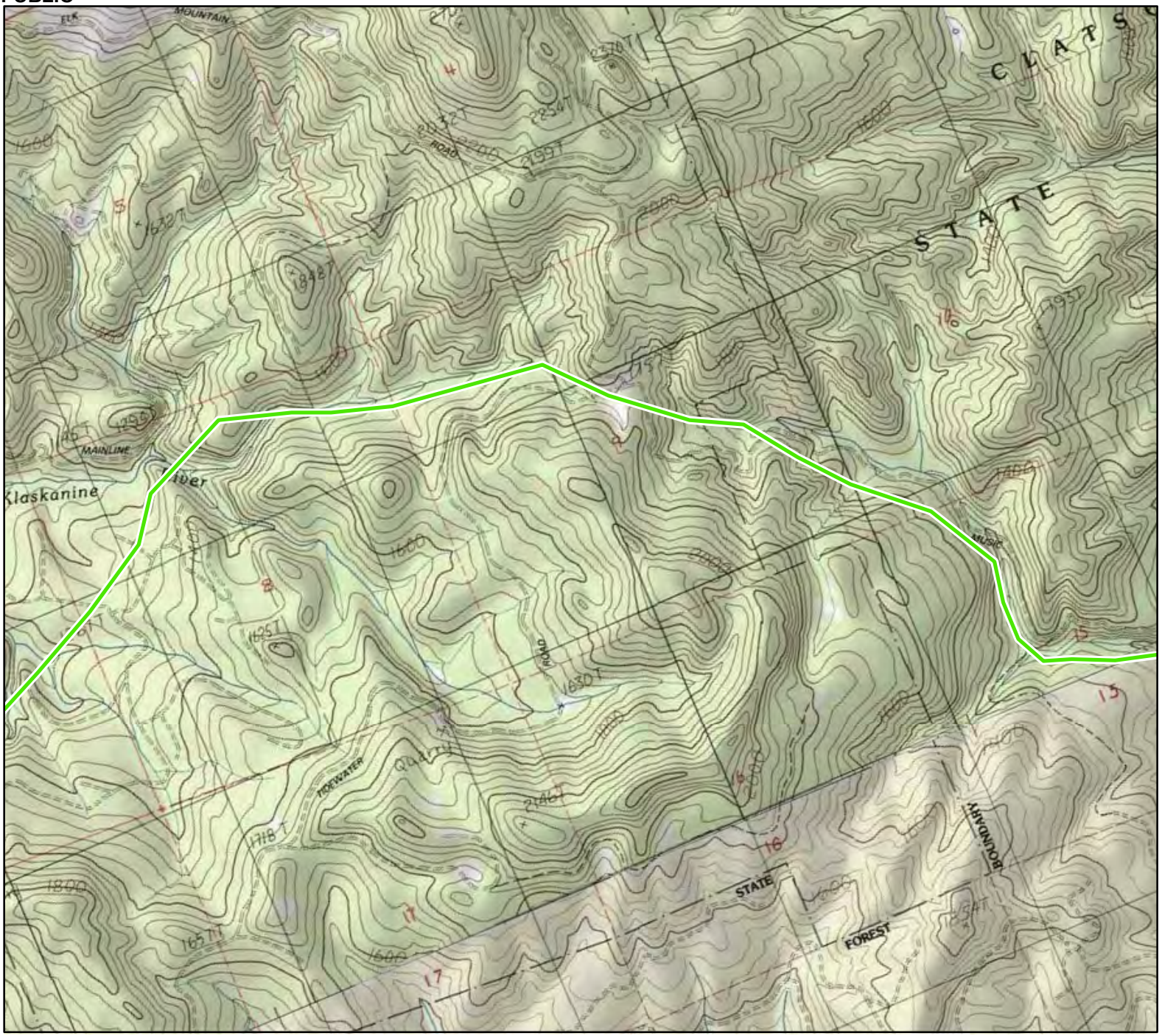


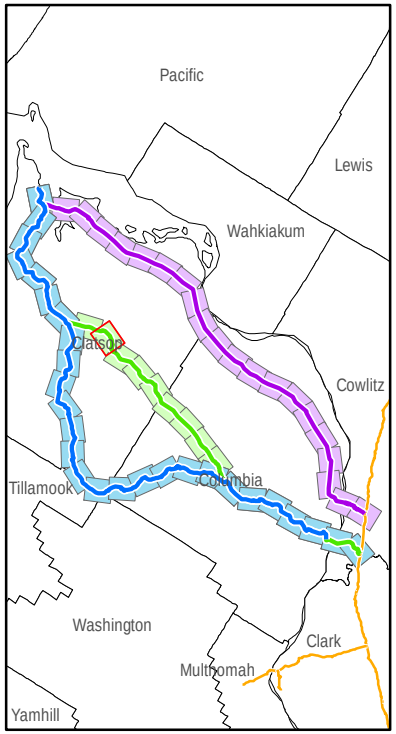
Appendix 10D

Figure 2-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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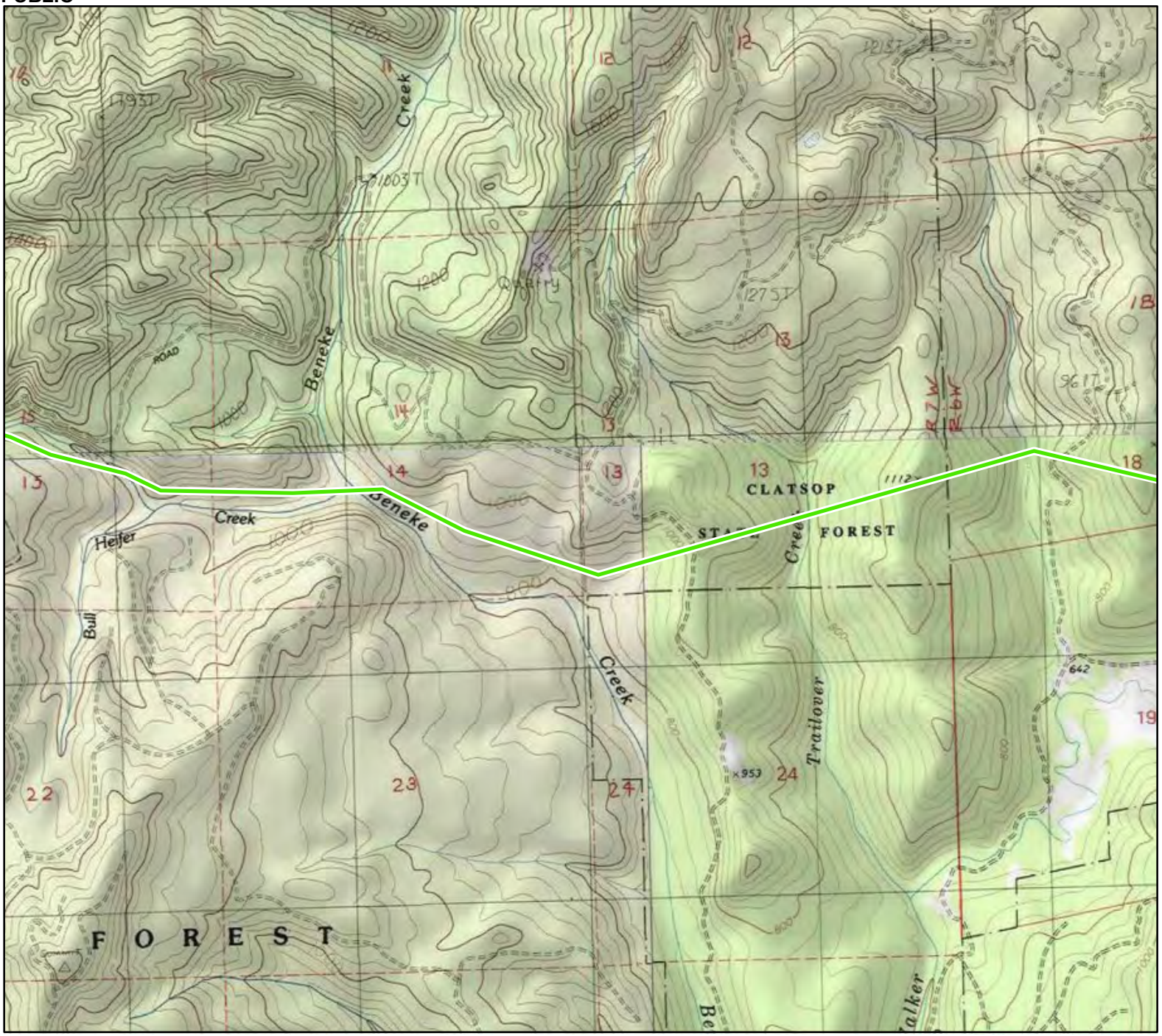


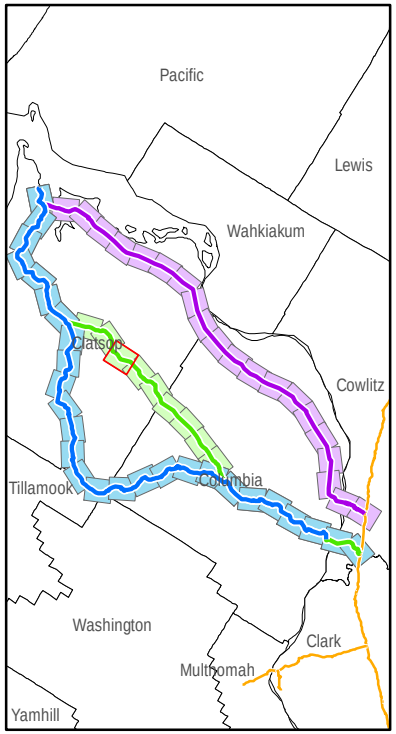
Appendix 10D

Figure 2-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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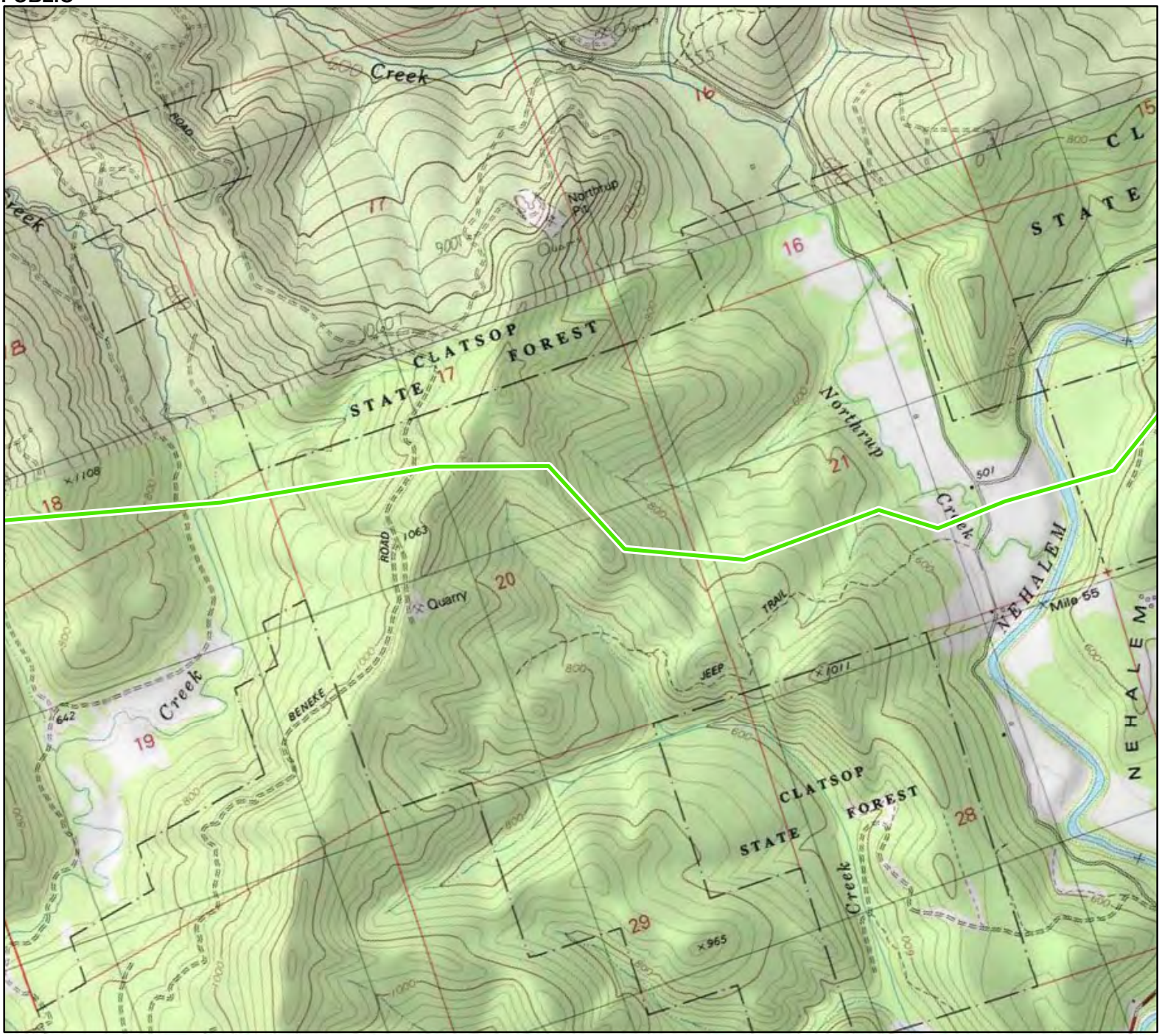


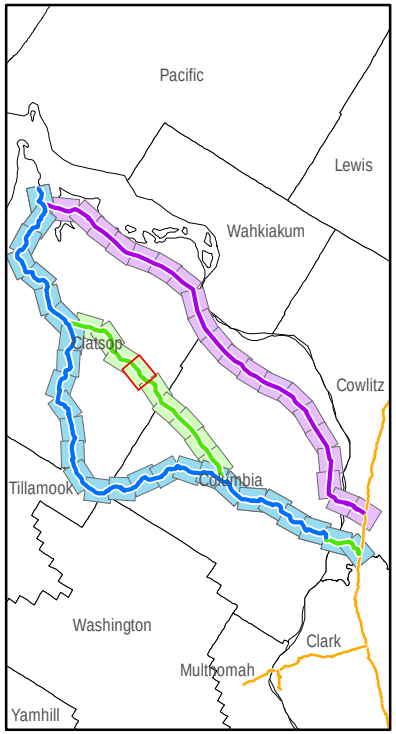
Appendix 10D

Figure 2-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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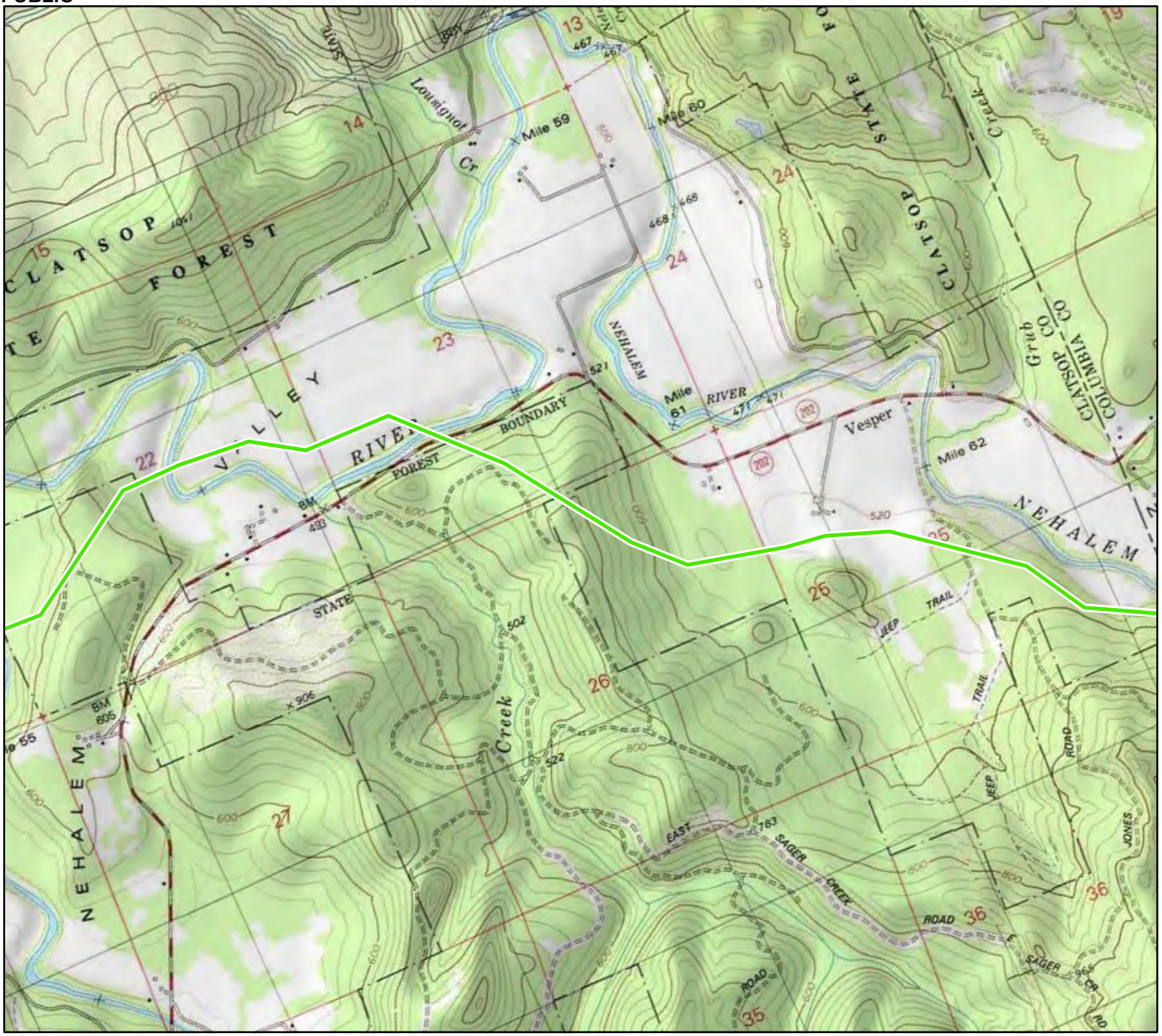


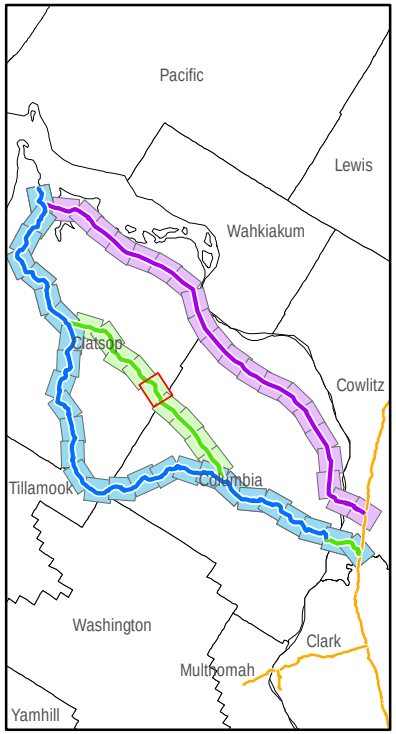
Appendix 10D

Figure 2-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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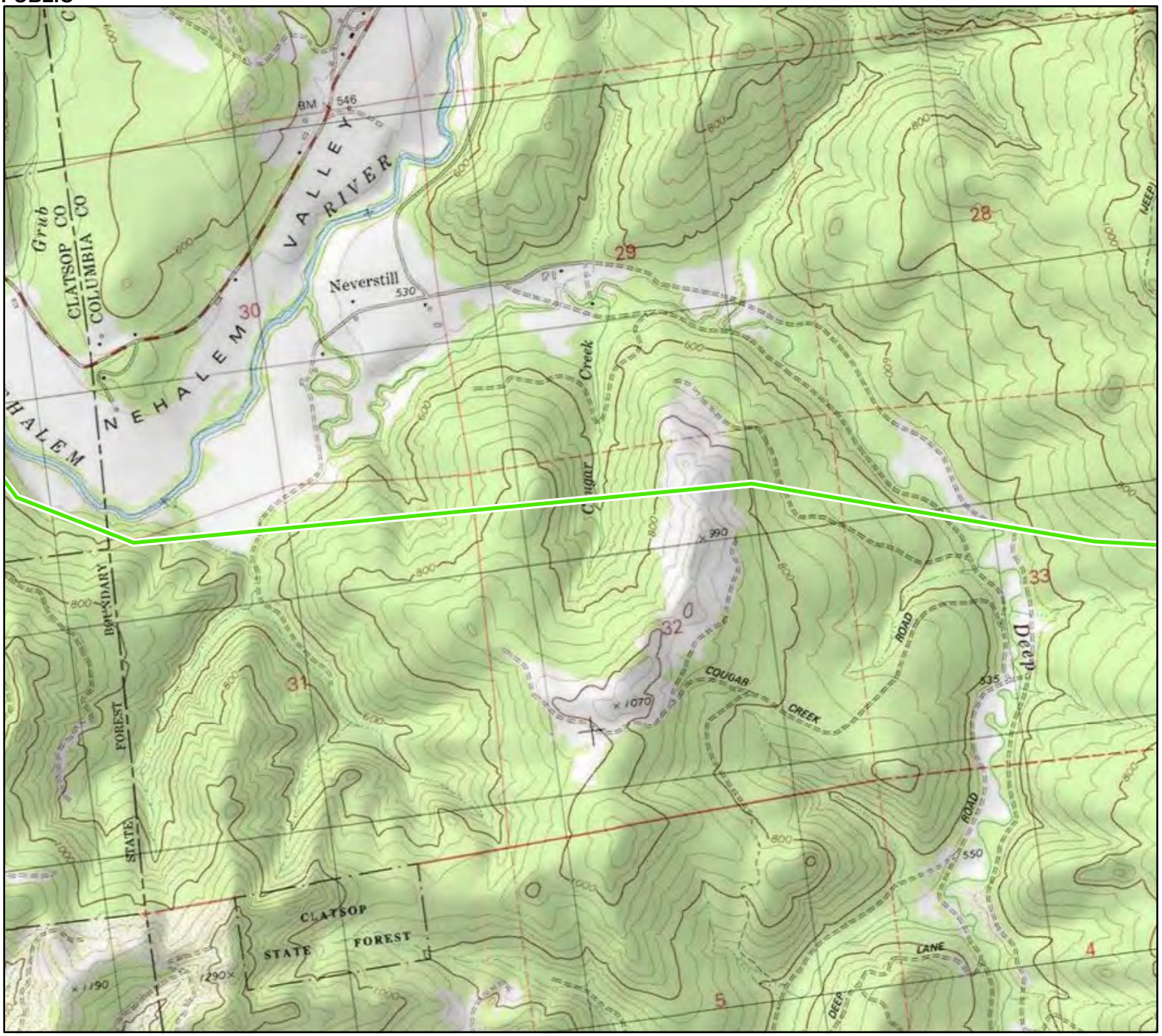


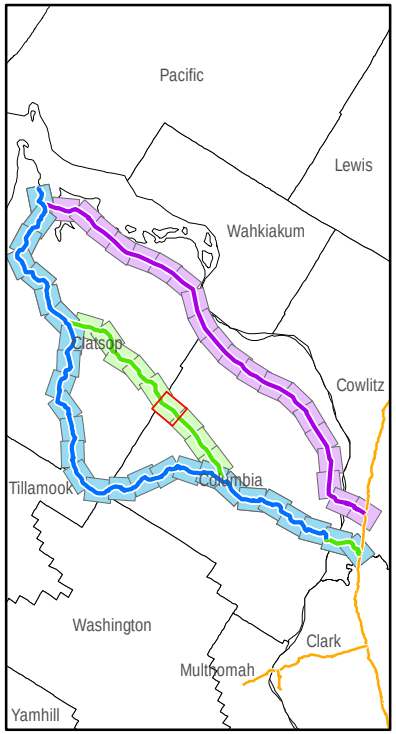
Appendix 10D

Figure 2-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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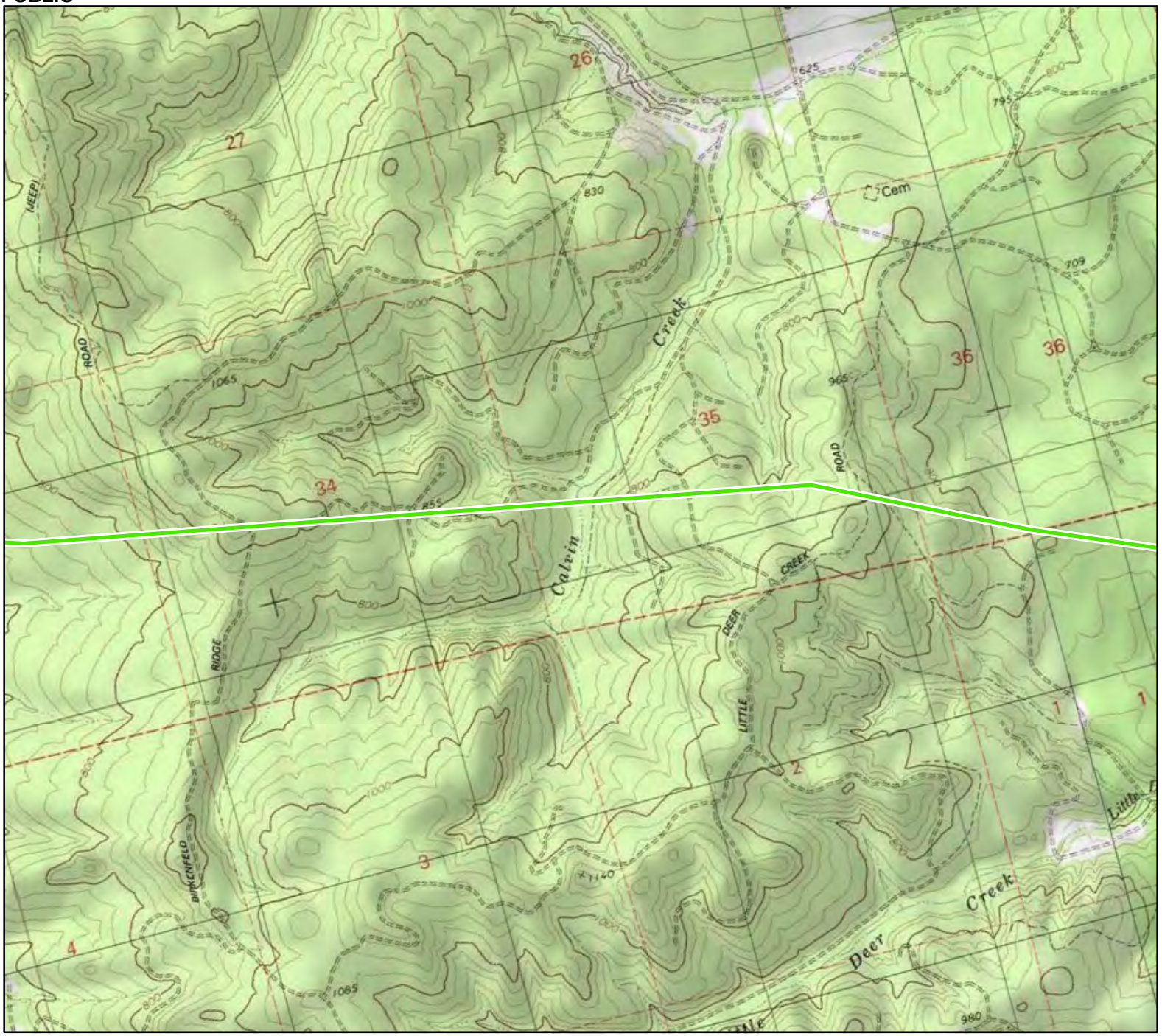


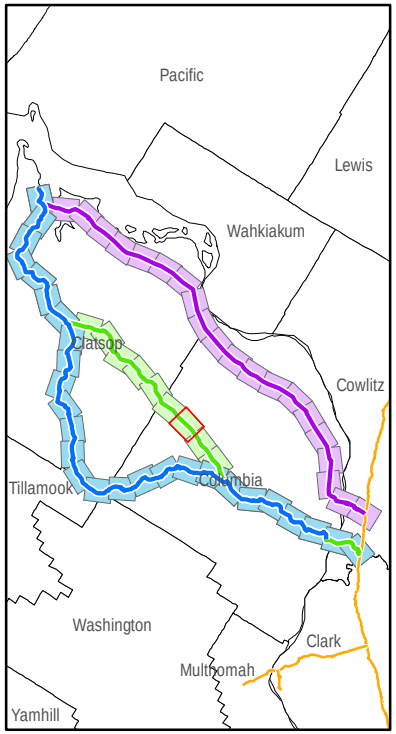
Appendix 10D

Figure 2-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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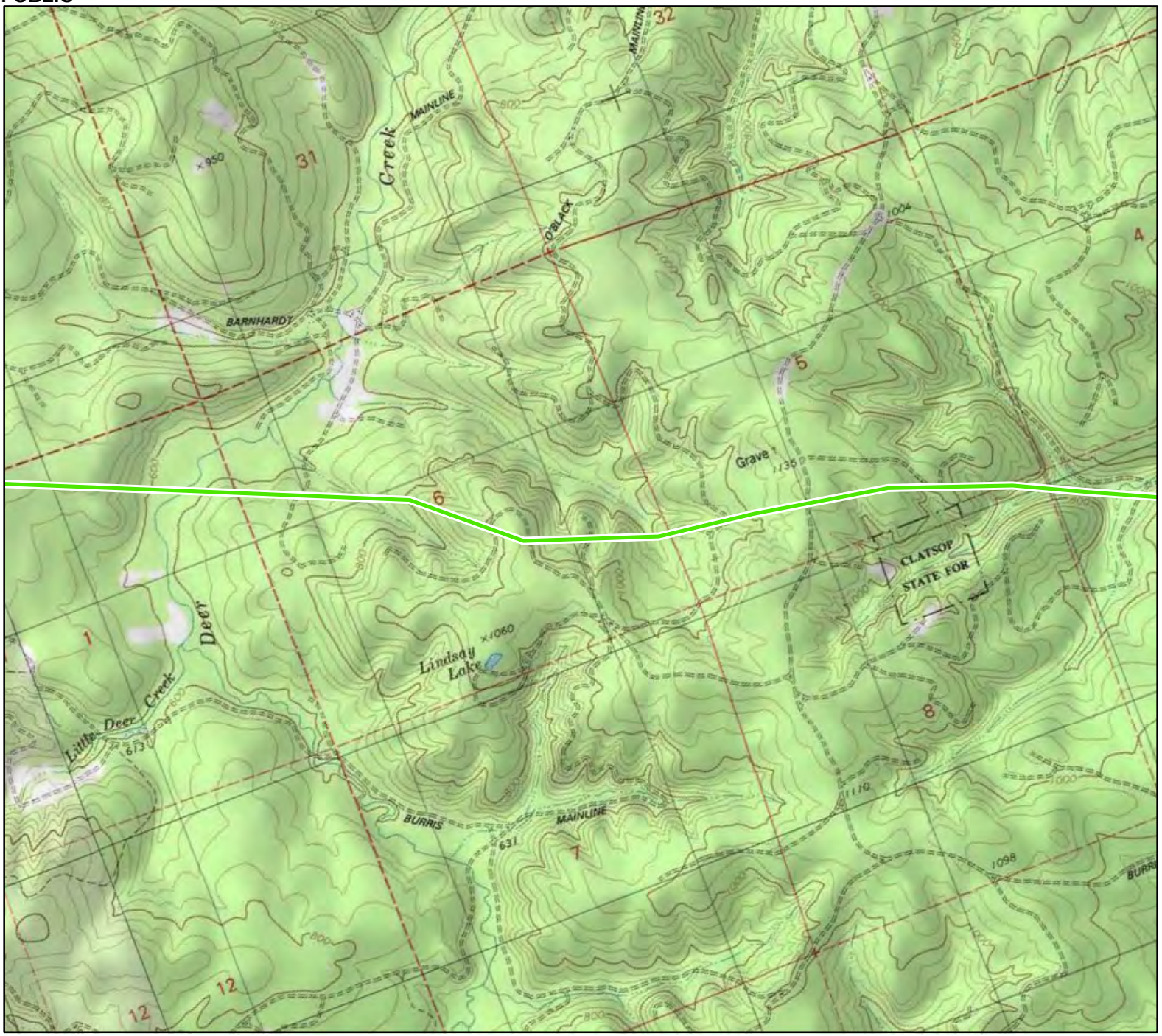


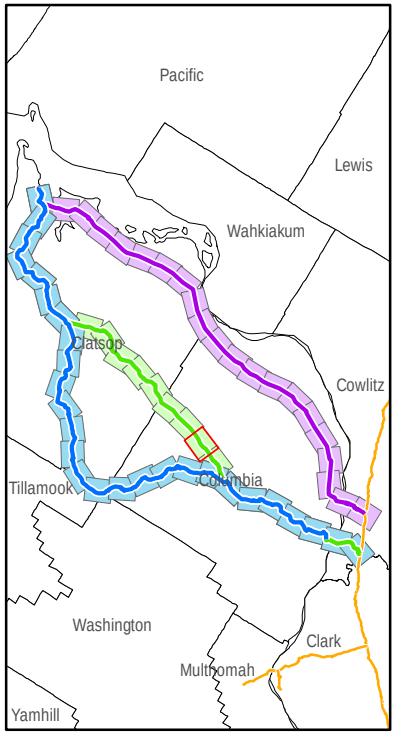
Appendix 10D

Figure 2-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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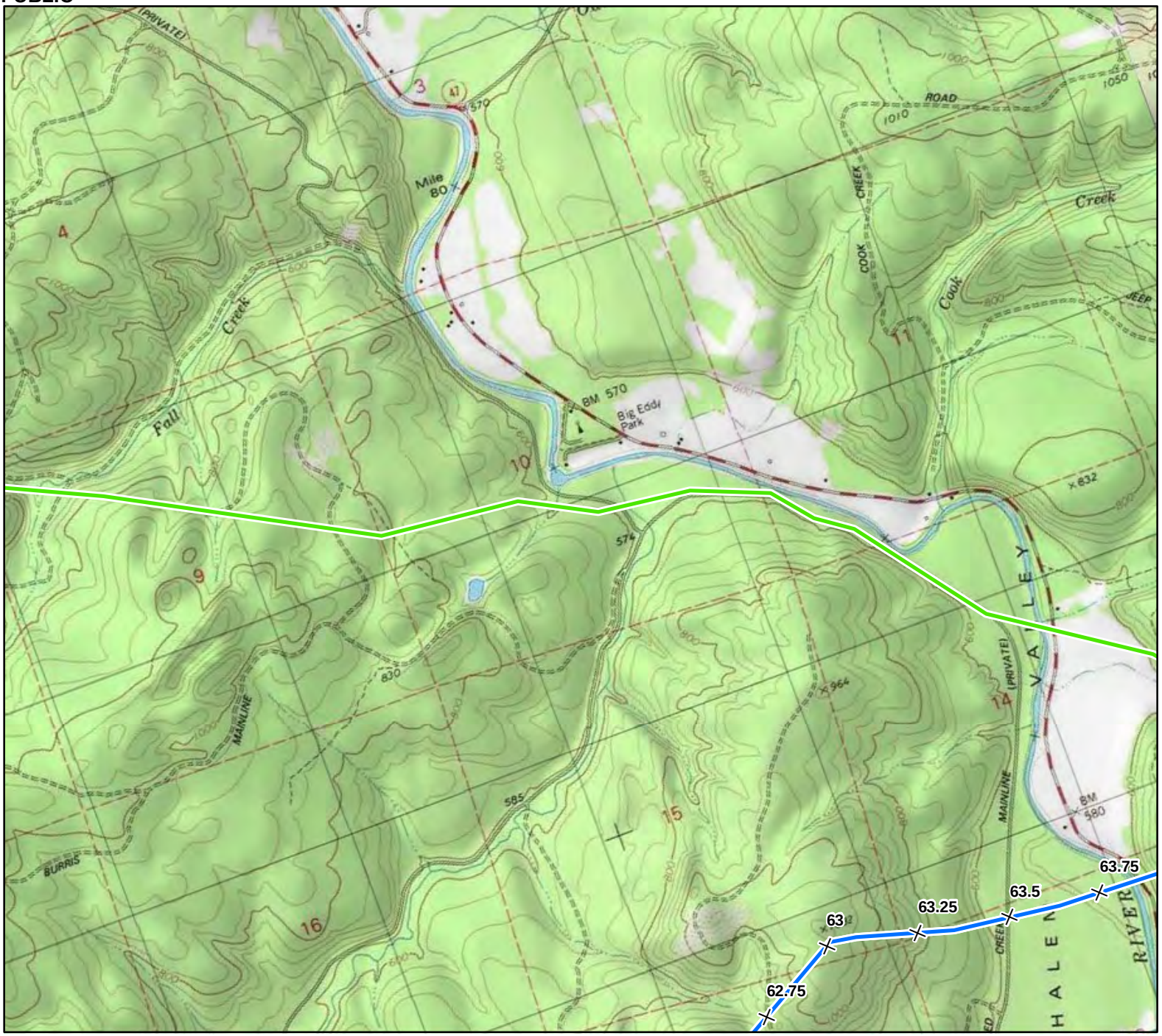


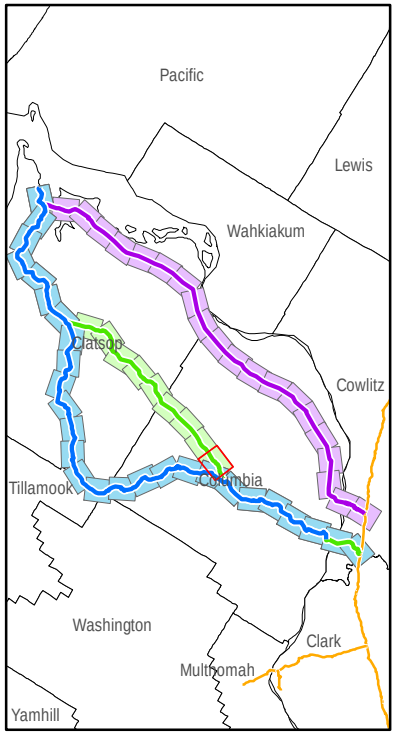
Appendix 10D

Figure 2-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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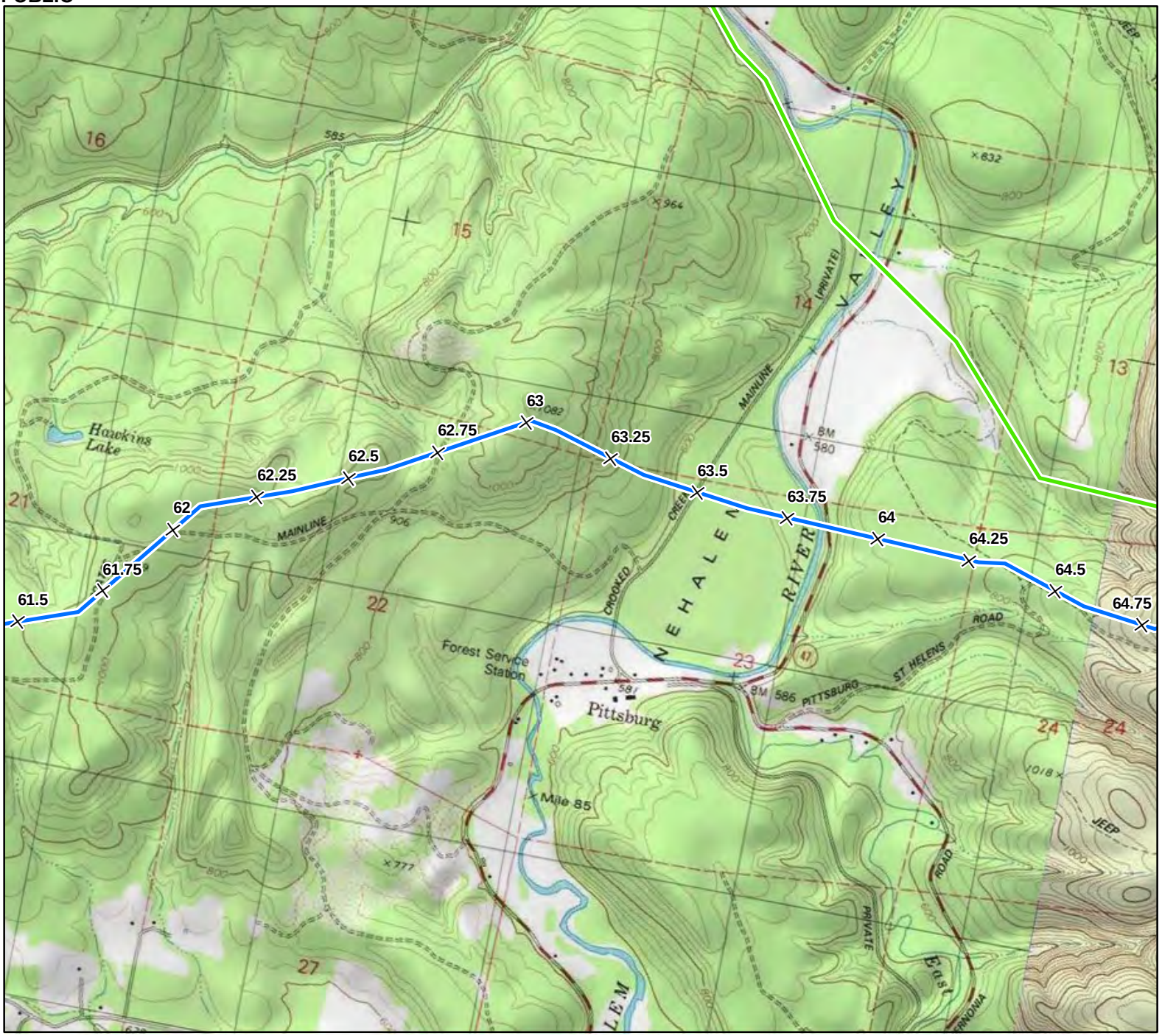


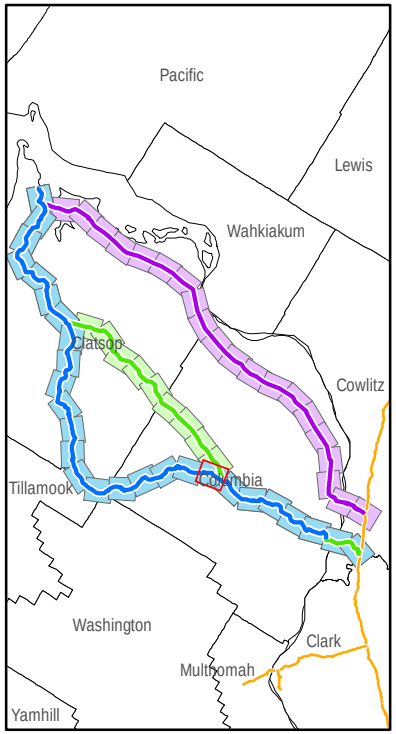
Appendix 10D

Figure 2-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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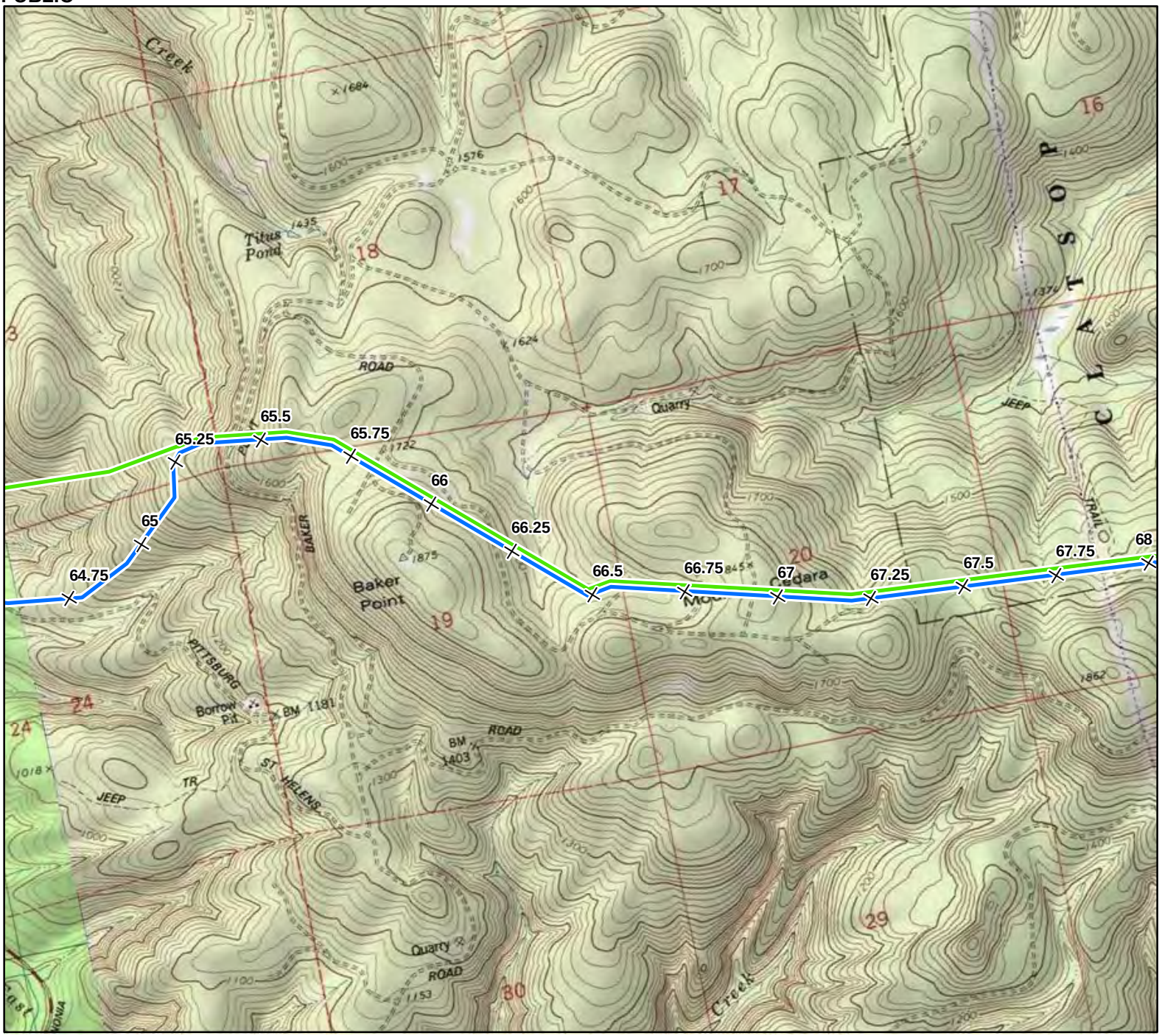


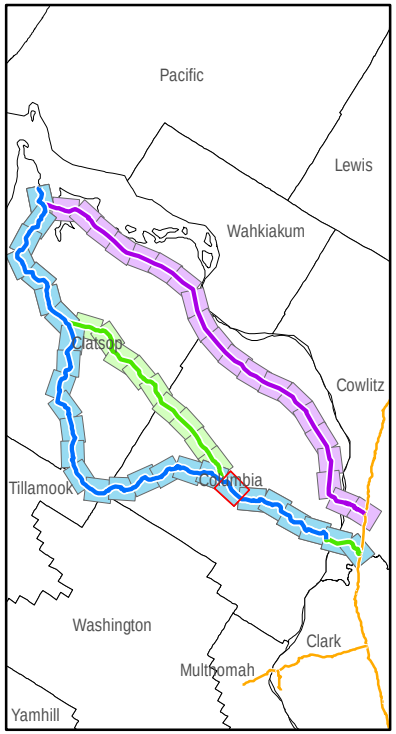
Appendix 10D

Figure 2-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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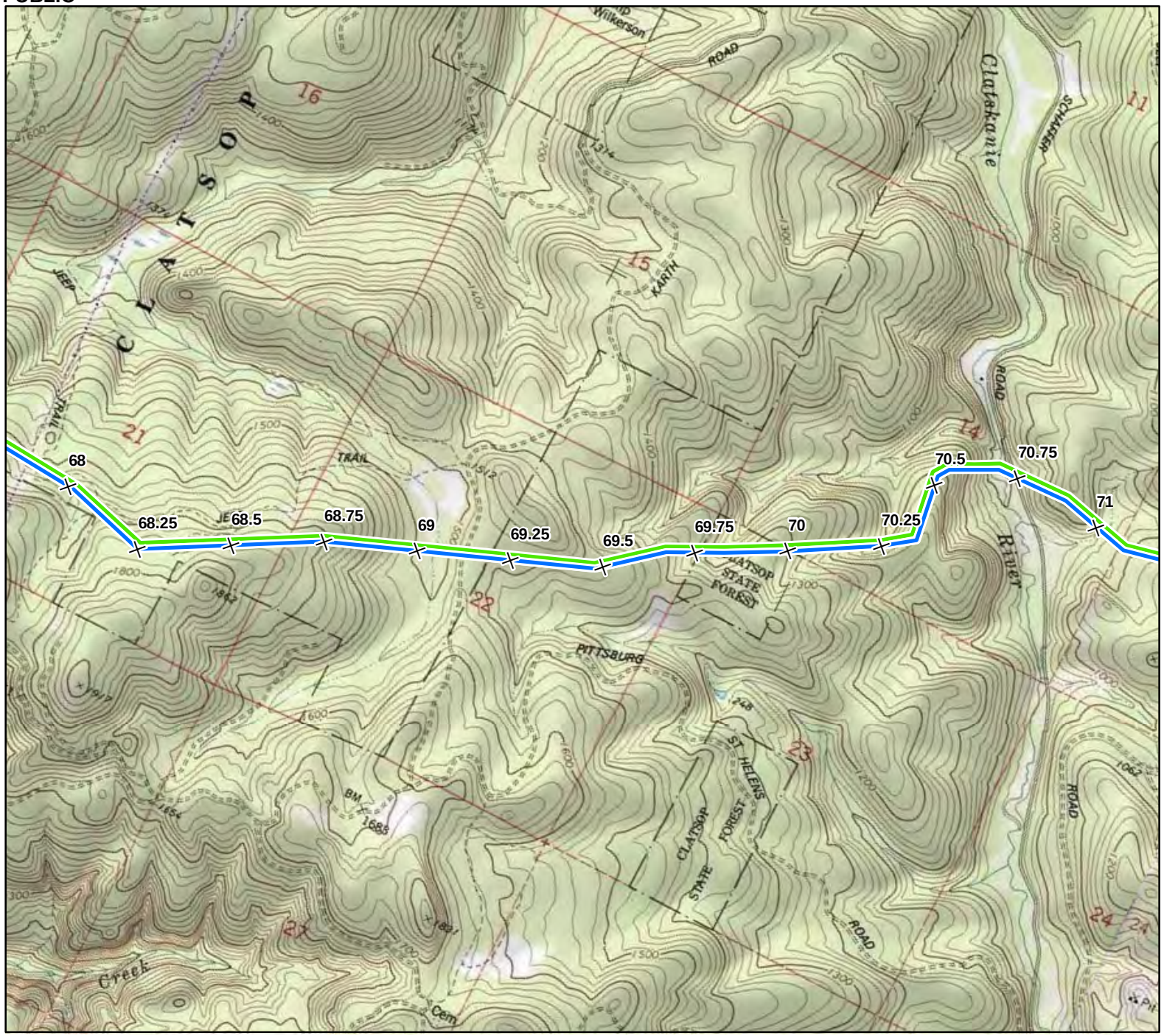


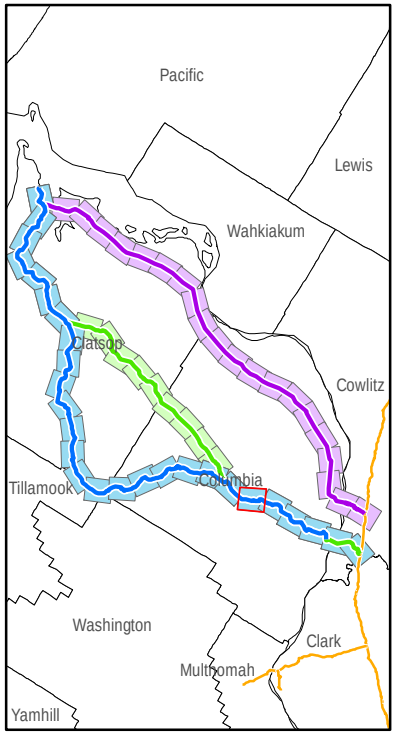
Appendix 10D

Figure 2-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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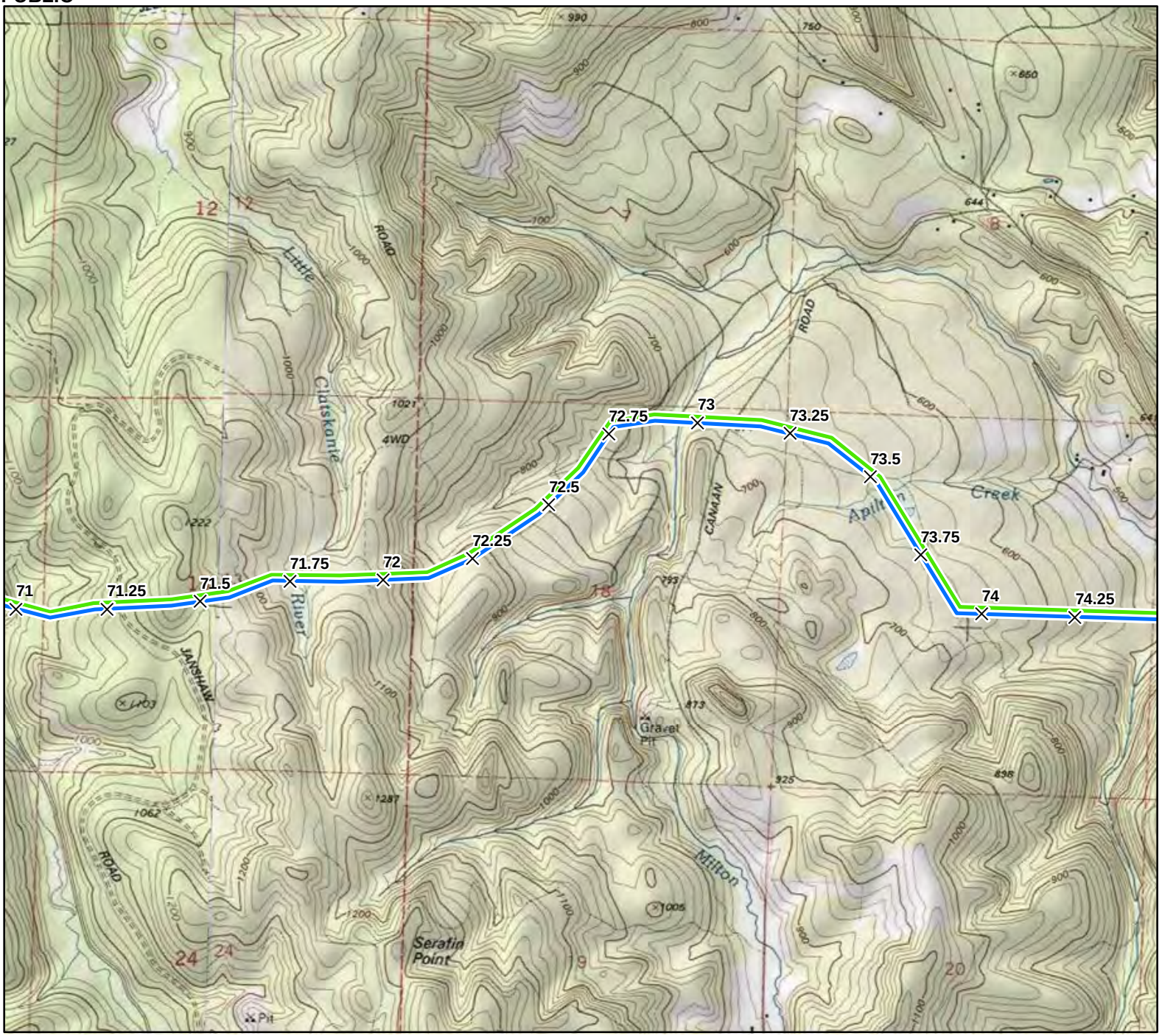


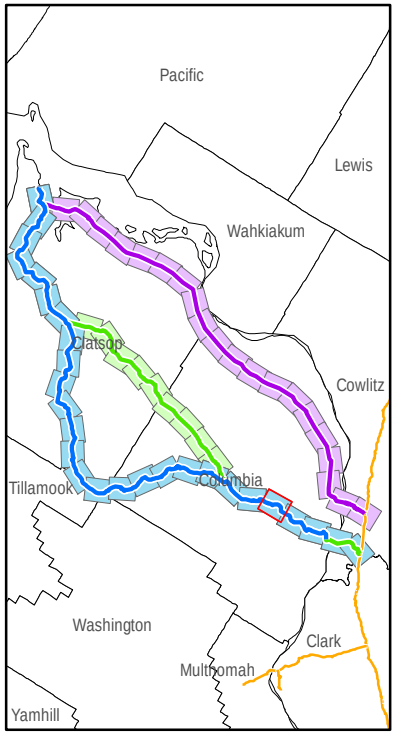
Appendix 10D

Figure 2-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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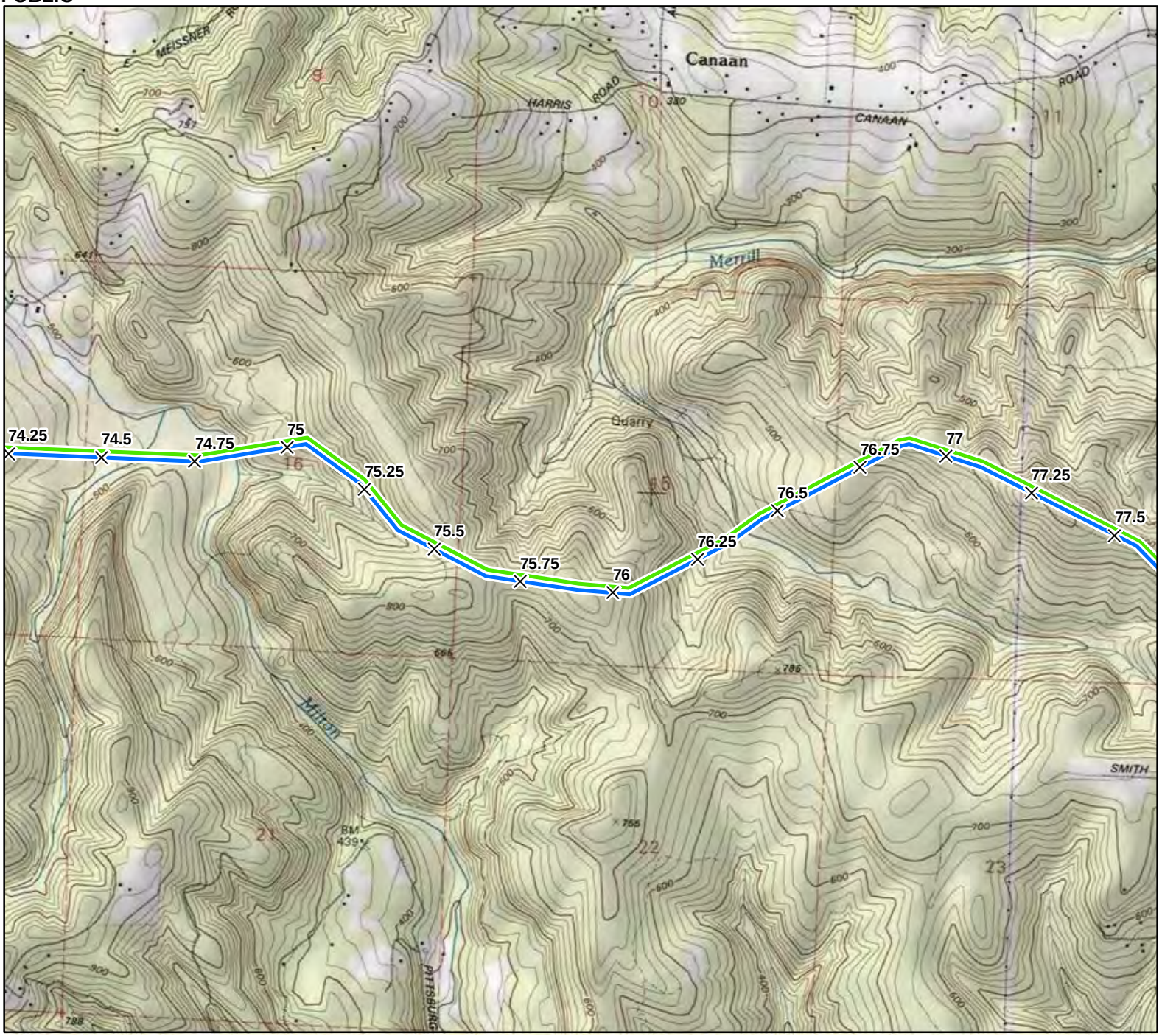


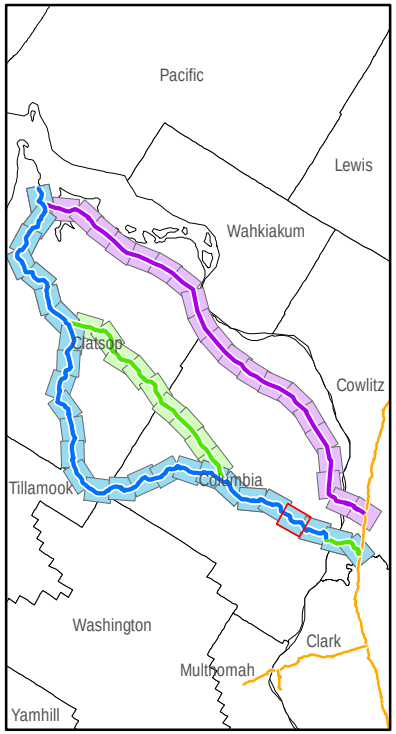
Appendix 10D

Figure 2-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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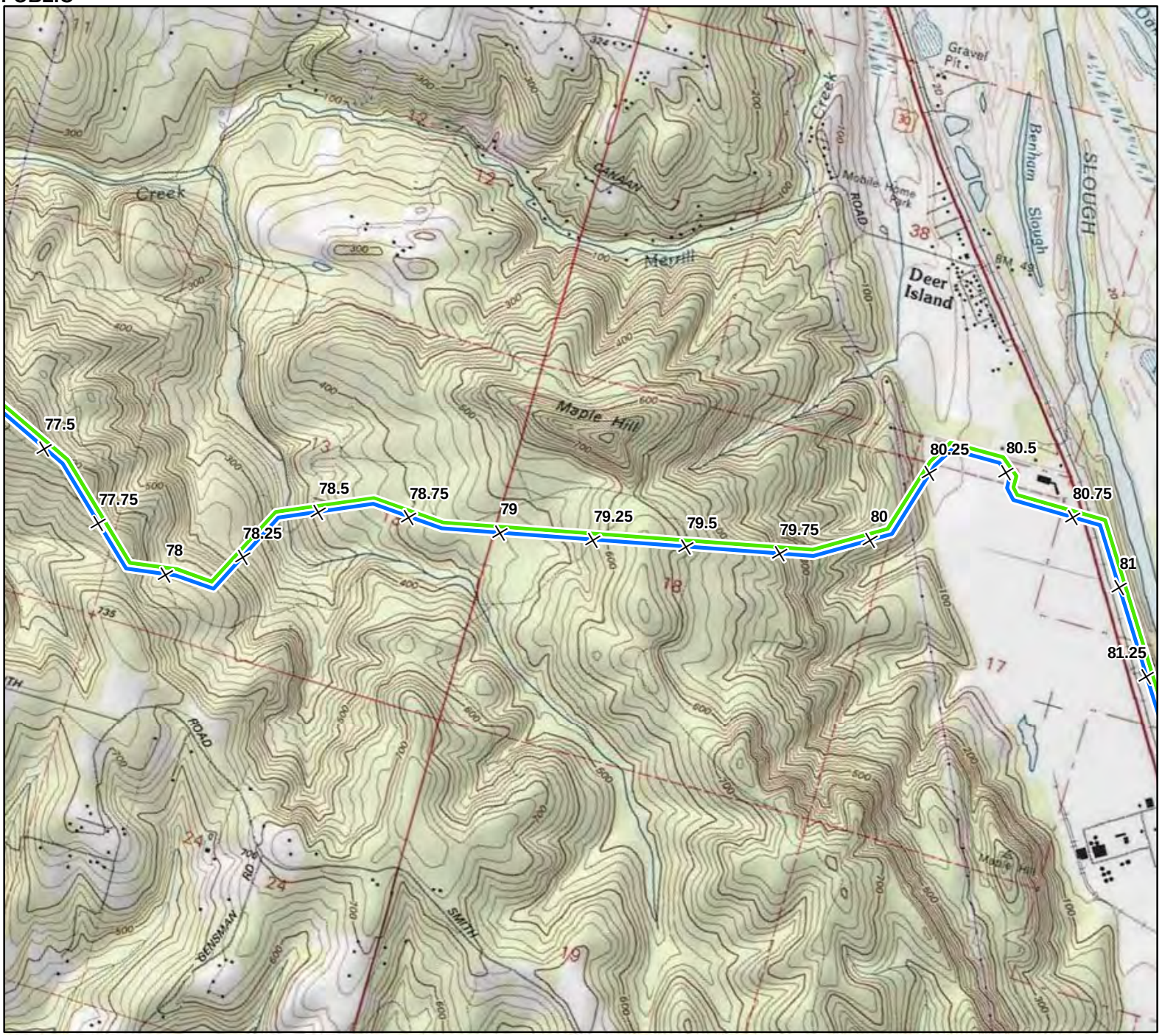


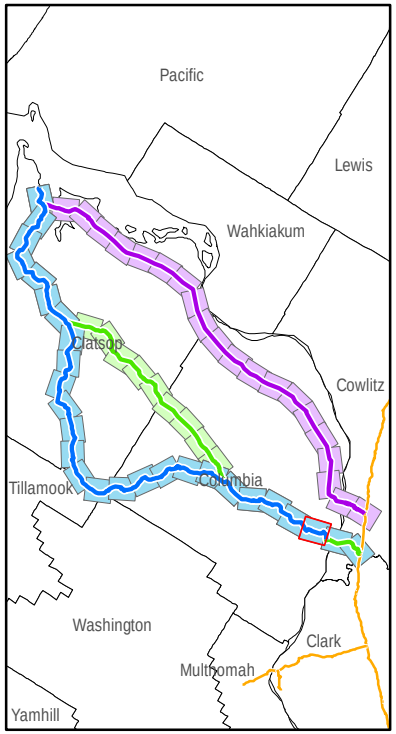
Appendix 10D

Figure 2-22

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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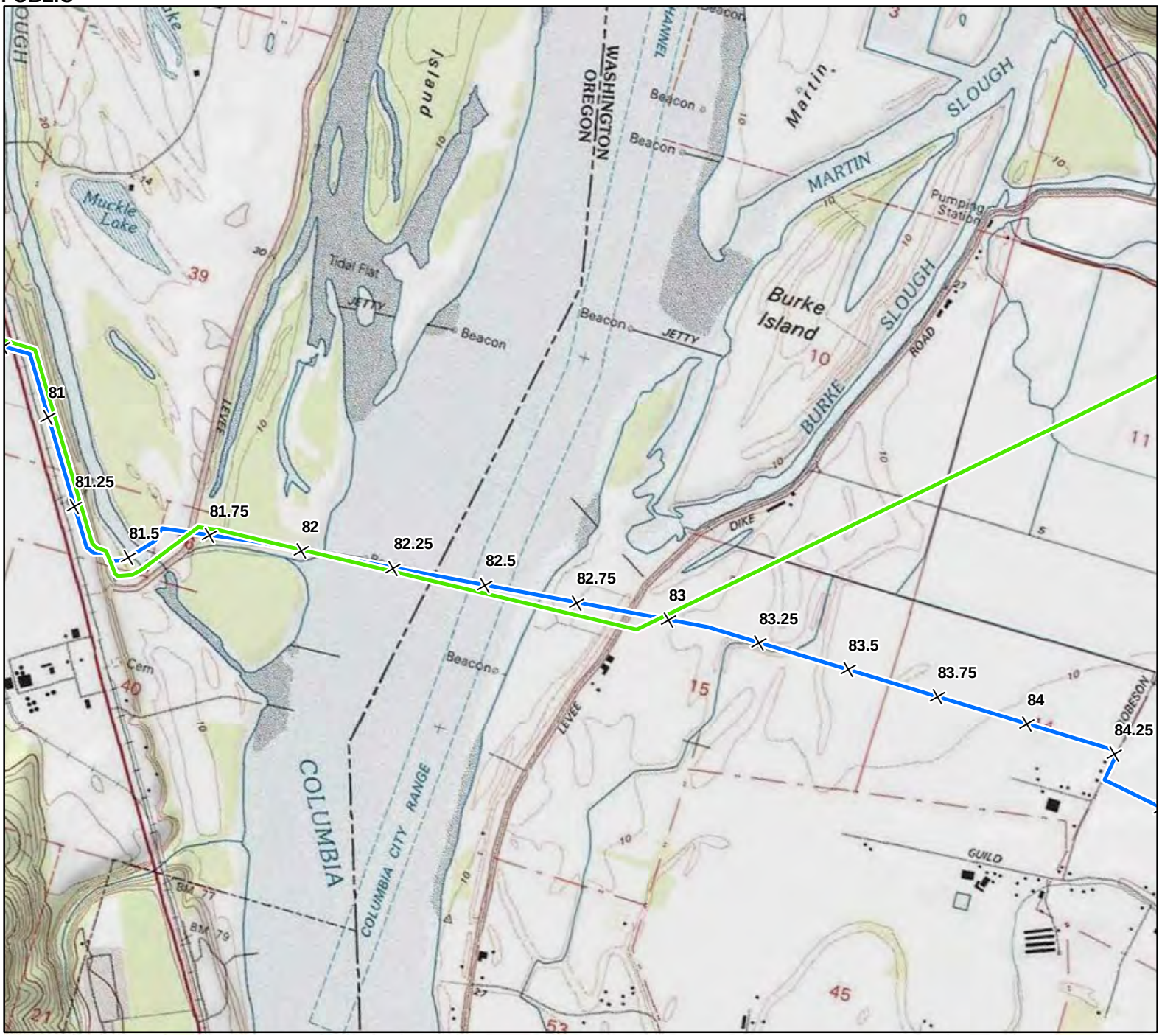


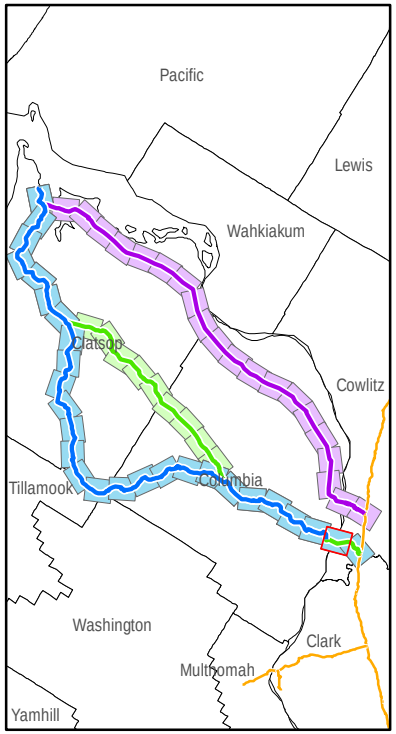
Appendix 10D

Figure 2-23

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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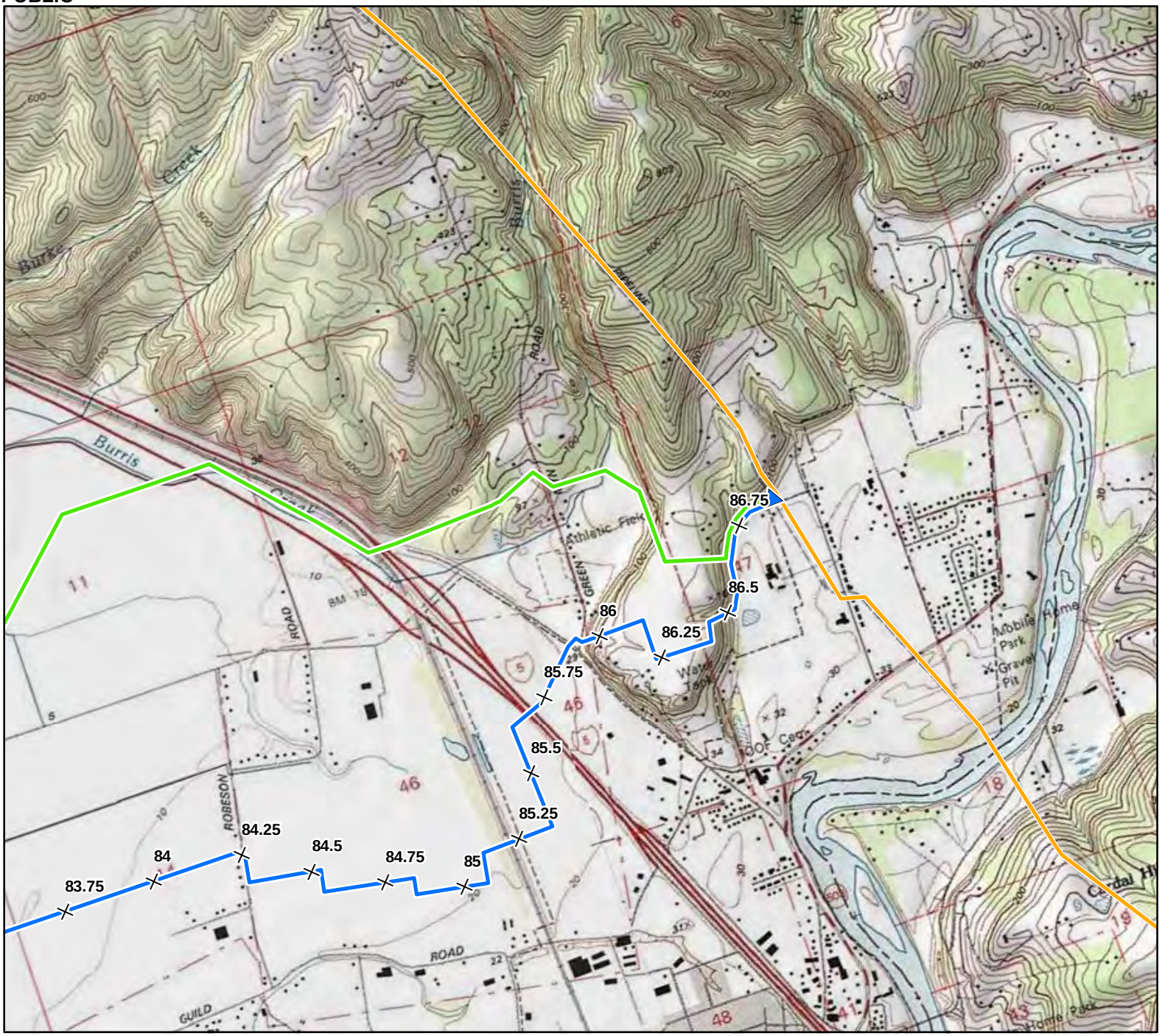


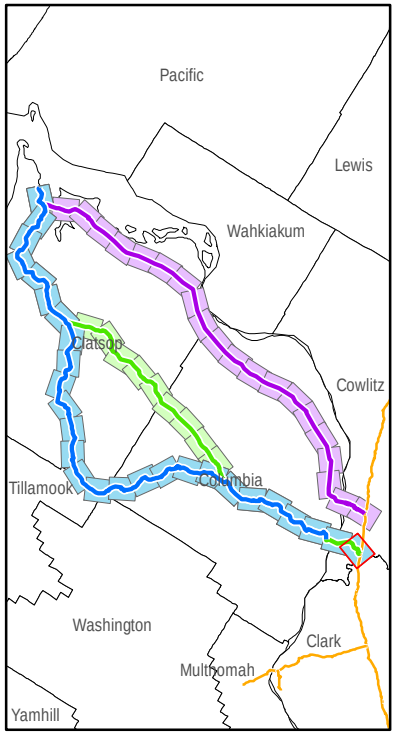
Appendix 10D

Figure 2-24

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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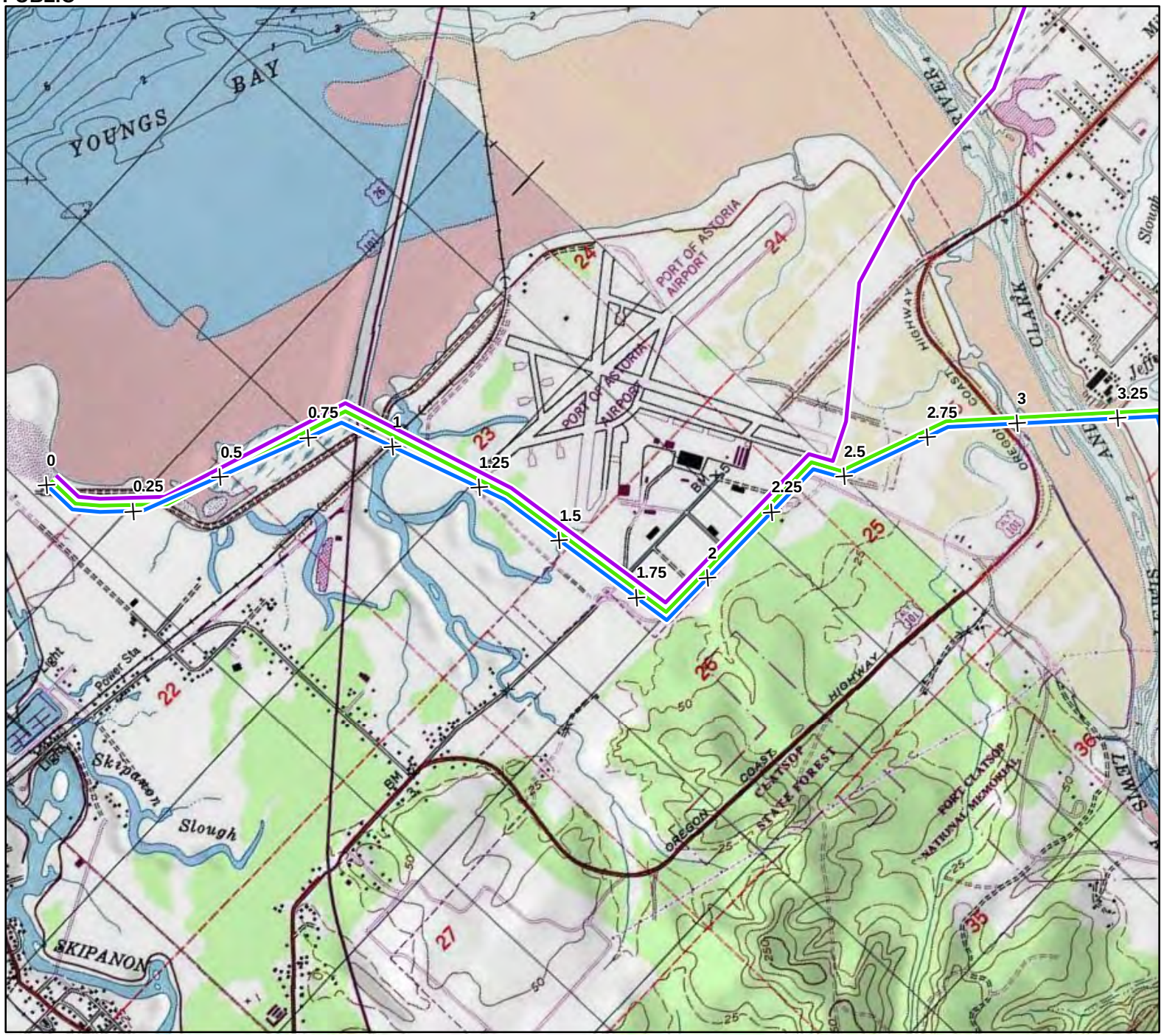


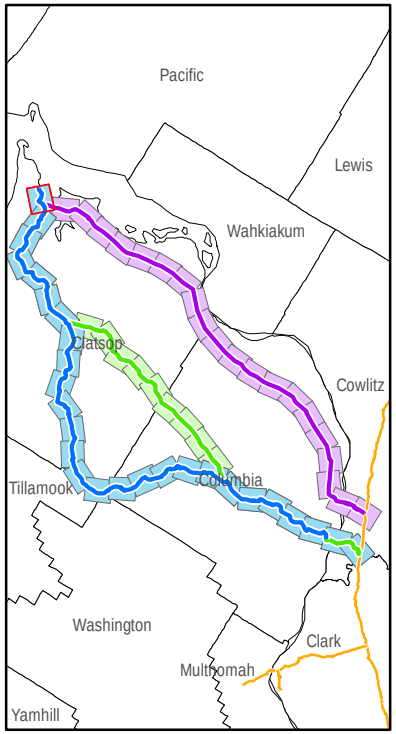
Appendix 10D

Figure 3-1

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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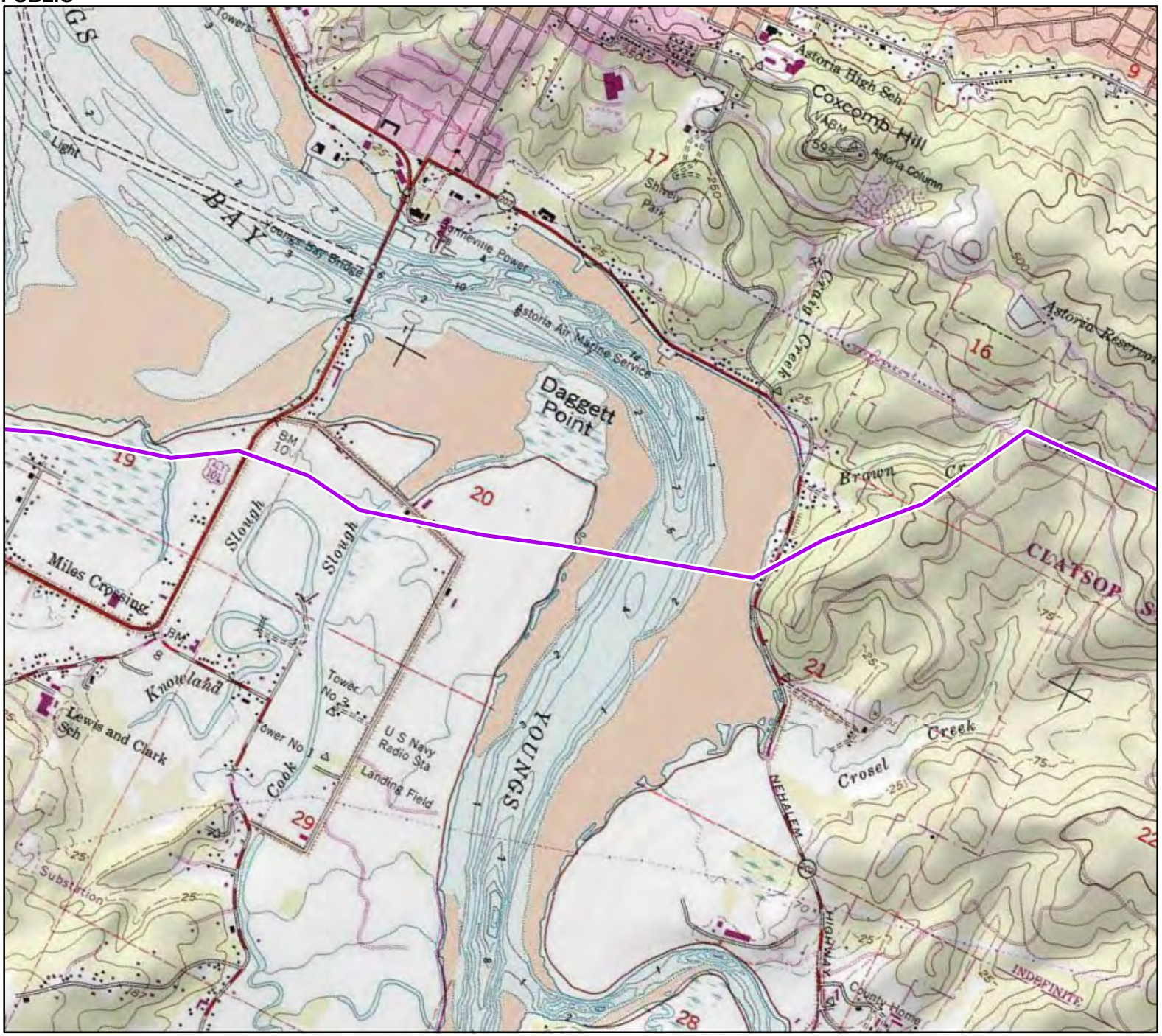


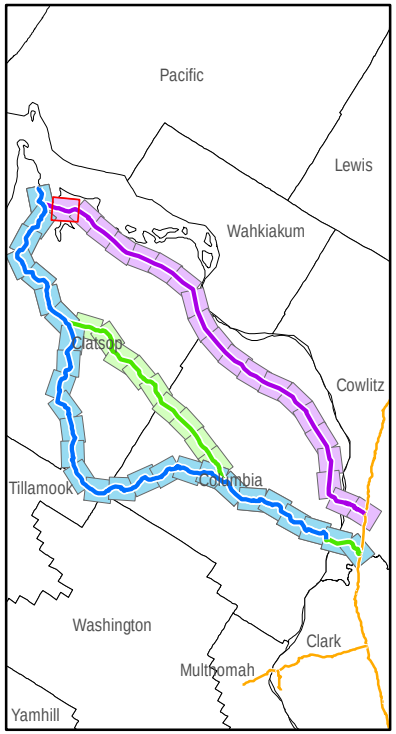
Appendix 10D

Figure 3-2

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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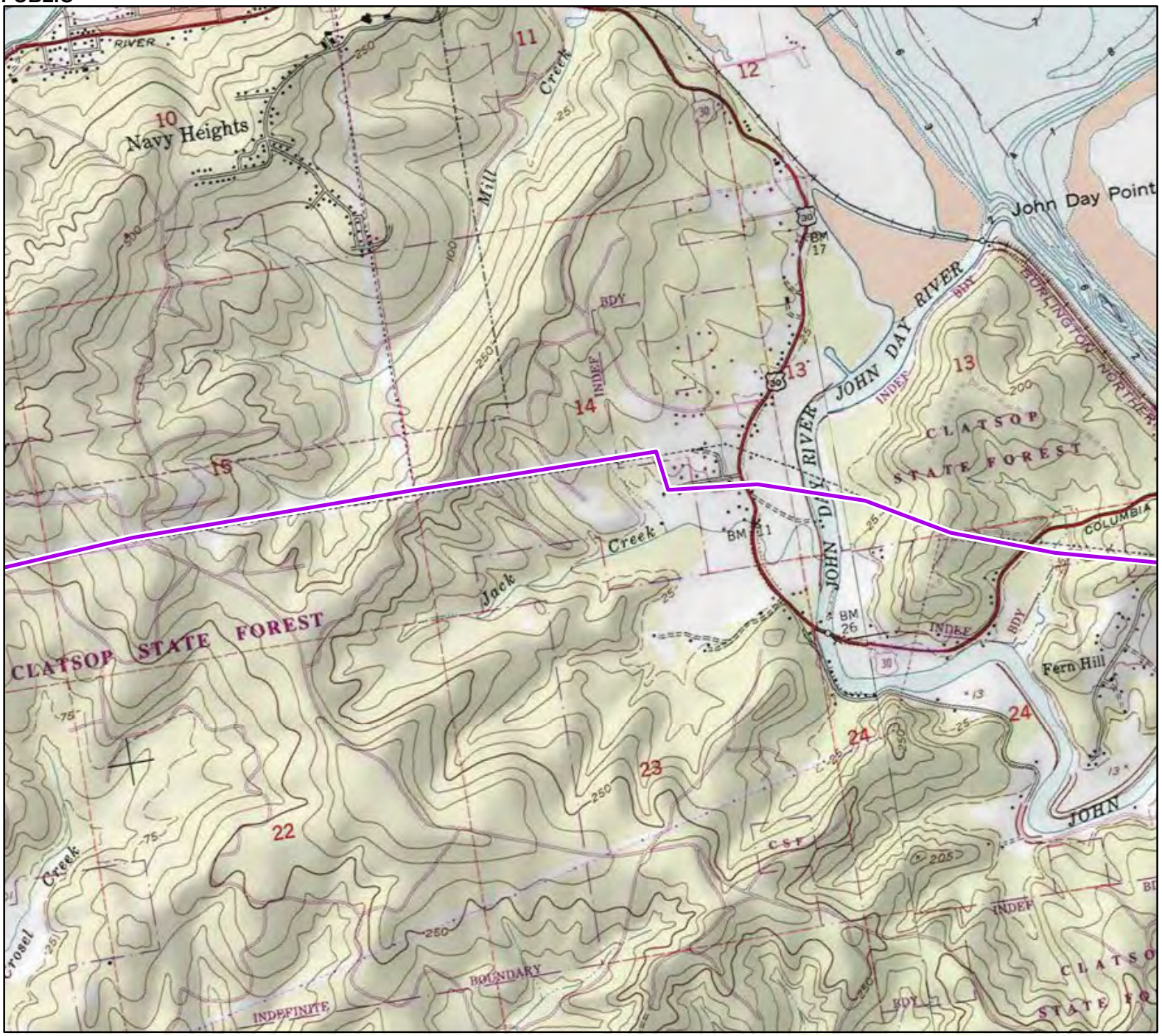


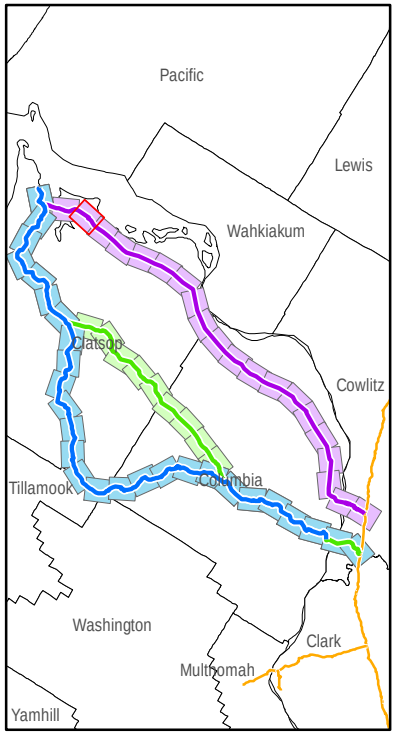
Appendix 10D

Figure 3-3

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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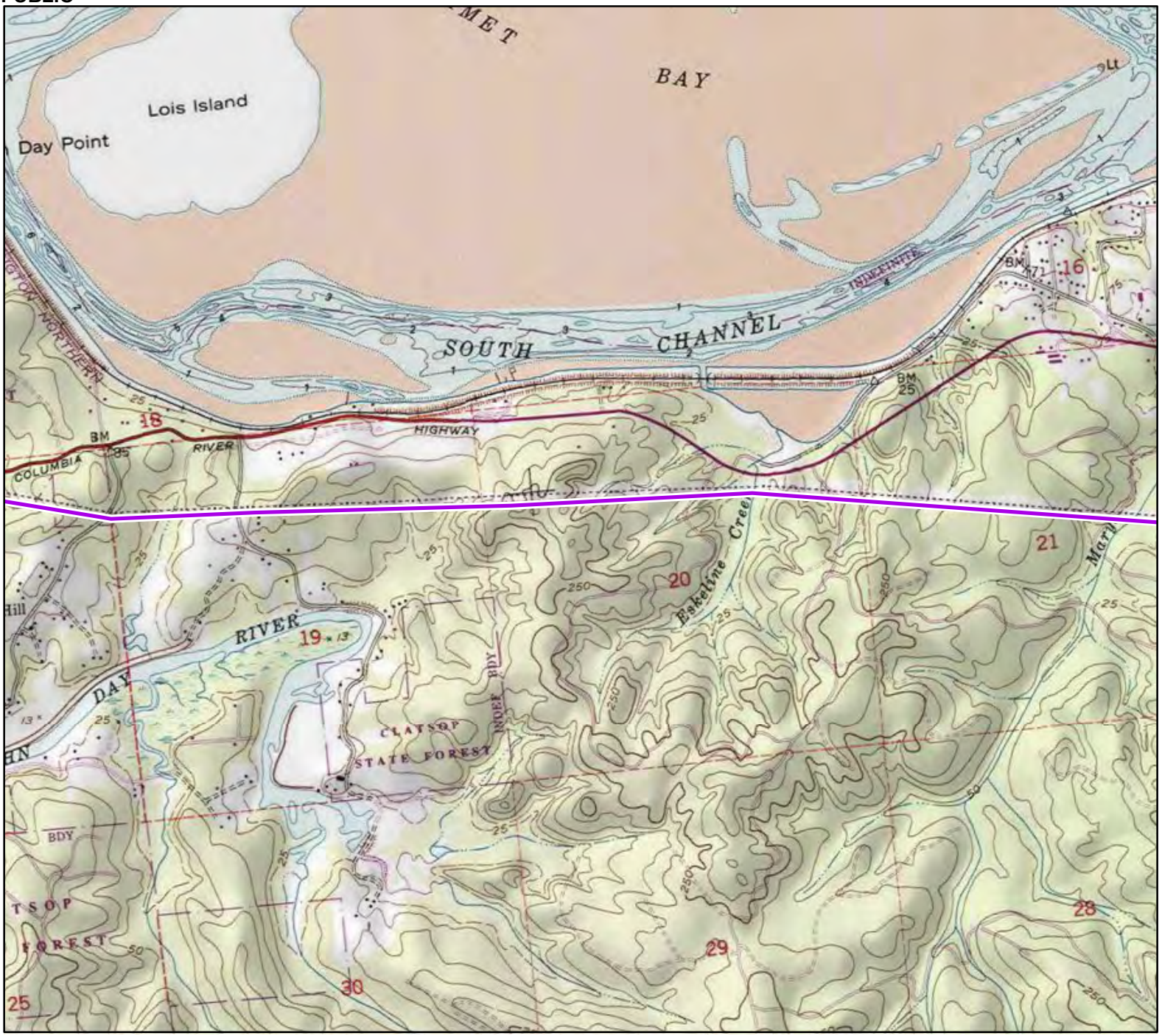


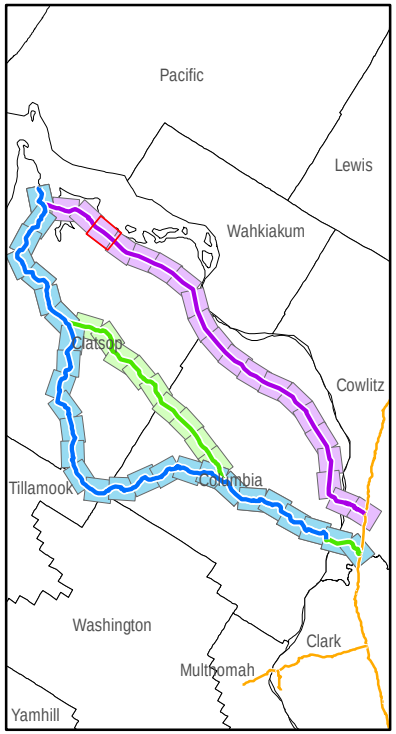
Appendix 10D

Figure 3-4

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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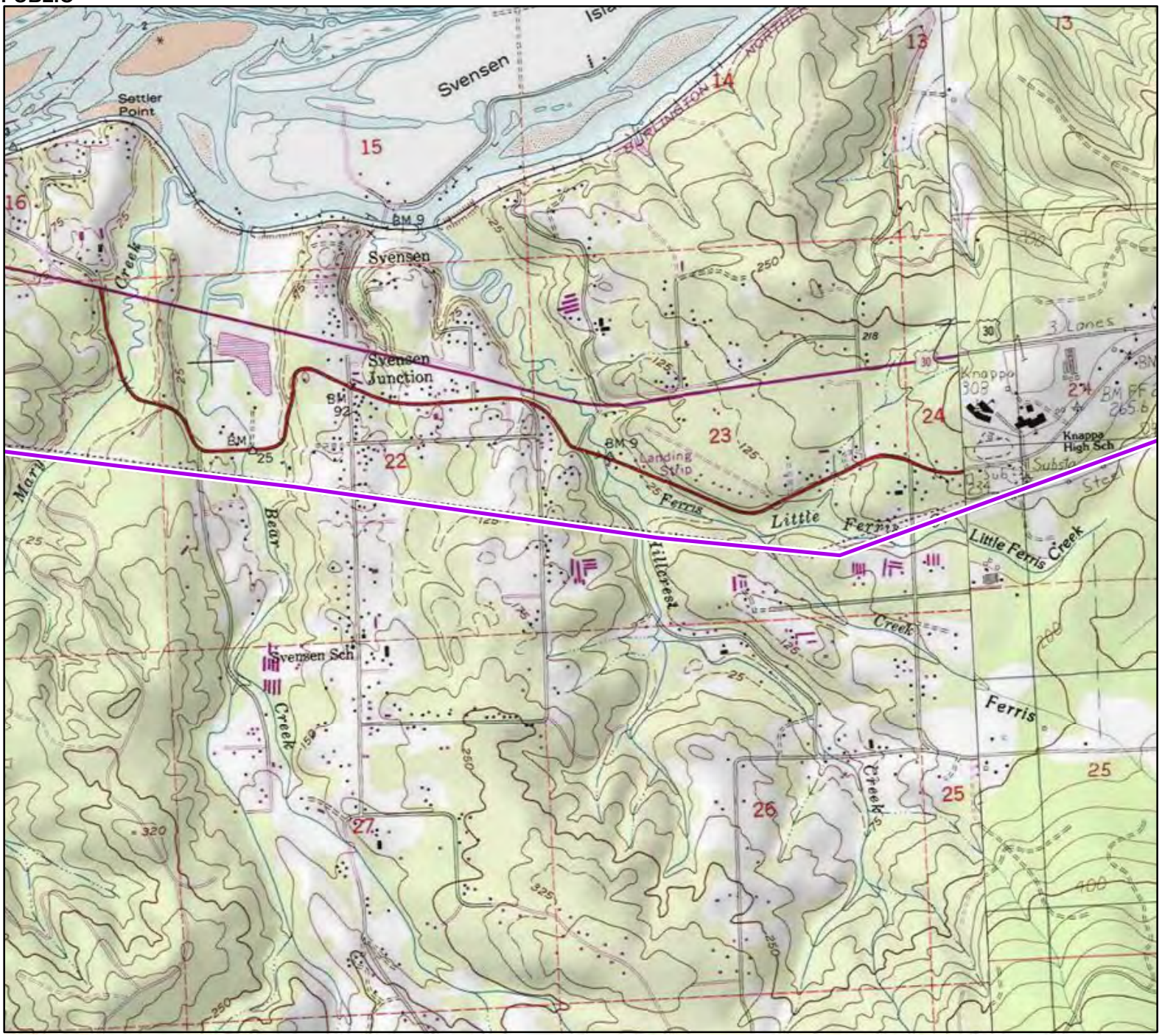


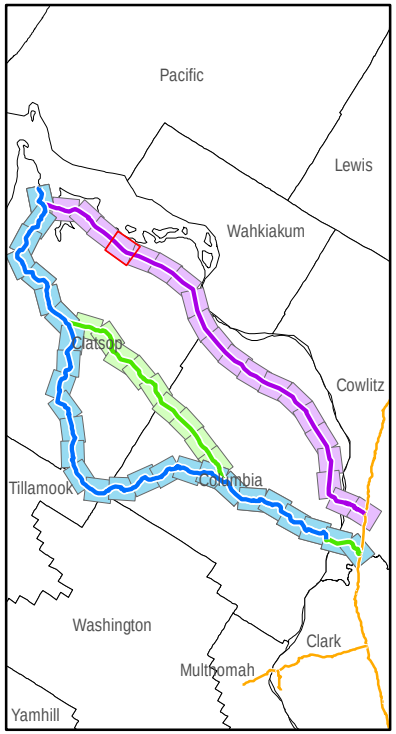
Appendix 10D

Figure 3-5

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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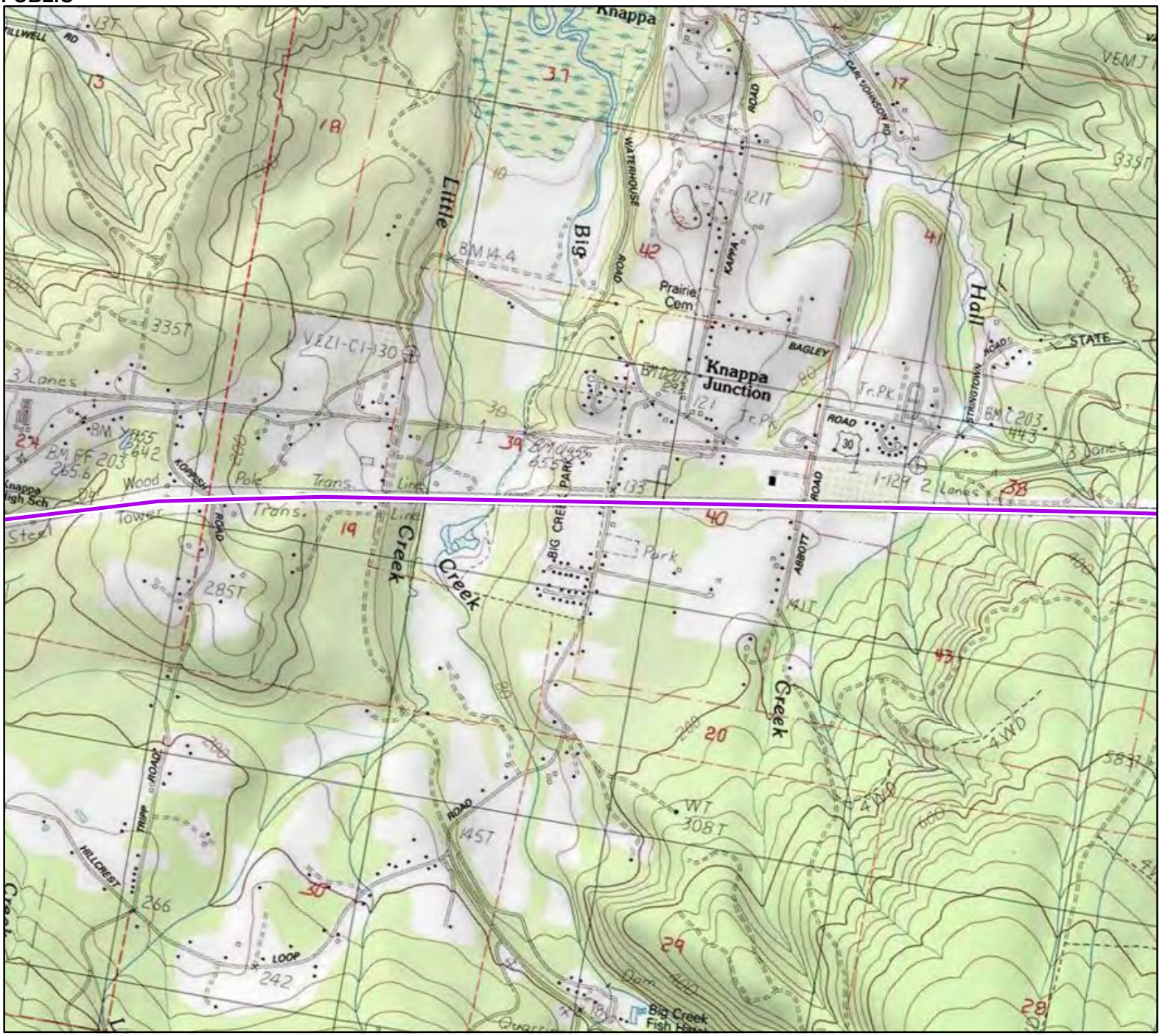


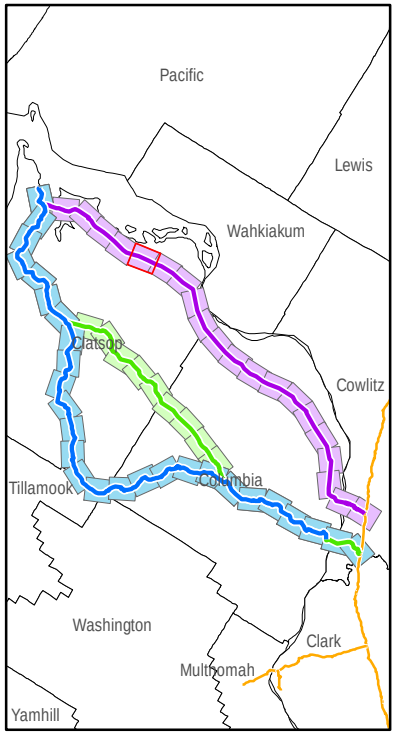
Appendix 10D

Figure 3-6

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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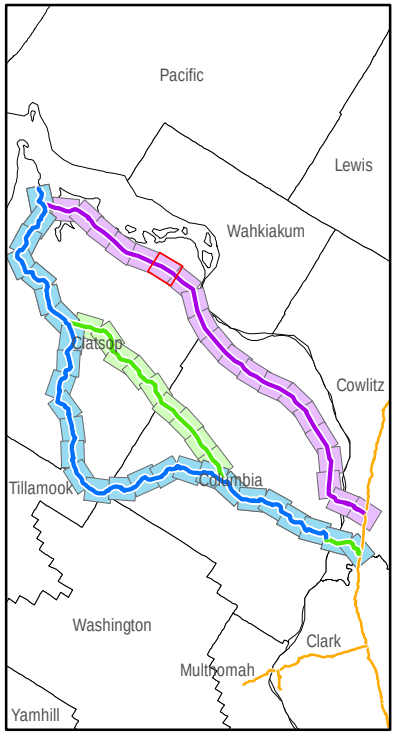
Appendix 10D

Figure 3-7

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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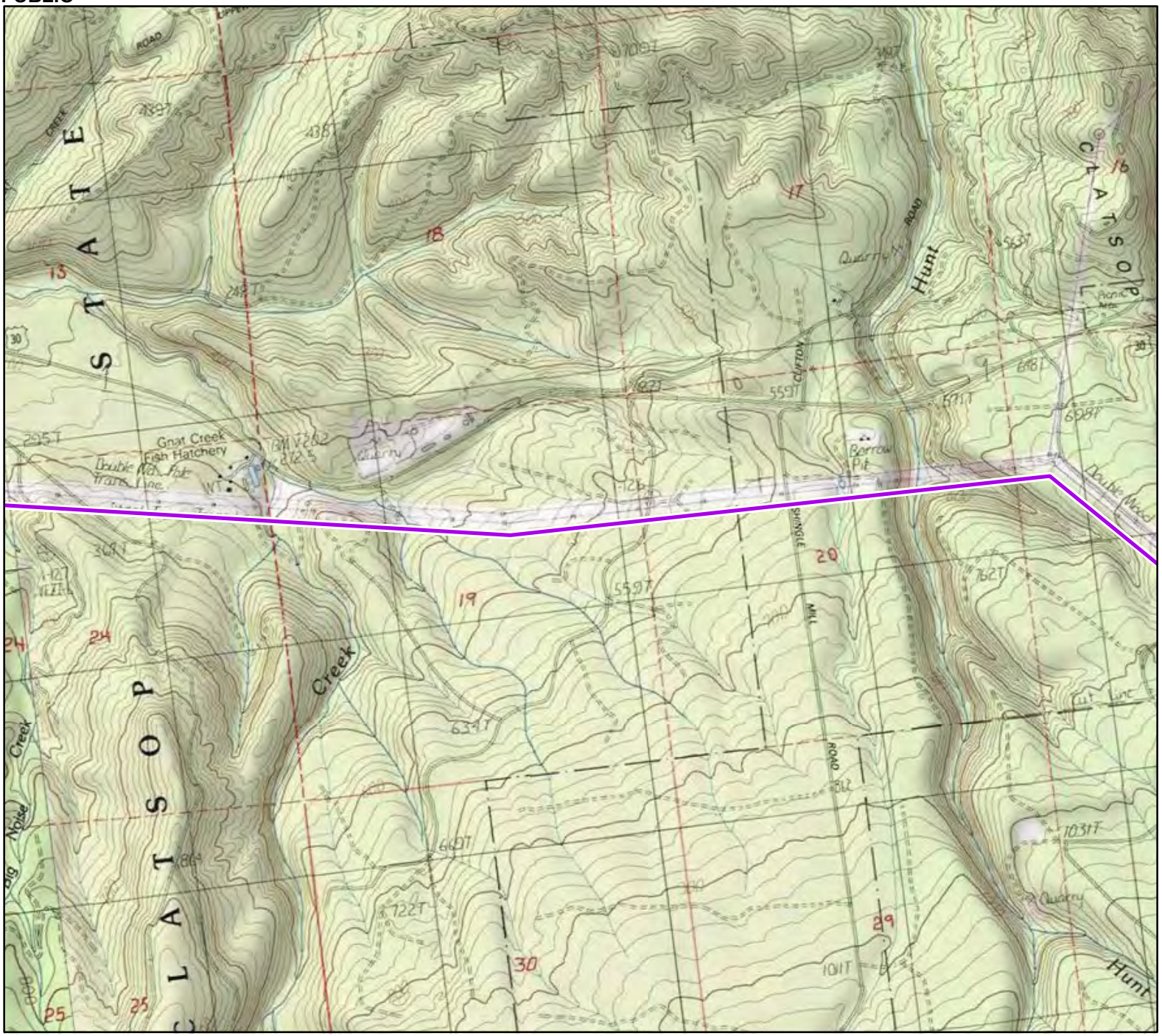


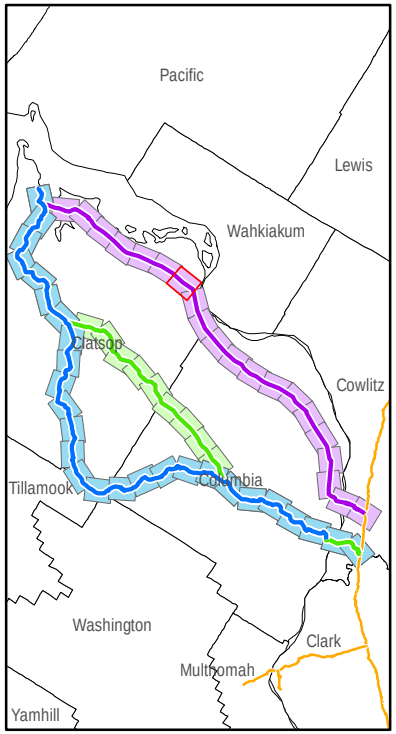
Appendix 10D

Figure 3-8

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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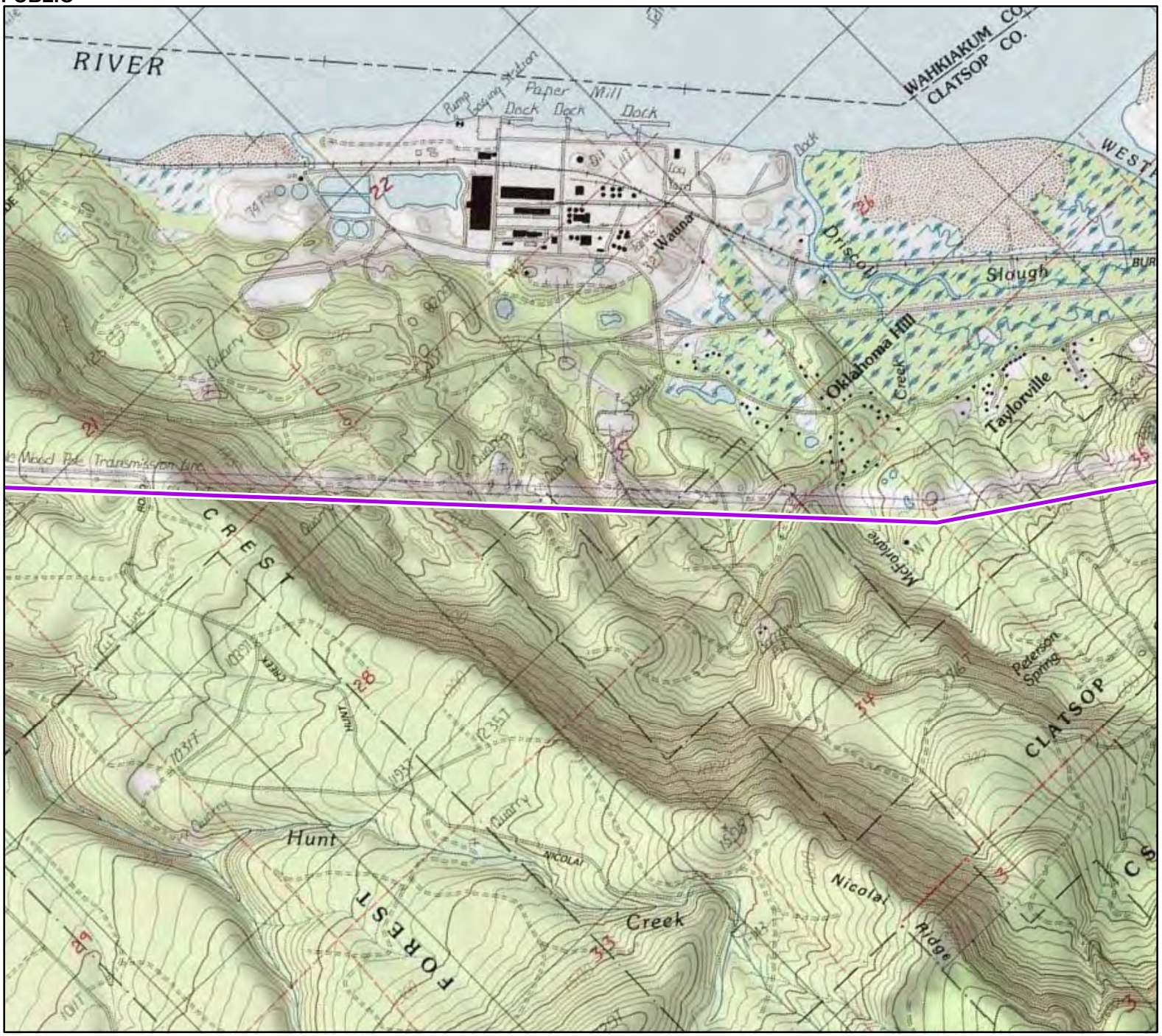


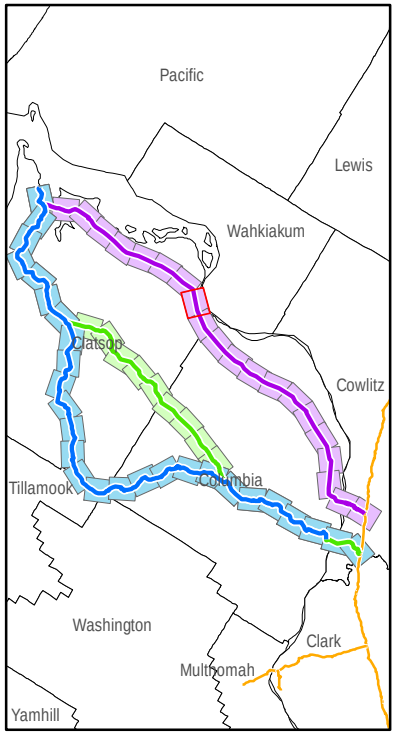
Appendix 10D

Figure 3-9

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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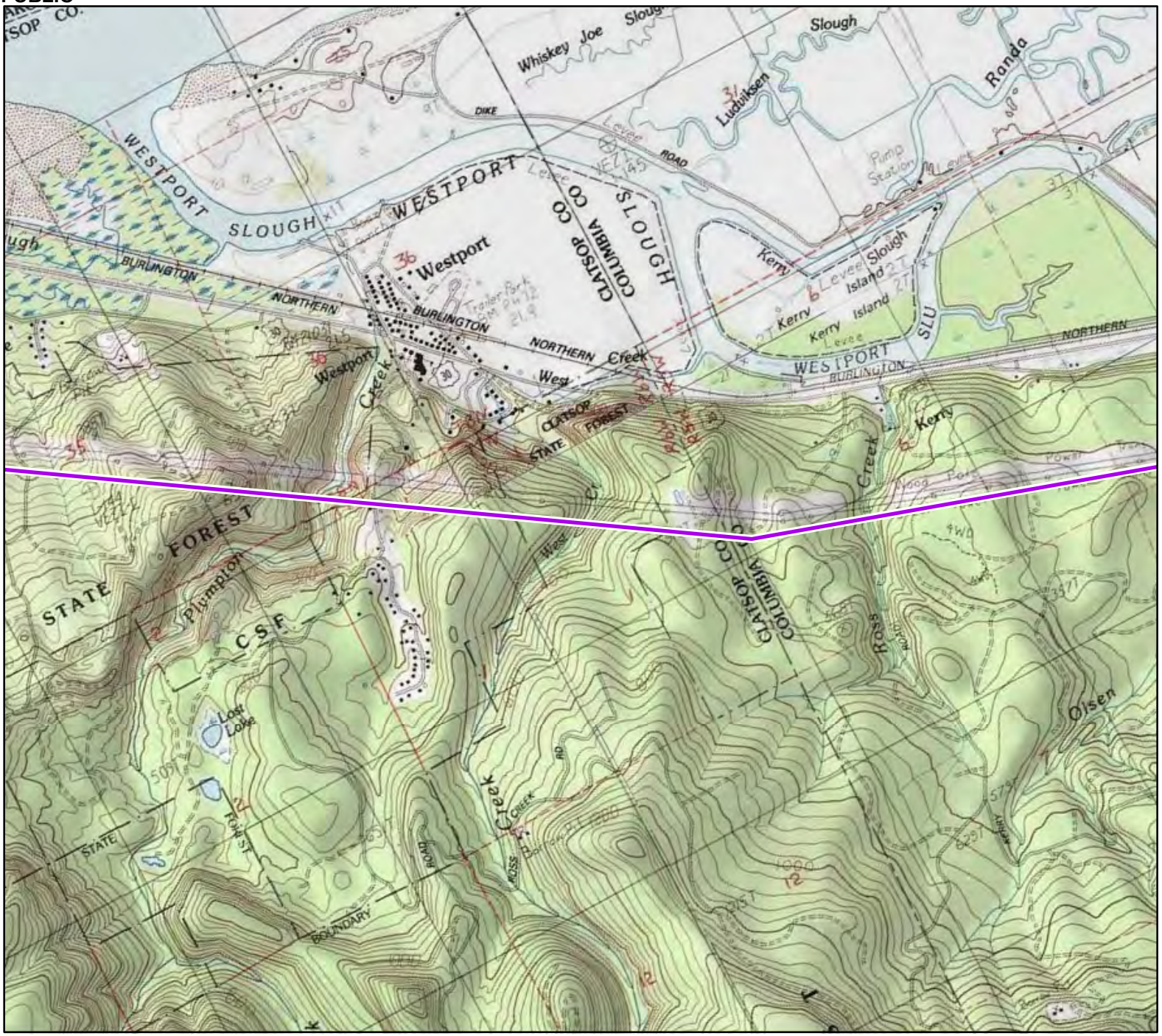


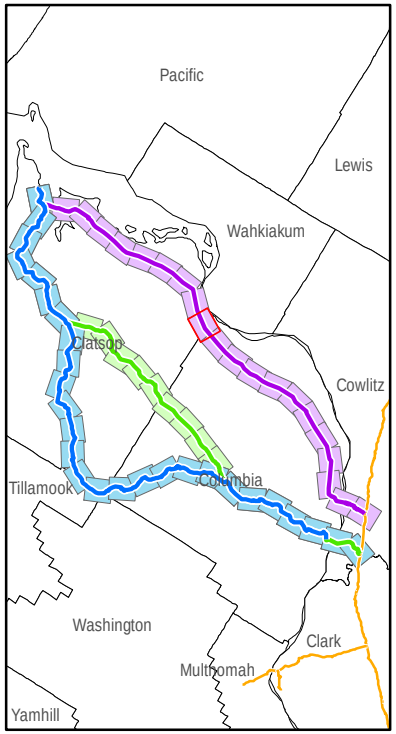
Appendix 10D

Figure 3-10

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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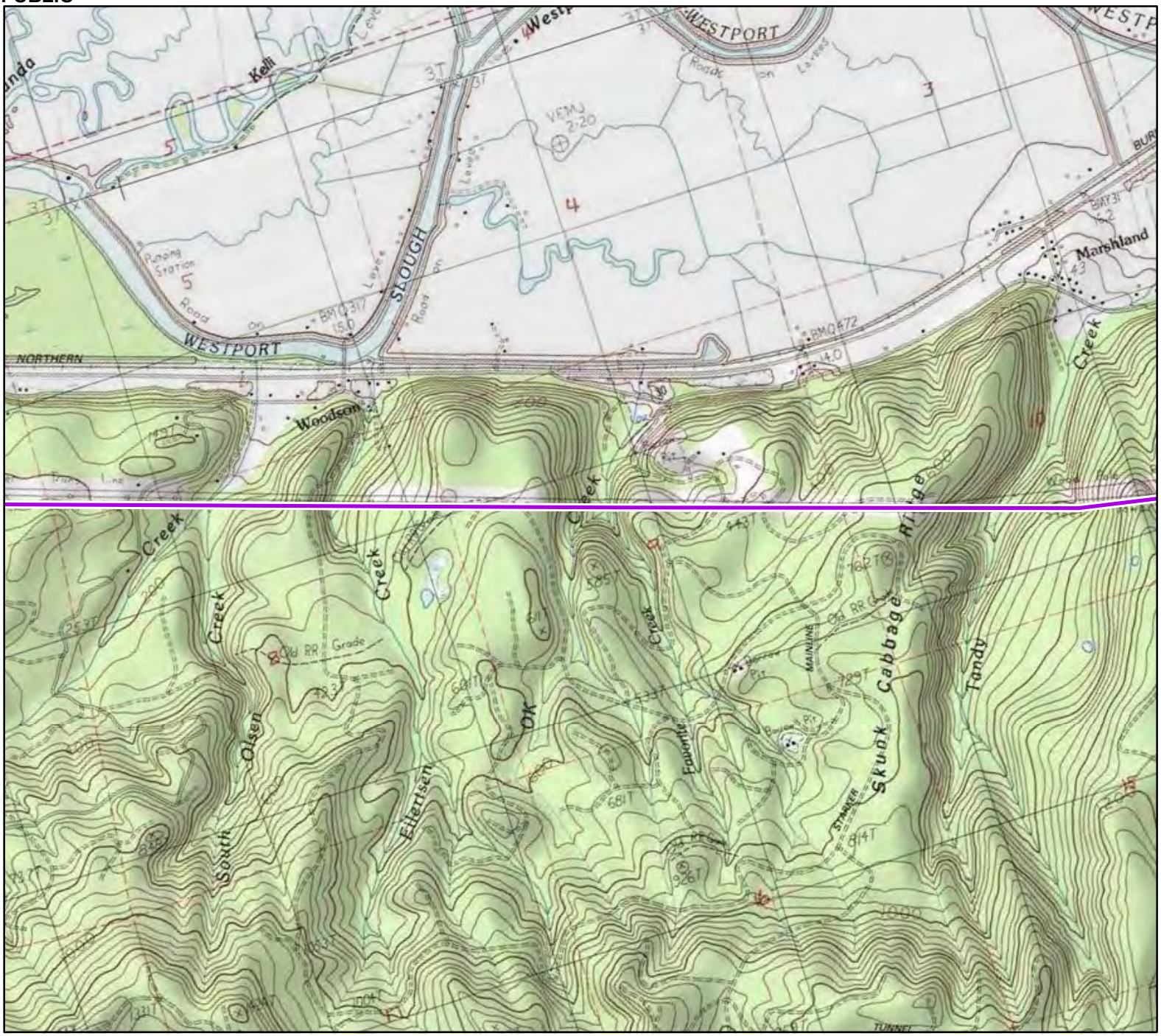


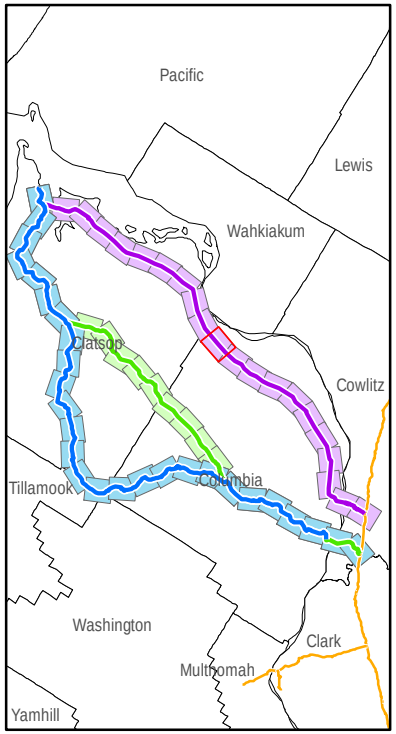
Appendix 10D

Figure 3-11

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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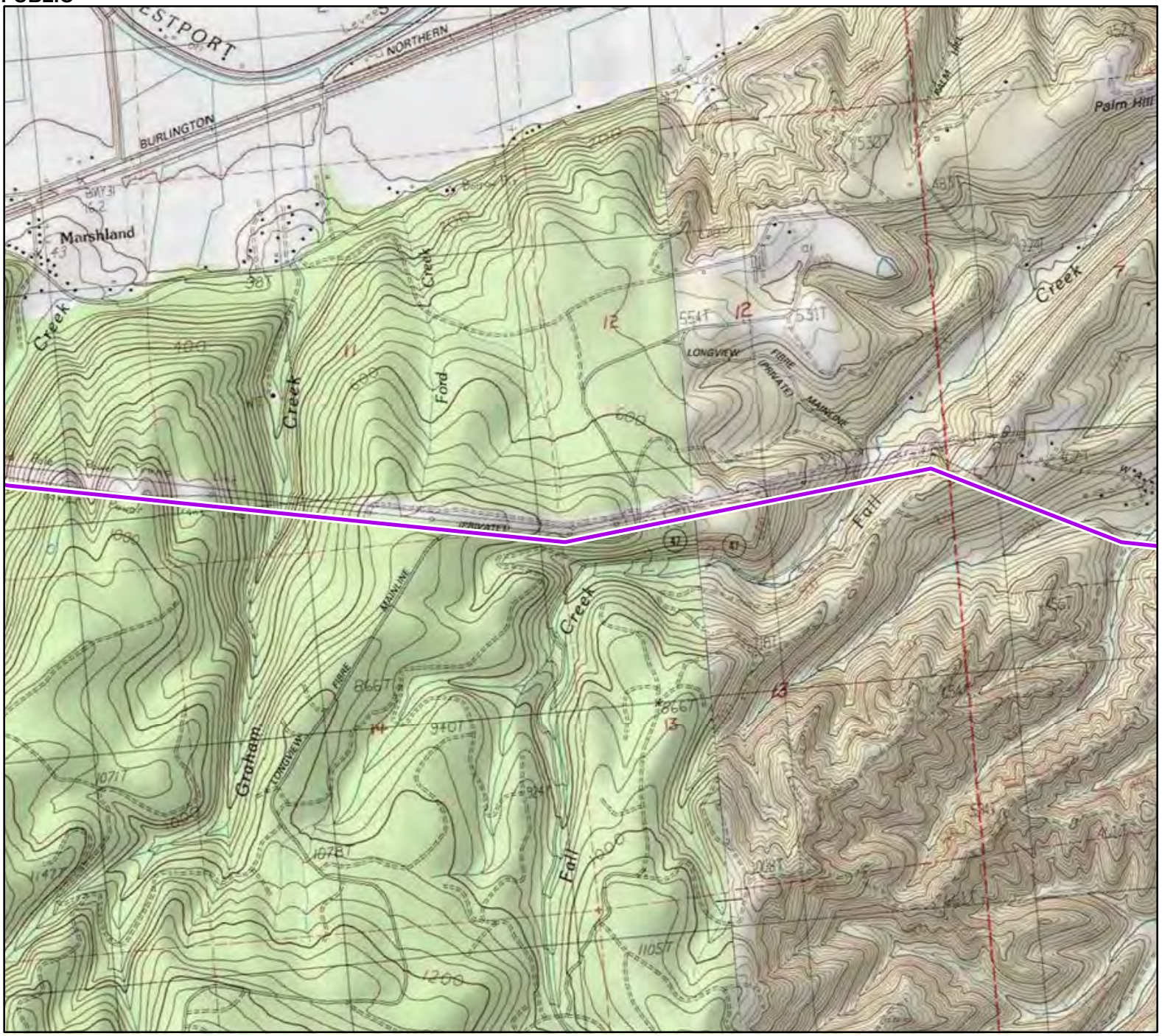


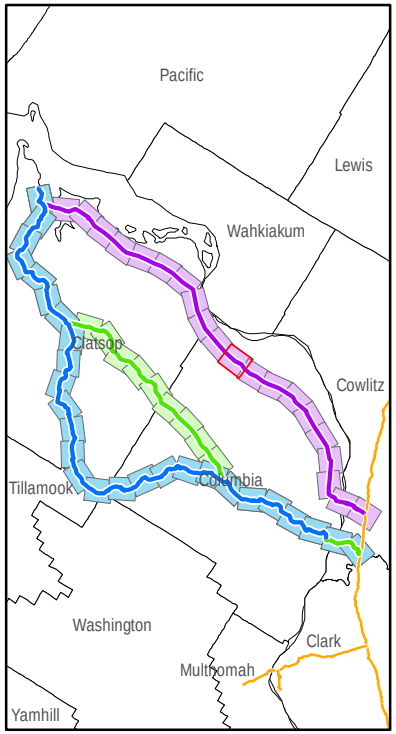
Appendix 10D

Figure 3-12

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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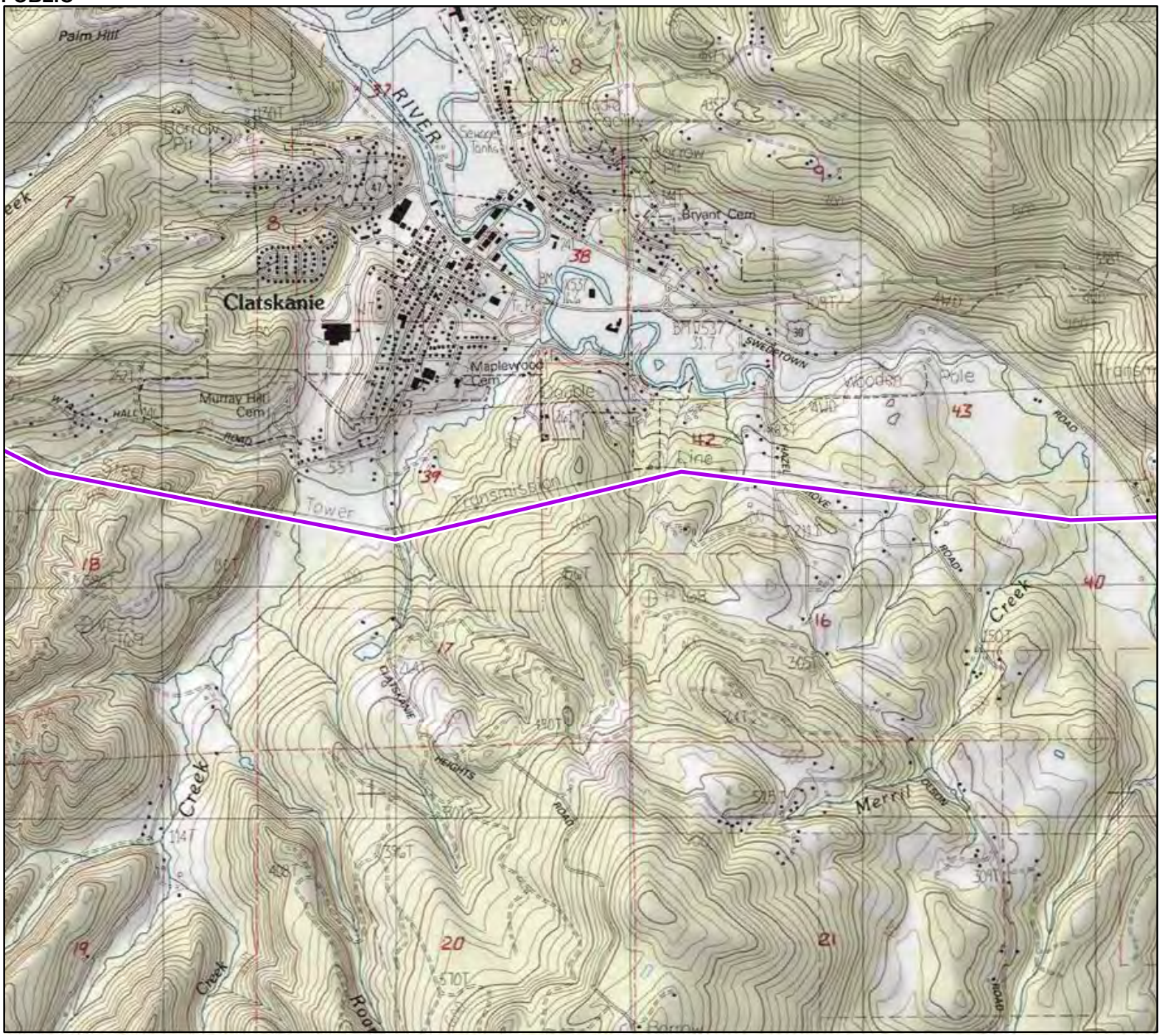


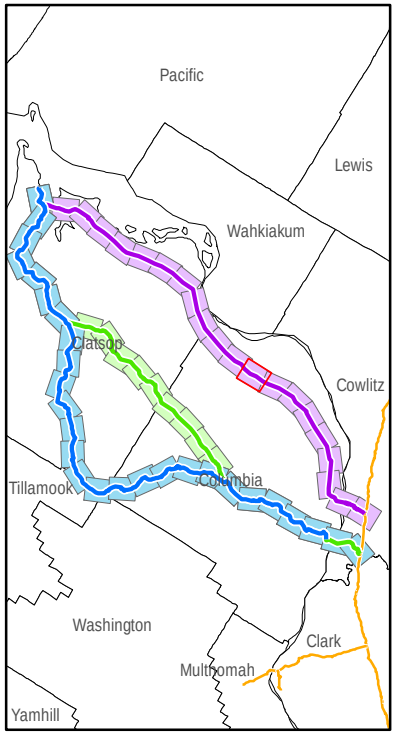
Appendix 10D

Figure 3-13

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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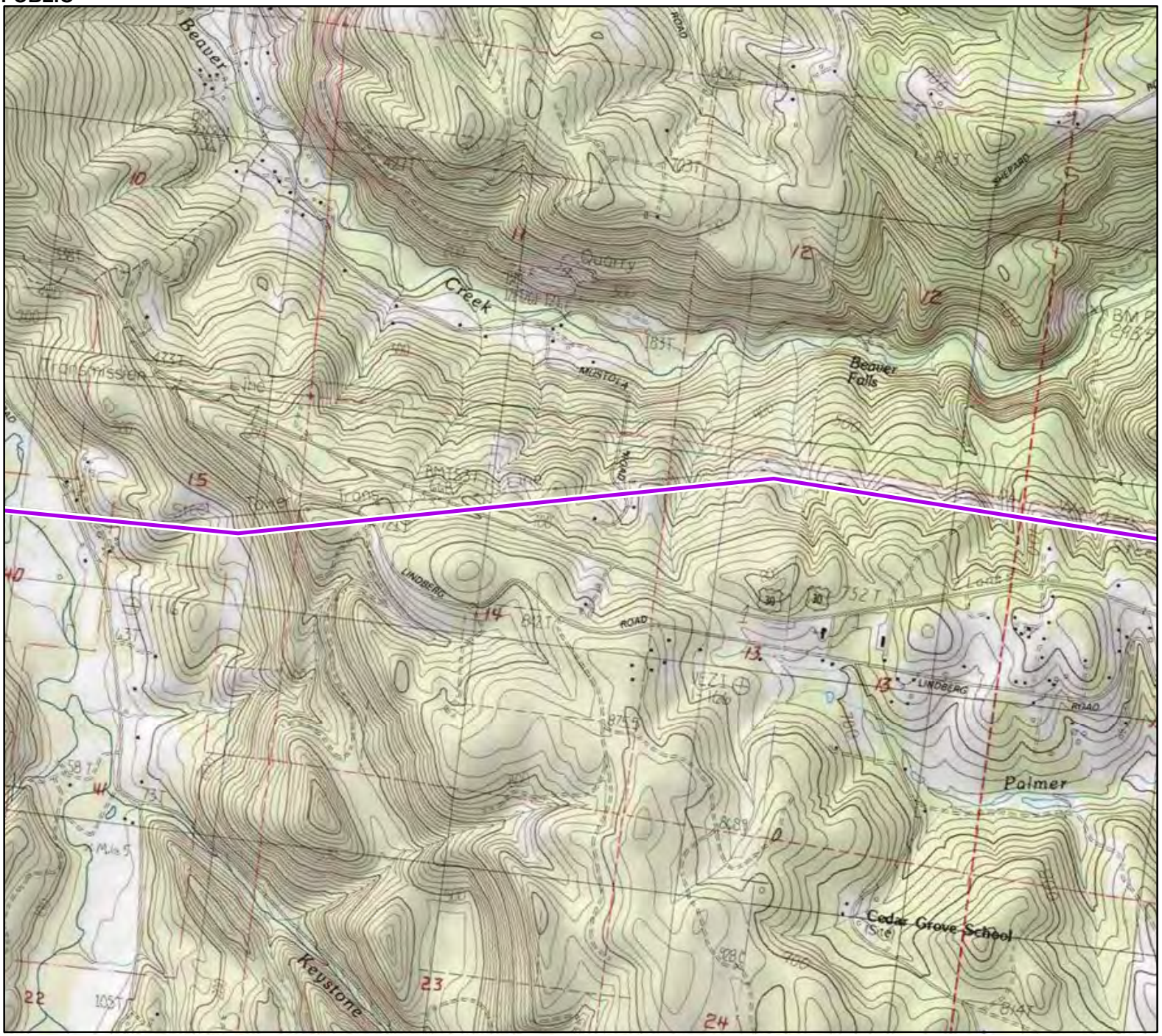


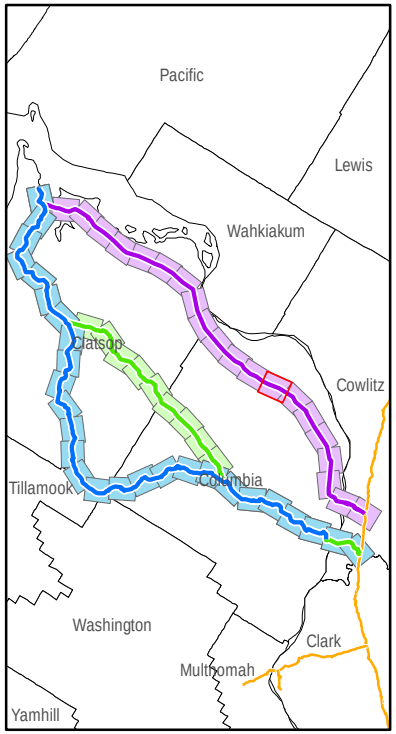
Appendix 10D

Figure 3-14

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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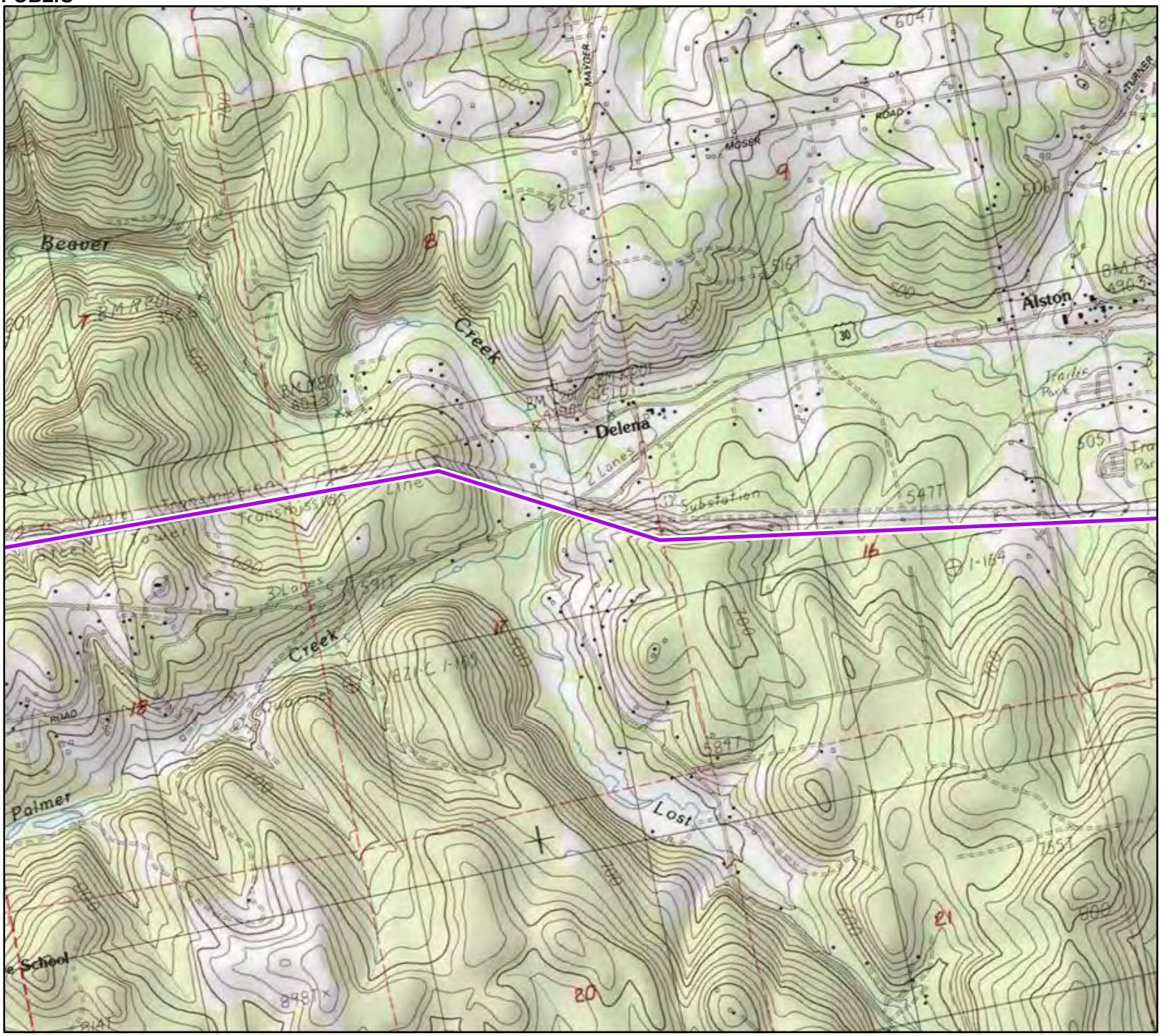


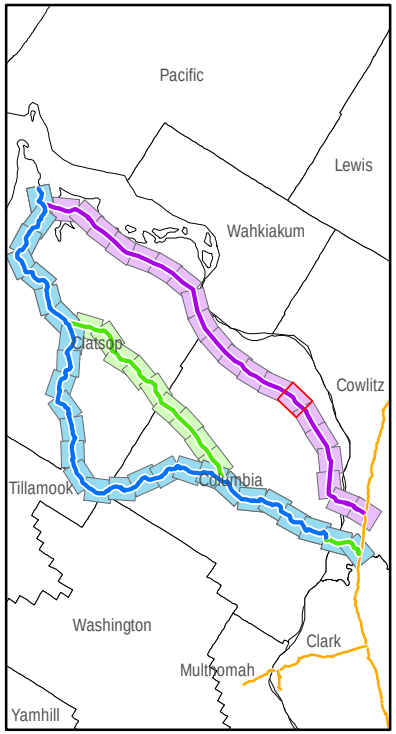
Appendix 10D

Figure 3-15

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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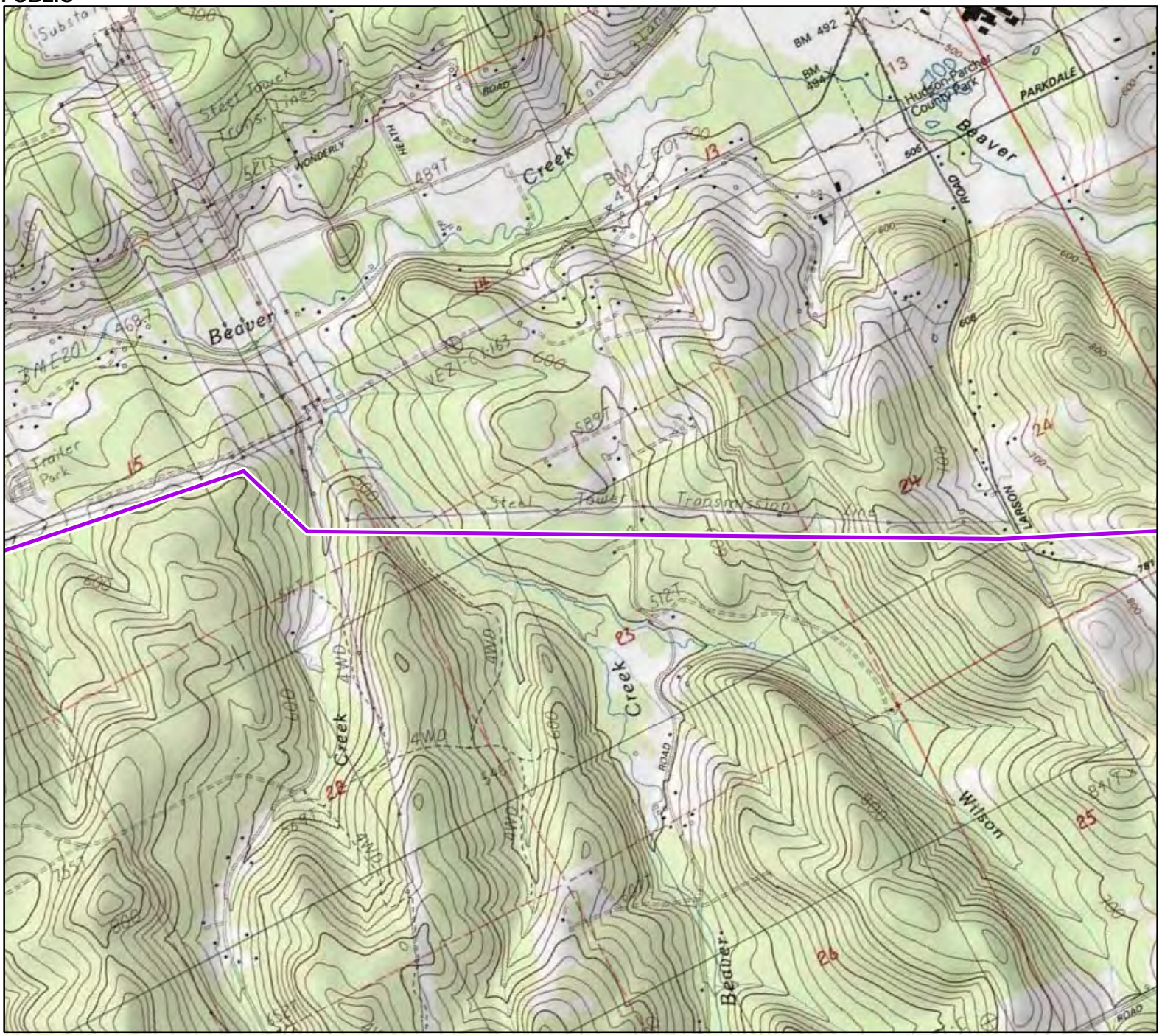


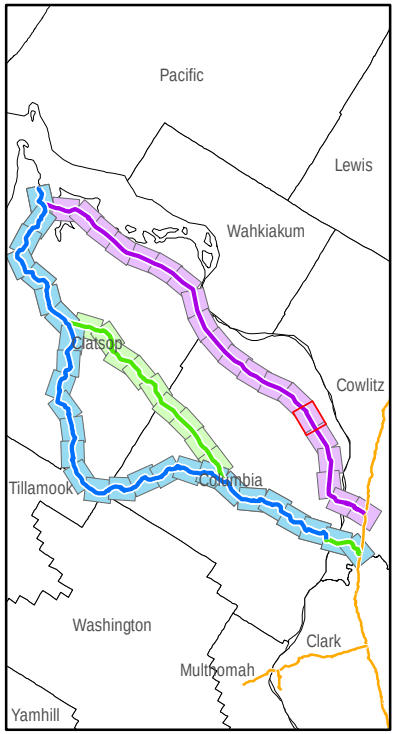
Appendix 10D

Figure 3-16

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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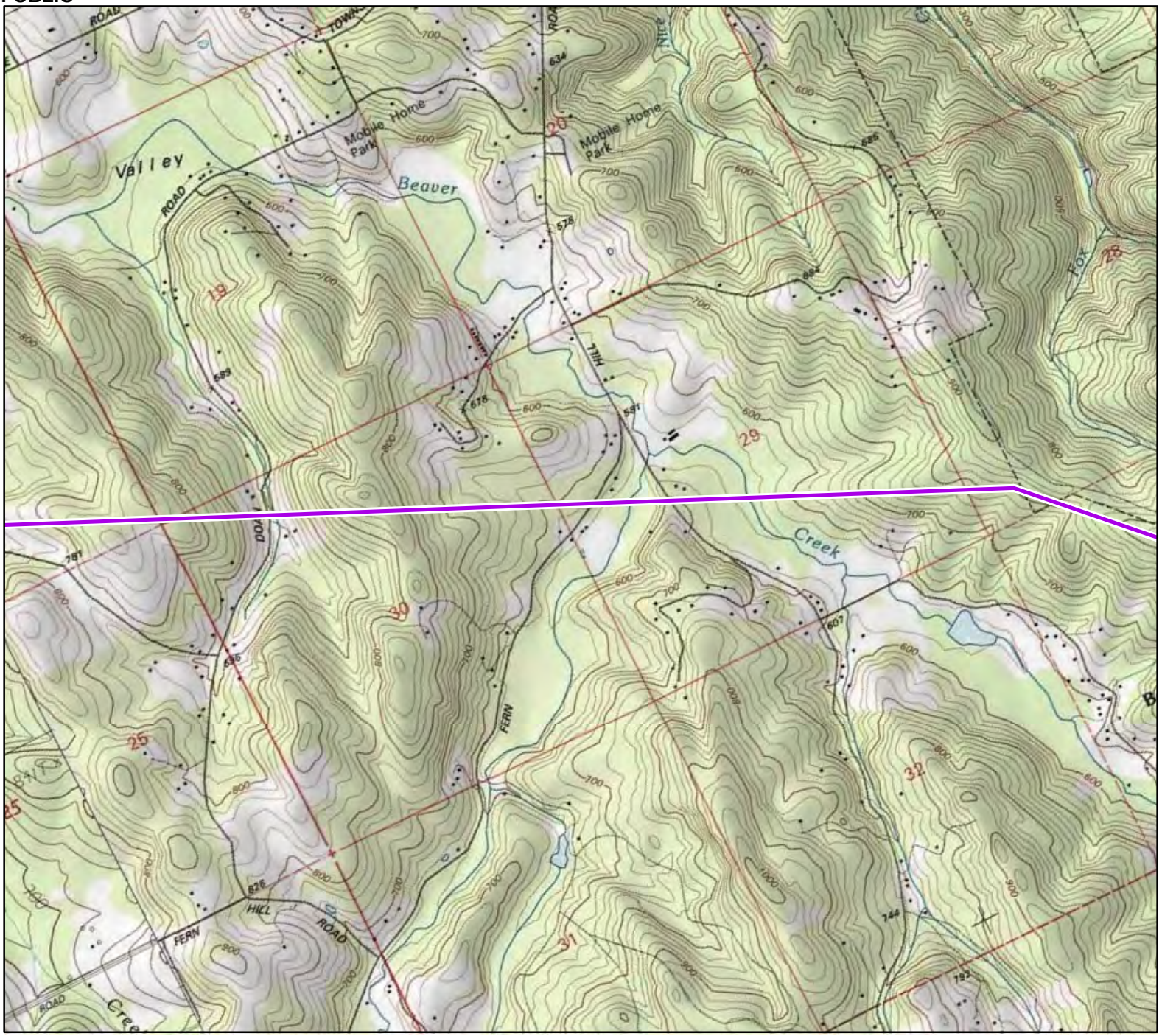


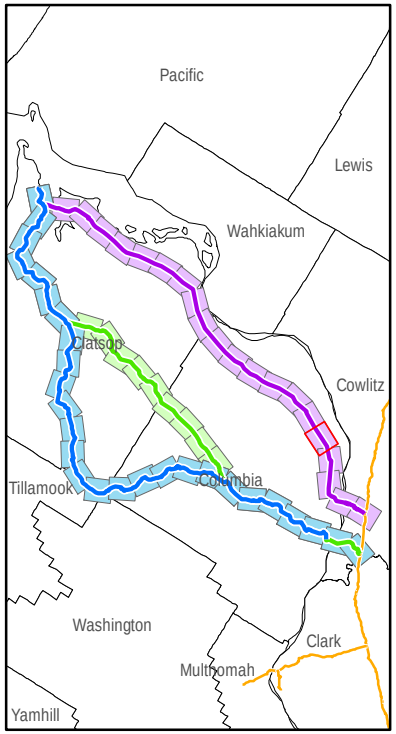
Appendix 10D

Figure 3-17

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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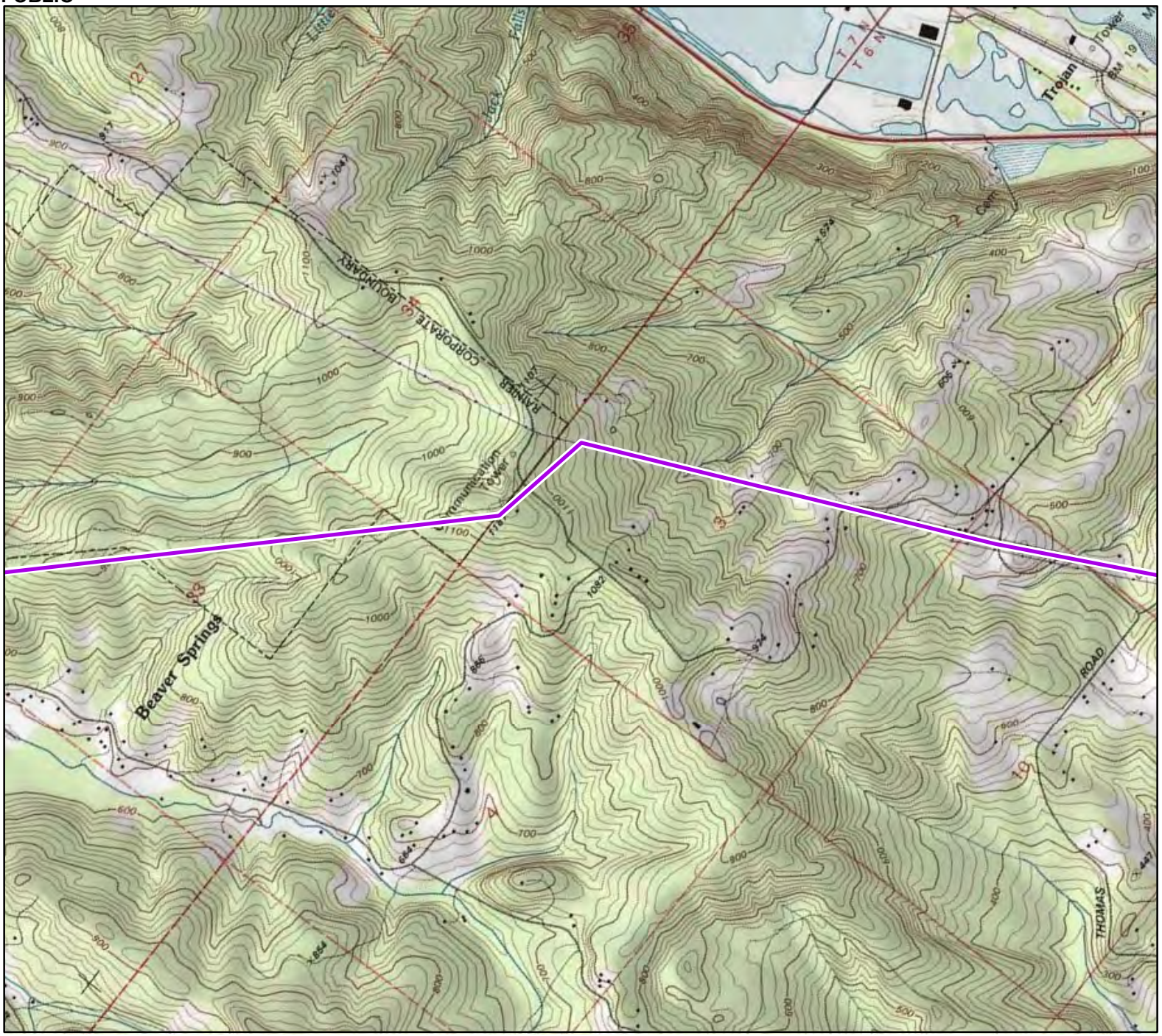


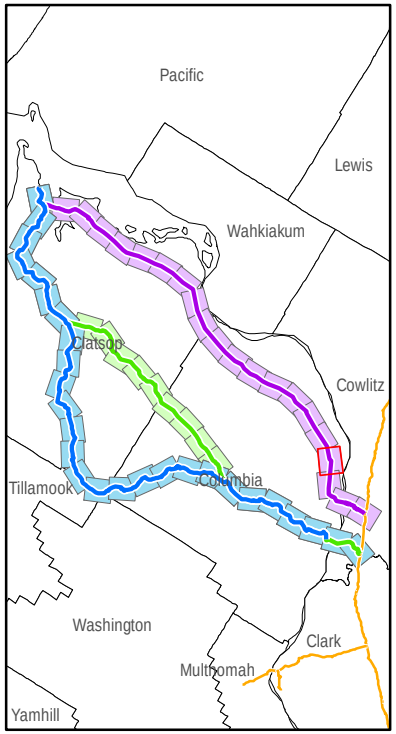
Appendix 10D

Figure 3-18

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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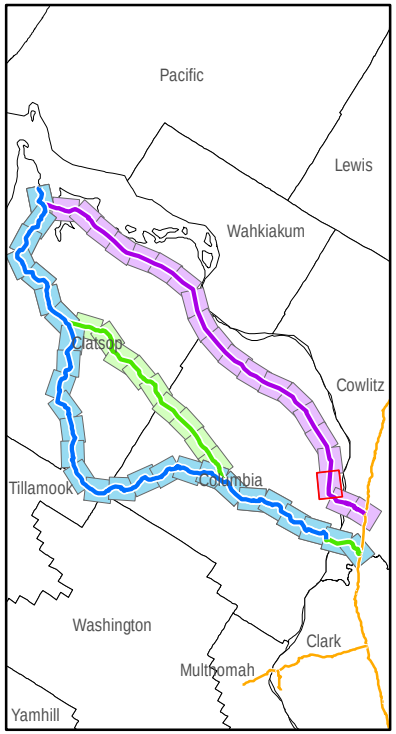
Appendix 10D

Figure 3-19

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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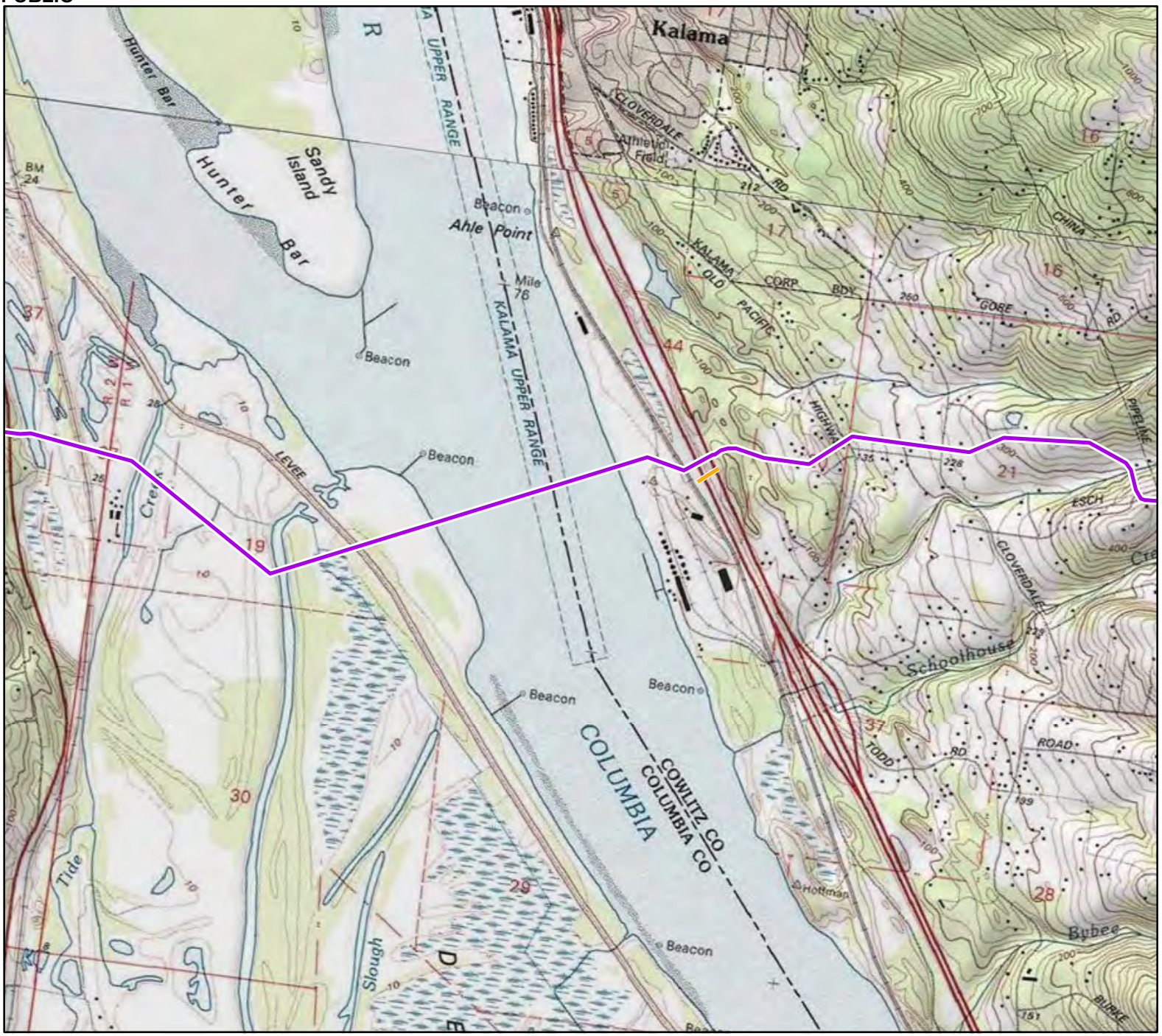


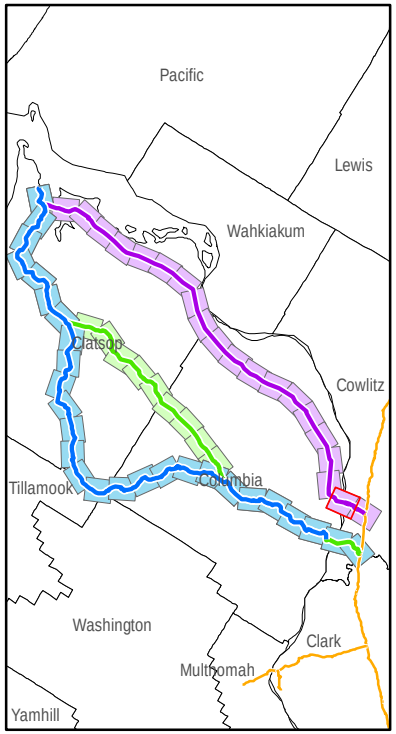
Appendix 10D

Figure 3-20

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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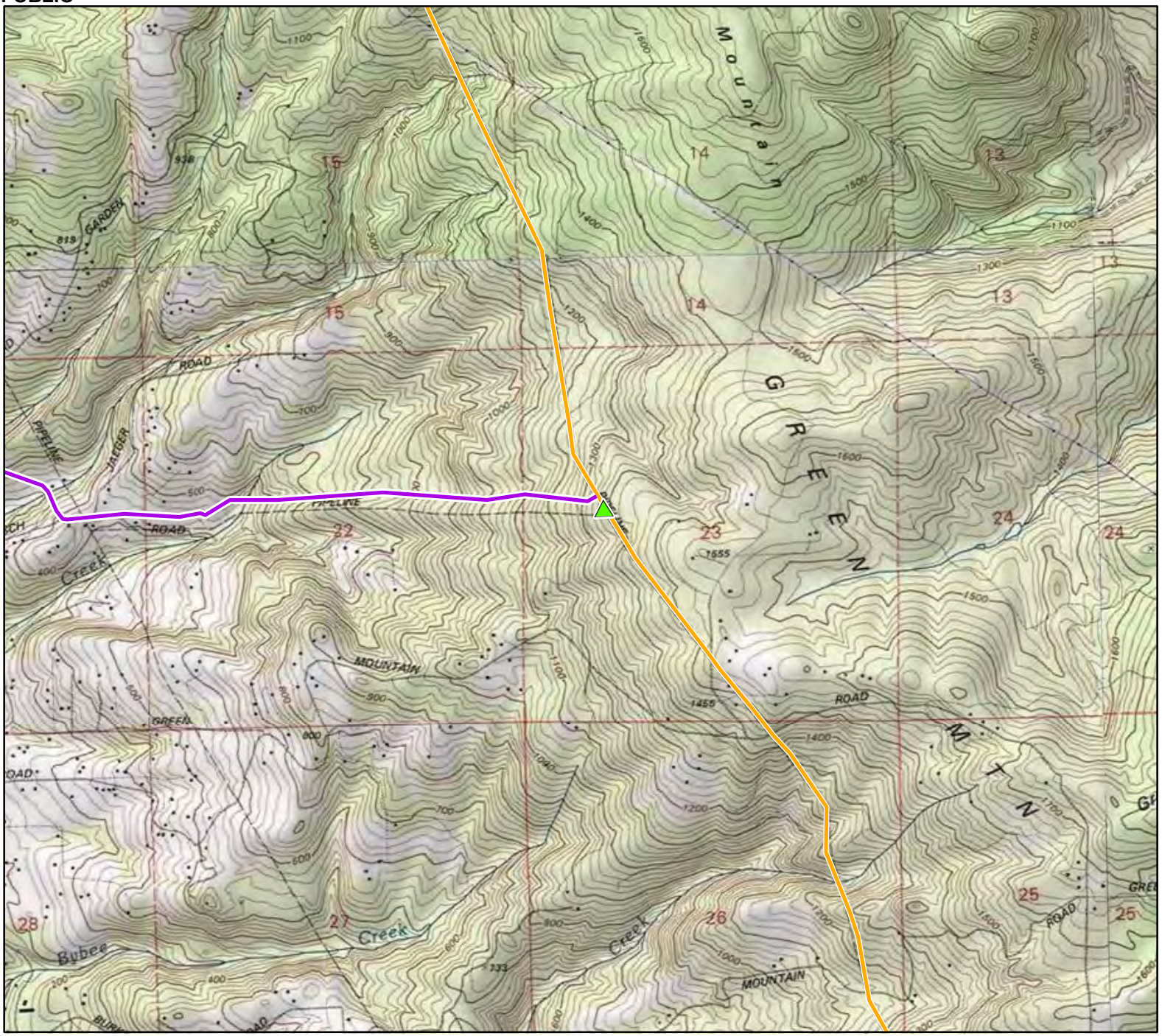


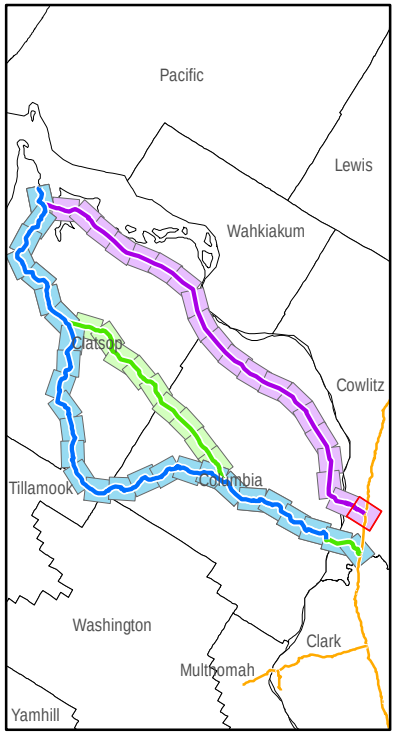
Appendix 10D

Figure 3-21

Major Pipeline Route Alternatives

Legend

- Pipeline Route Milepost (Qtr Mile)
- Oregon LNG Terminal - Warrenton, Oregon
- Northwest Pipeline Interconnect
- Green Mountain Alternative Interconnect
- Proposed Pipeline Route
- Alternative 1
- Alternative 2
- Northwest Pipeline



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Appendix 10F
Proposed and Minor Alternative Pipeline Route Variations [on Aerial Photography]

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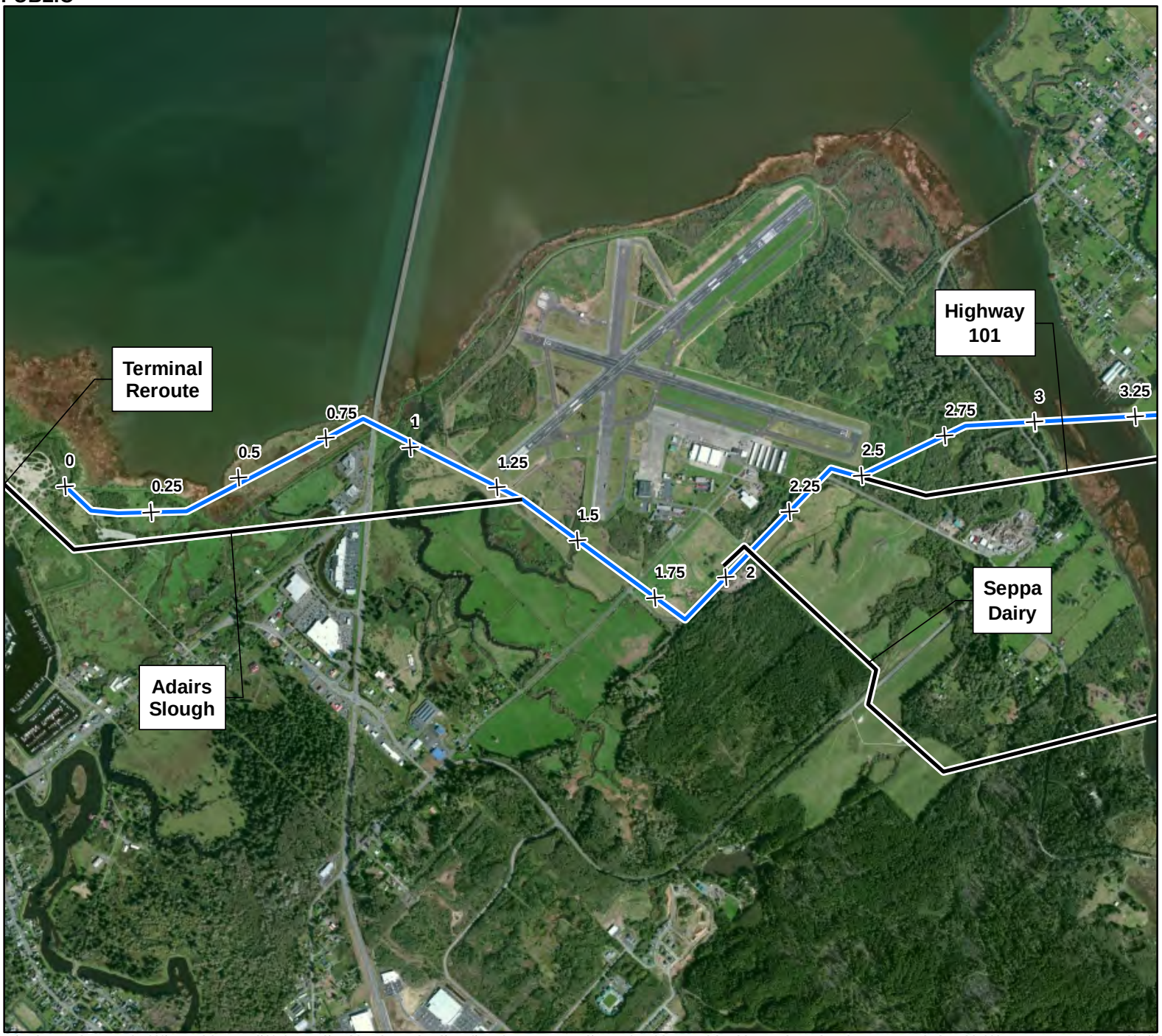
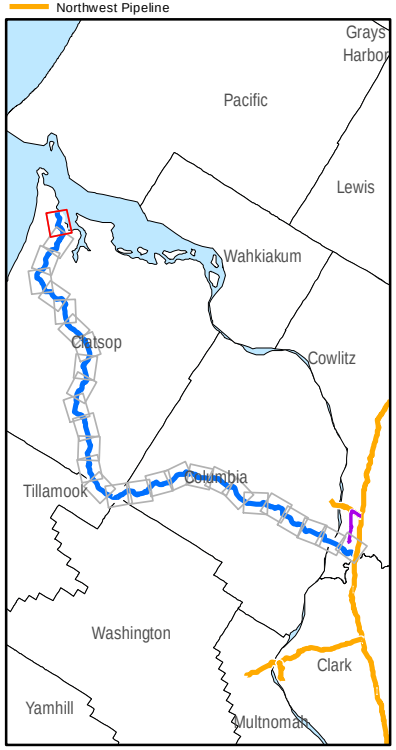


Appendix 10F

Figure 1
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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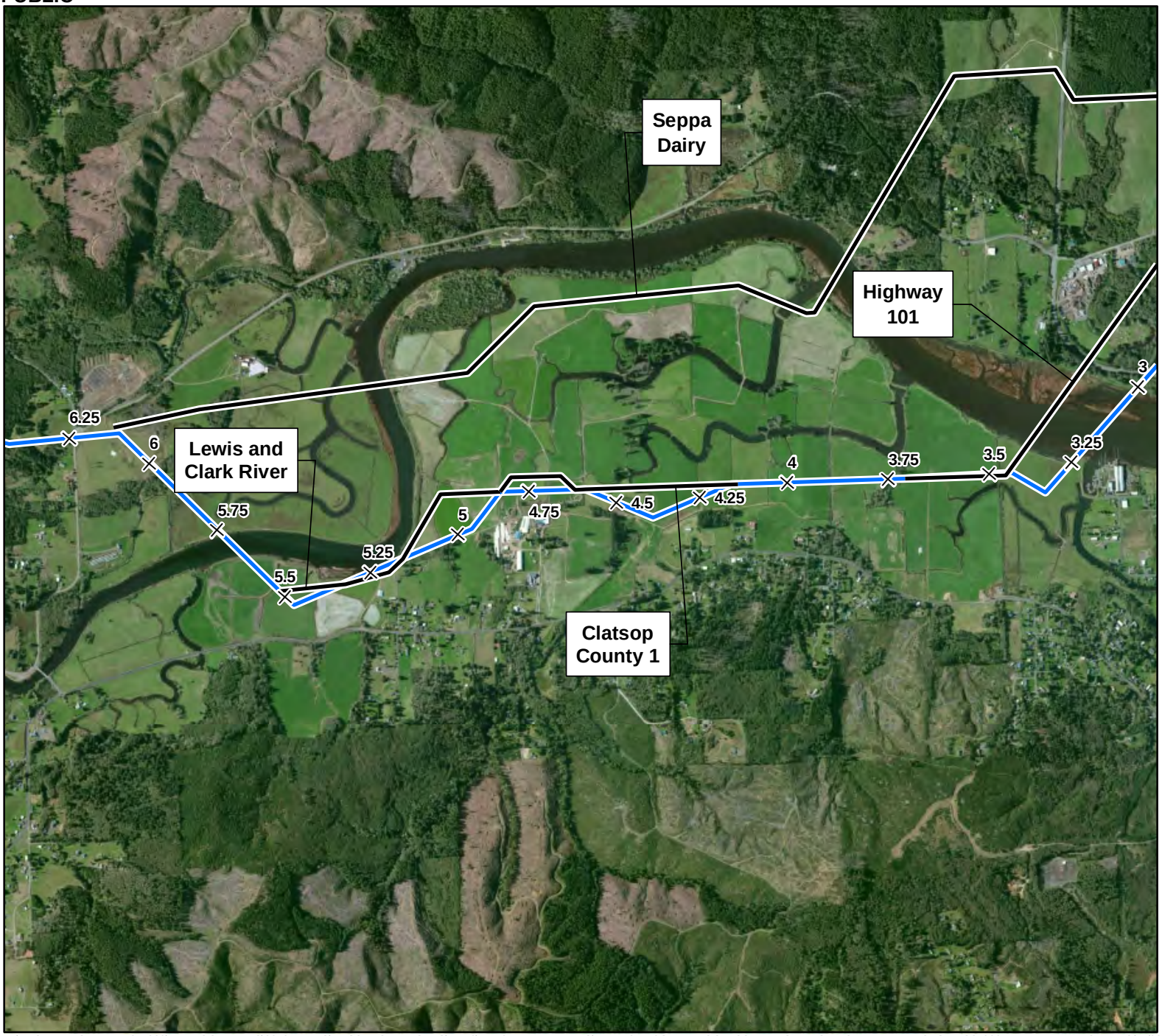

Appendix 10F

Figure 2
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

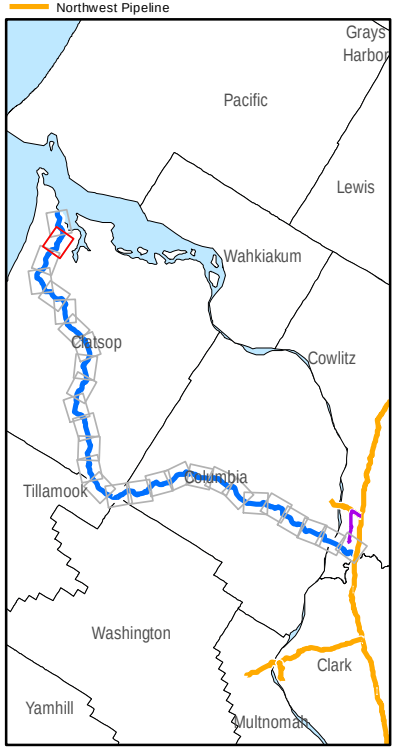

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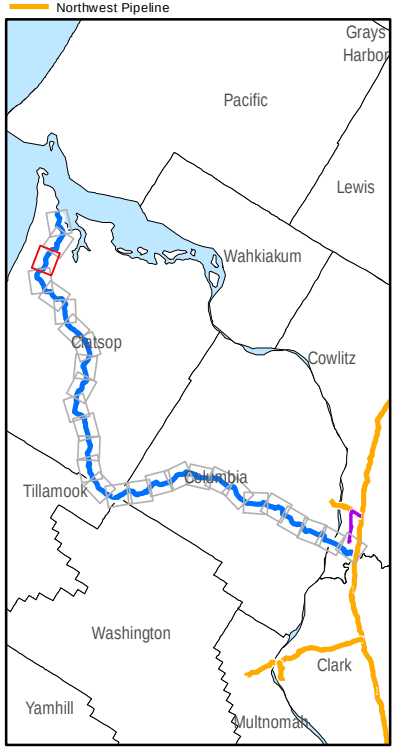
Figure 3
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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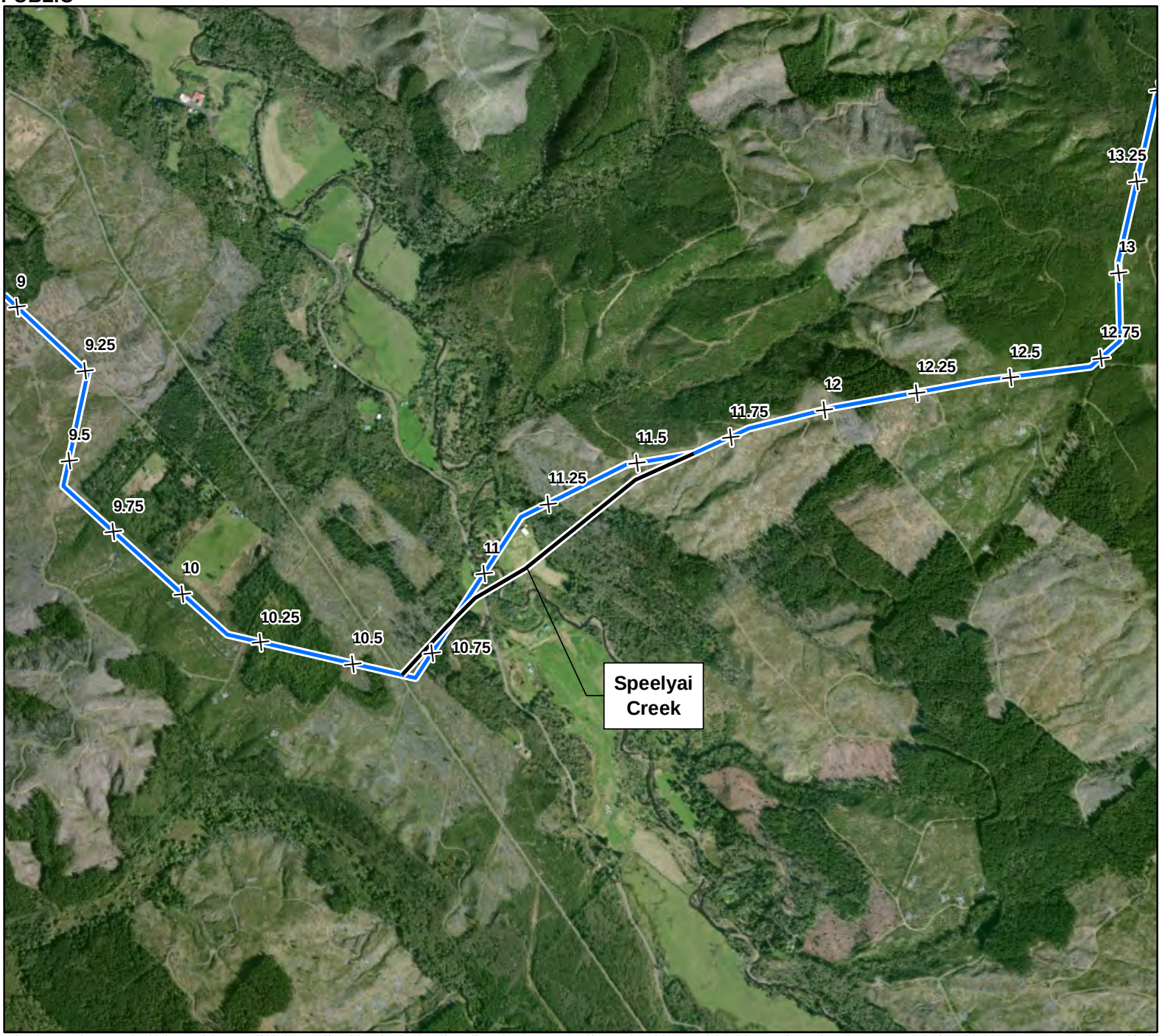
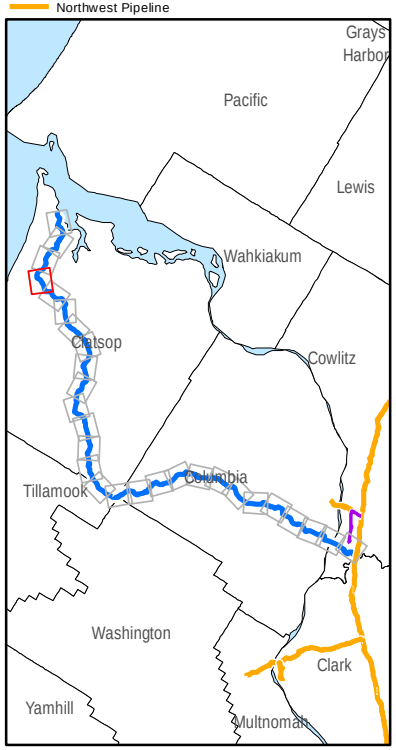


Appendix 10F

Figure 4
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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Appendix 10F

Figure 5
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

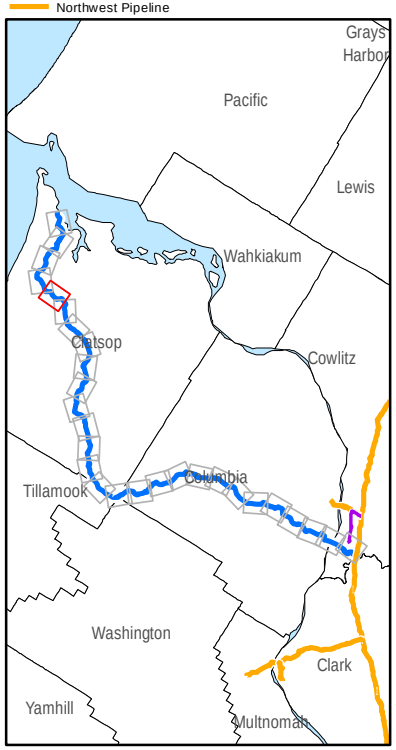

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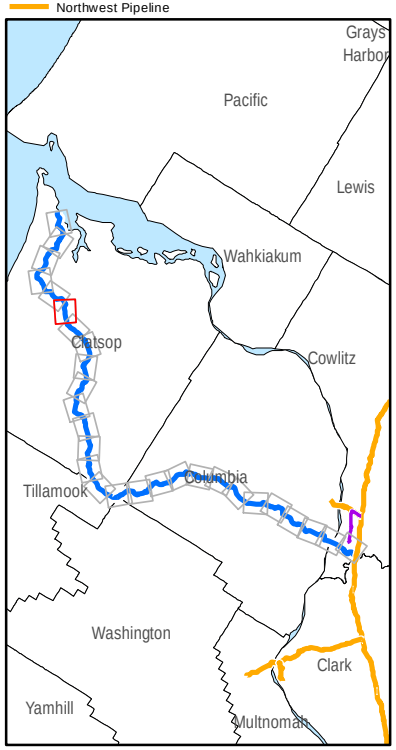
Figure 6
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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Appendix 10F

Figure 7
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

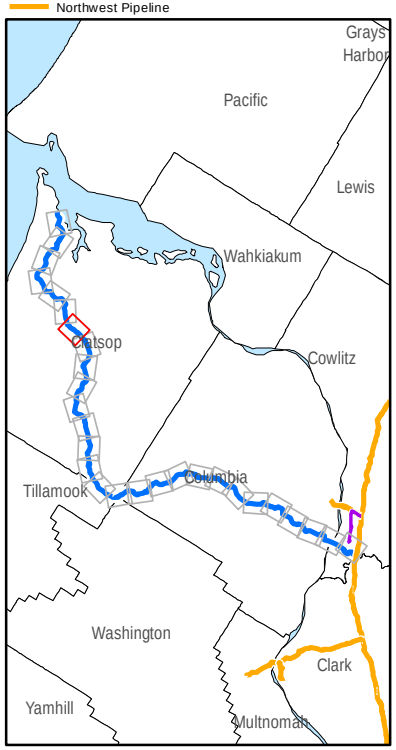

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Figure 8
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

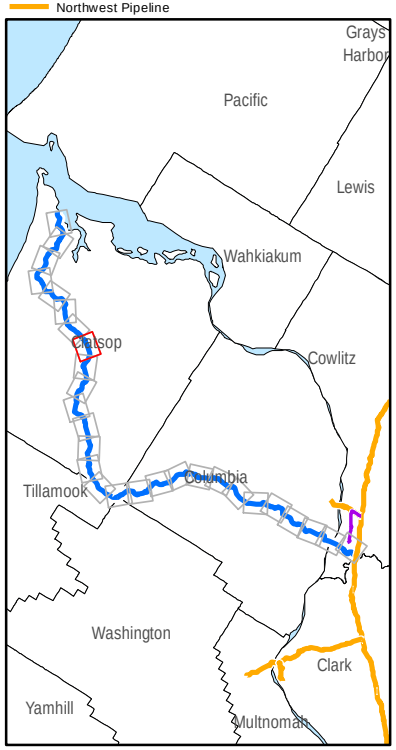

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Figure 9
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

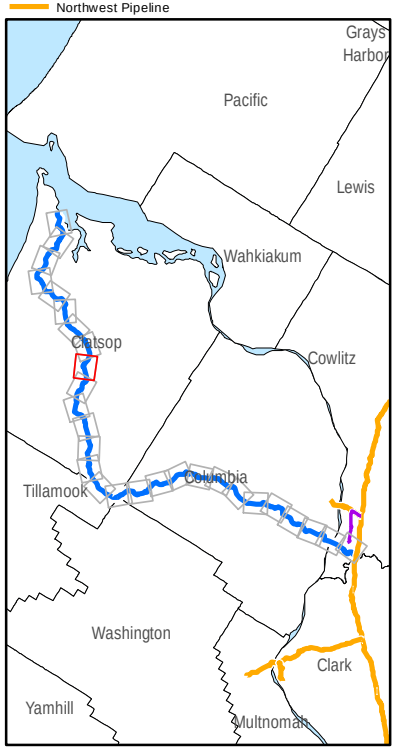

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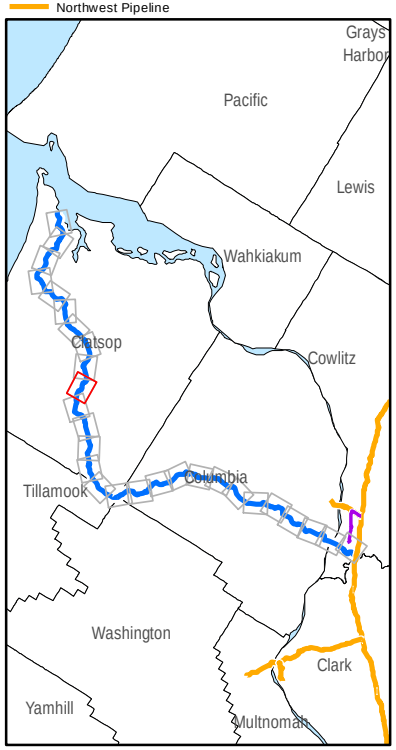
Figure 10
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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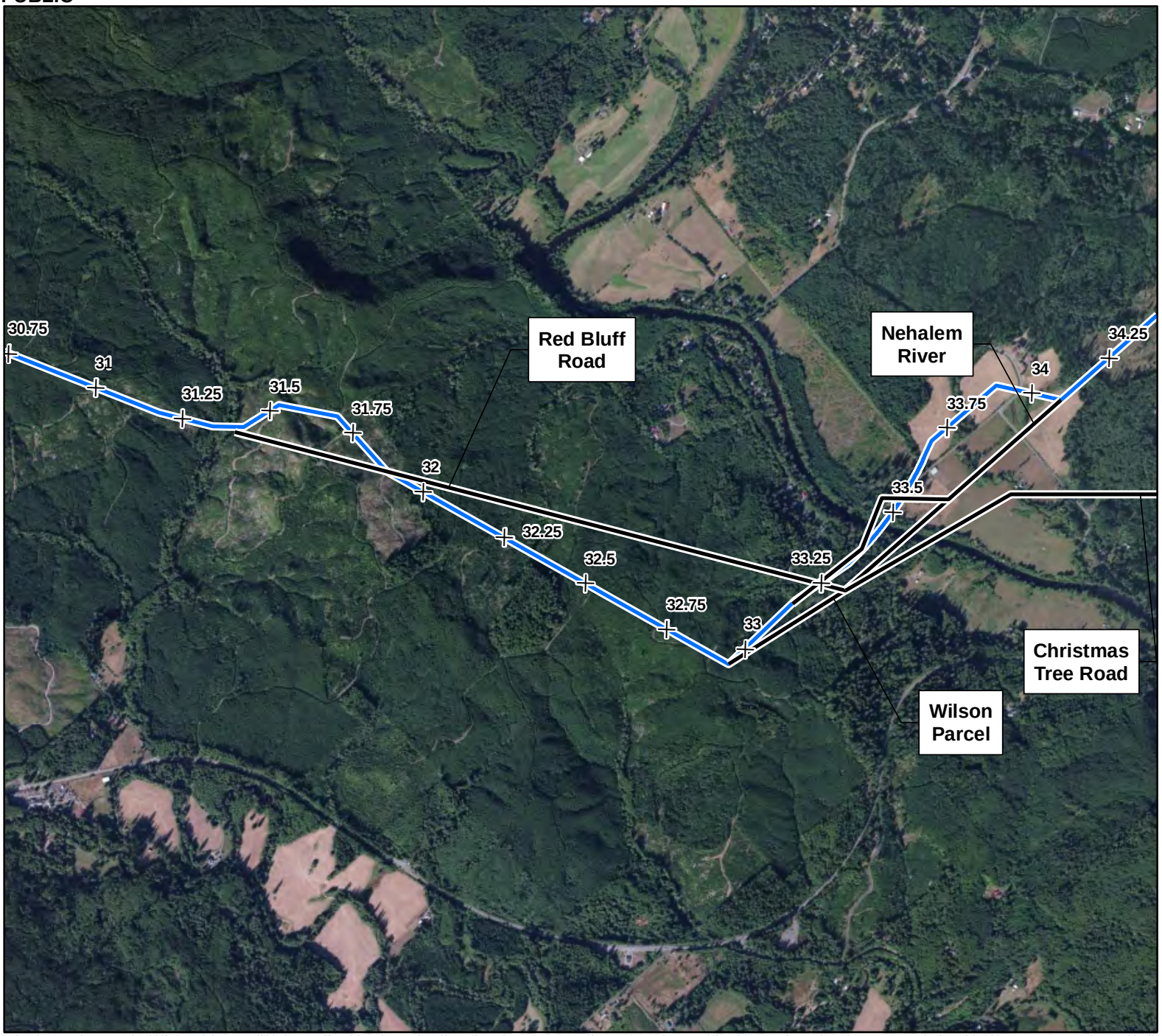
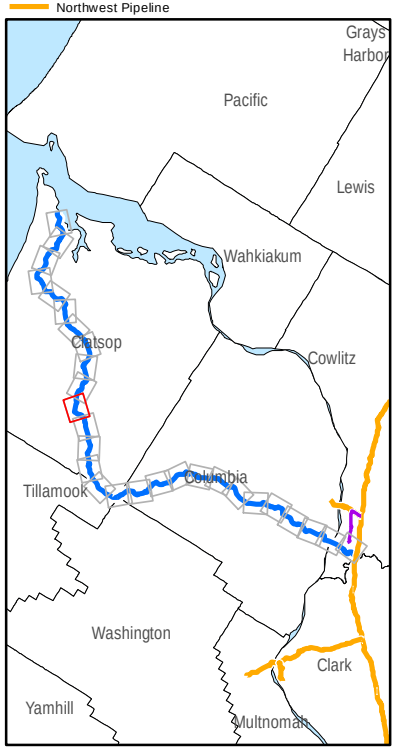


Appendix 10F

Figure 11
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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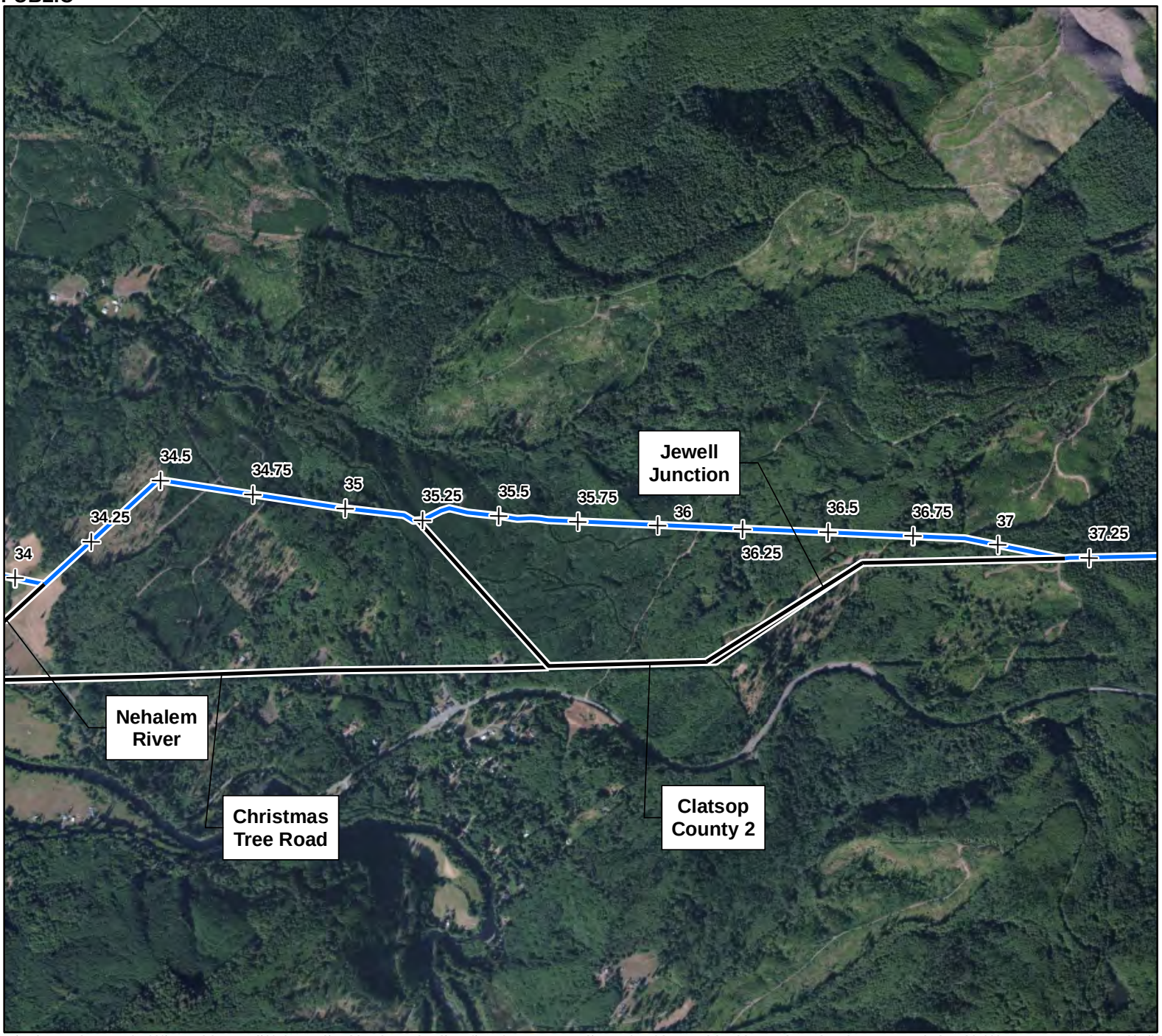
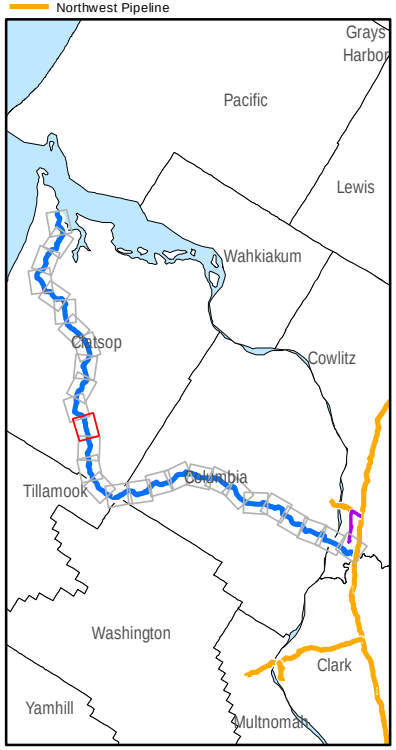


Appendix 10F

Figure 12
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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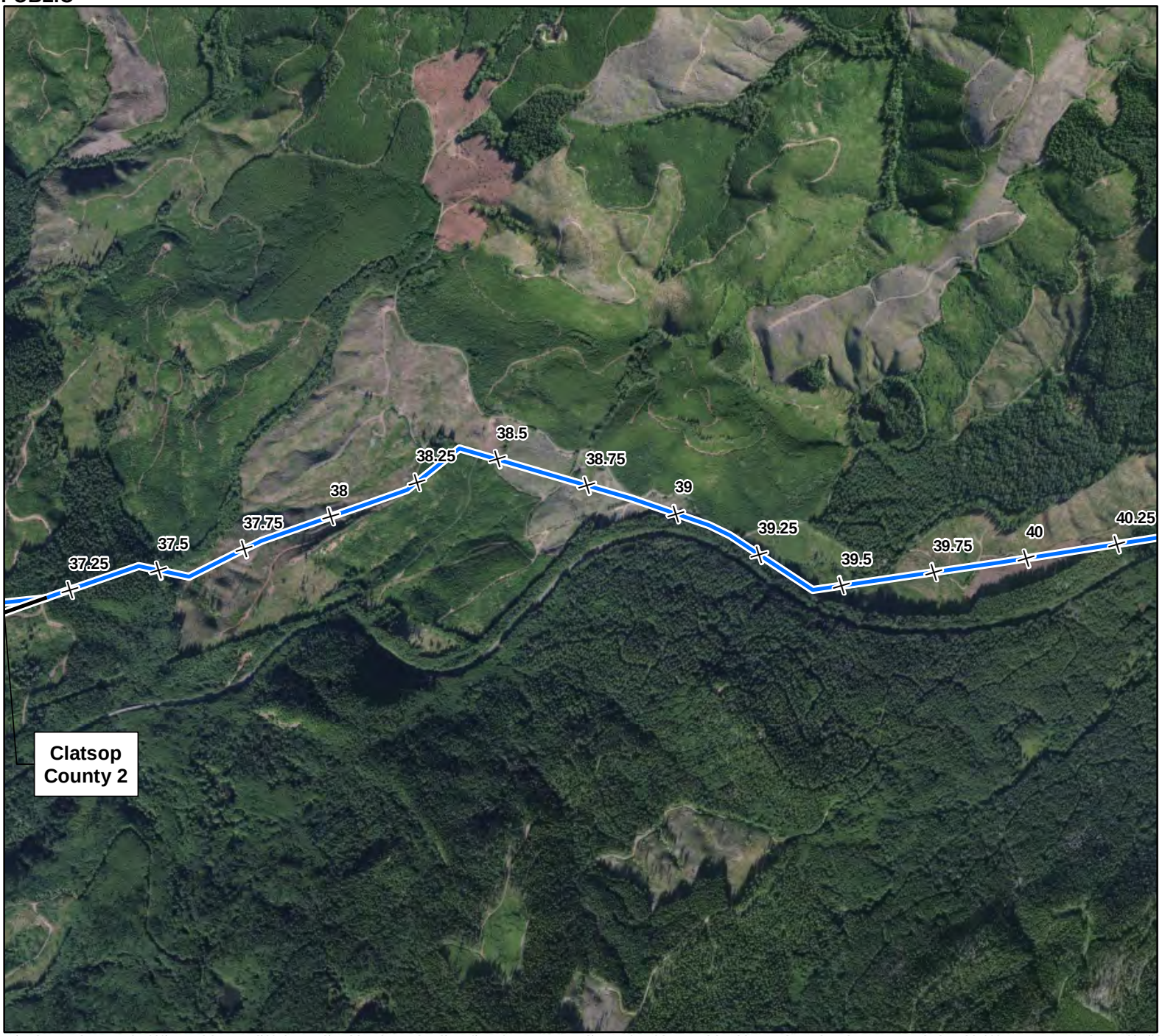
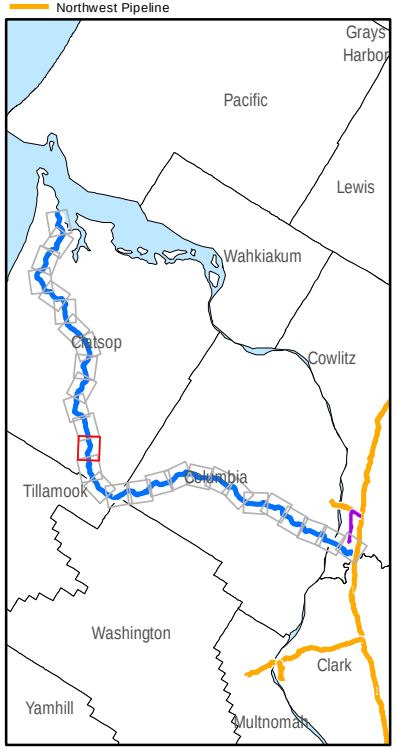


Appendix 10F

Figure 13
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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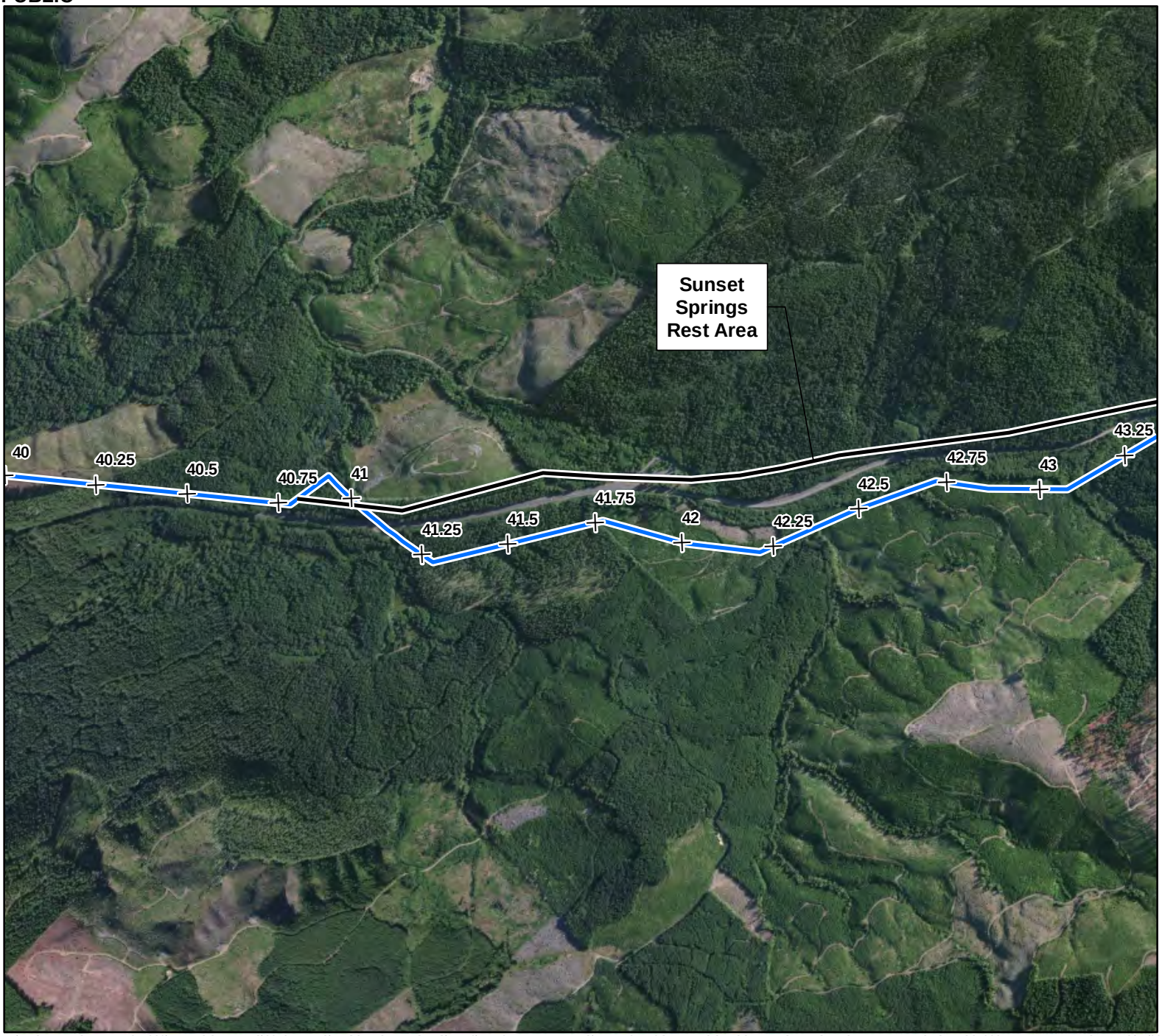
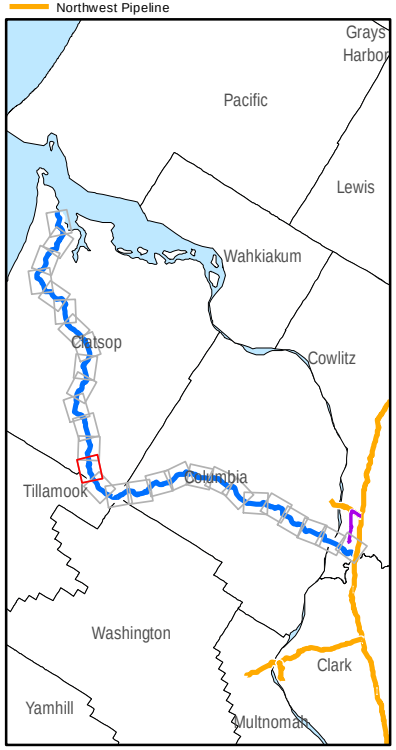


Appendix 10F

Figure 14
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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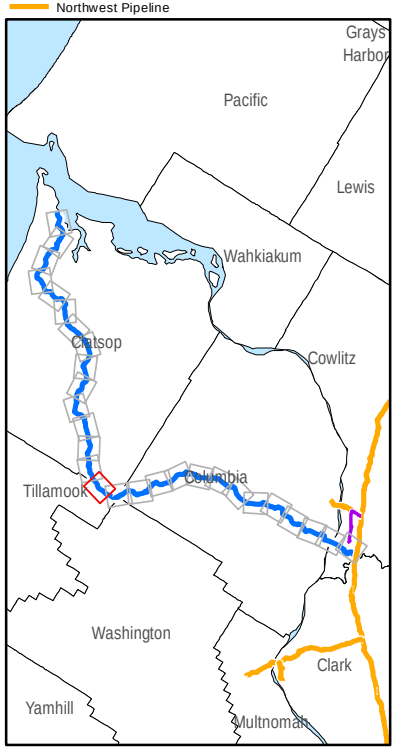
Appendix 10F

Figure 15
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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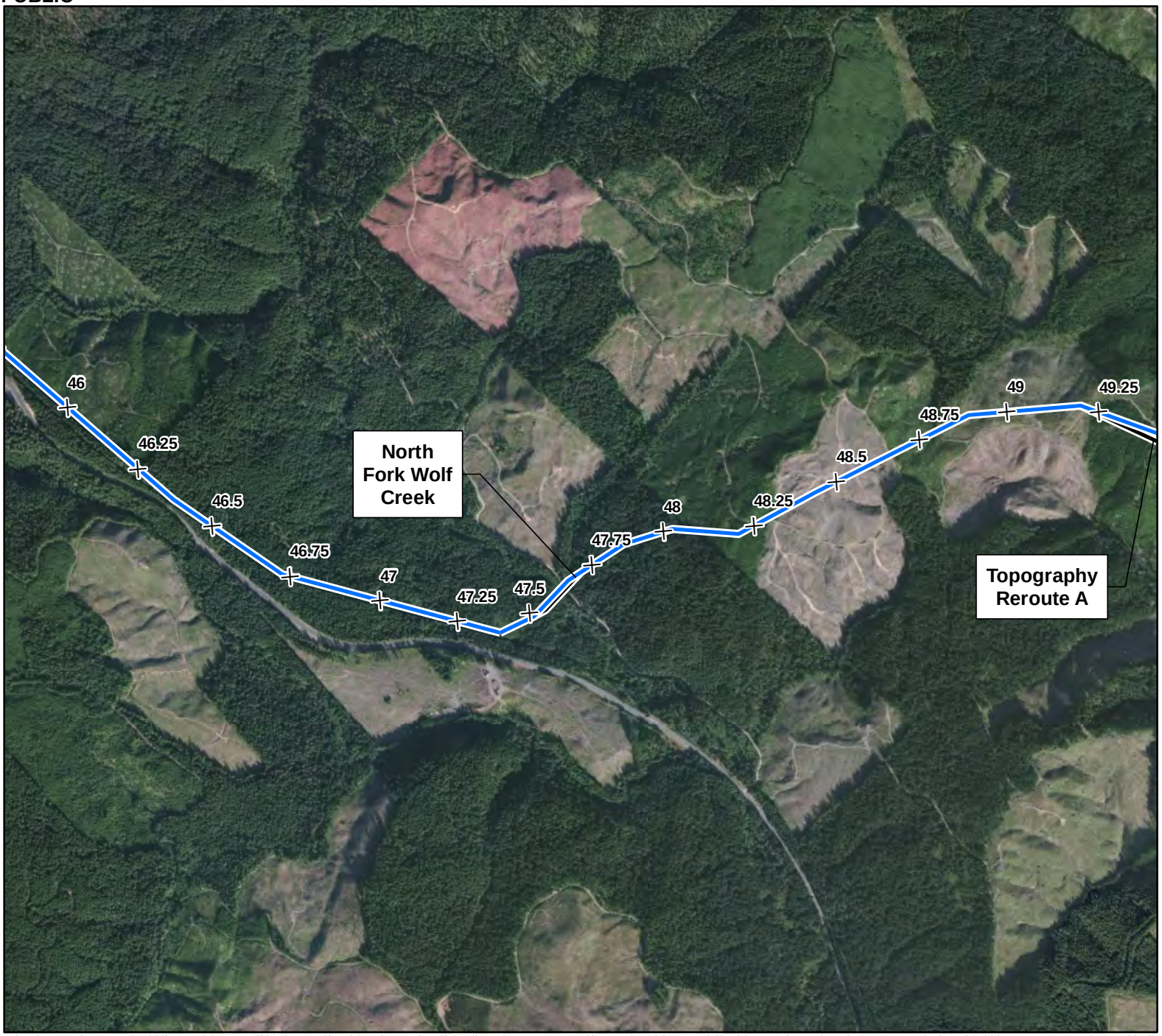
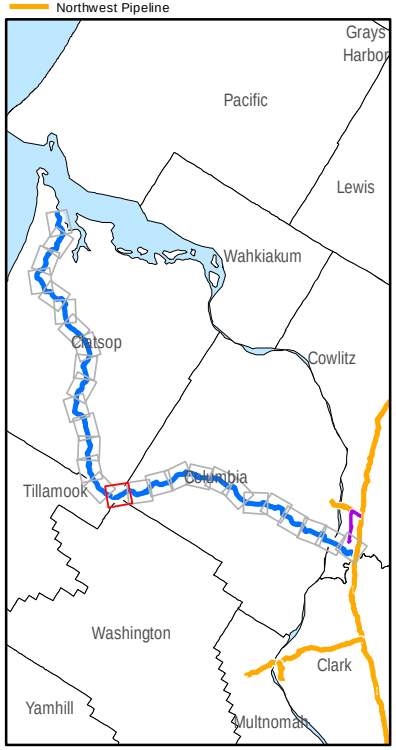


Appendix 10F

Figure 16
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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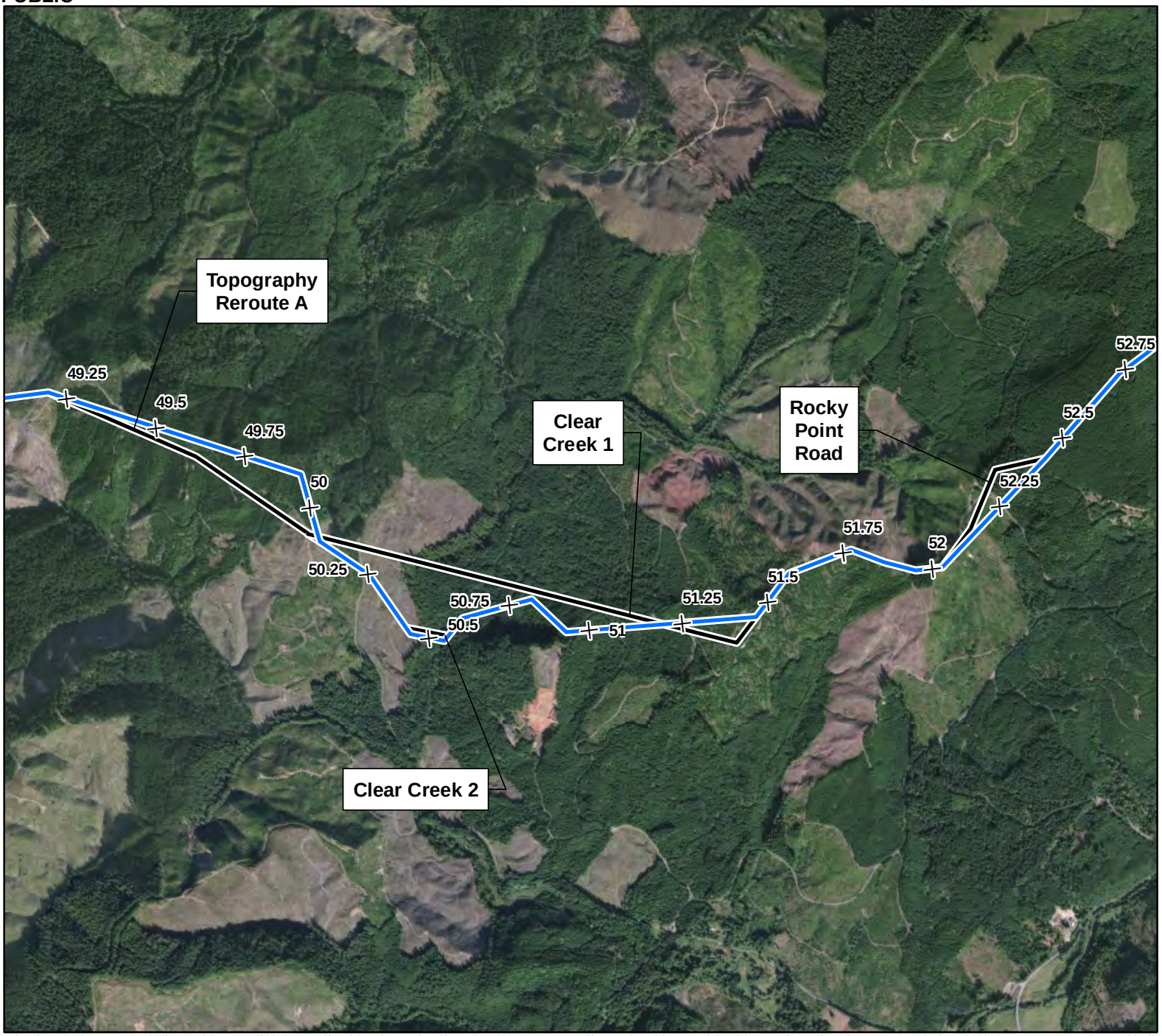
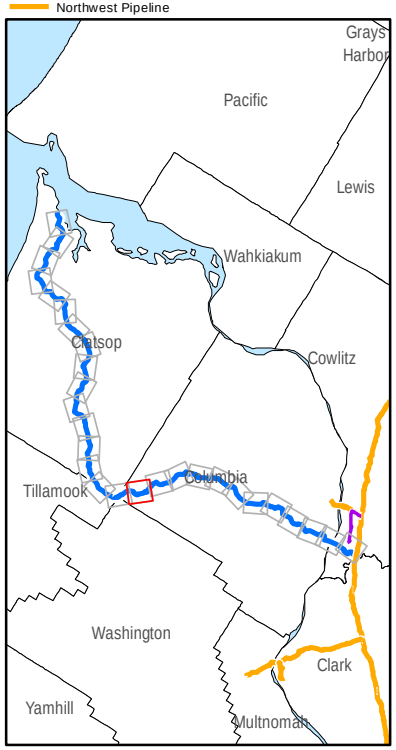


Appendix 10F

Figure 17
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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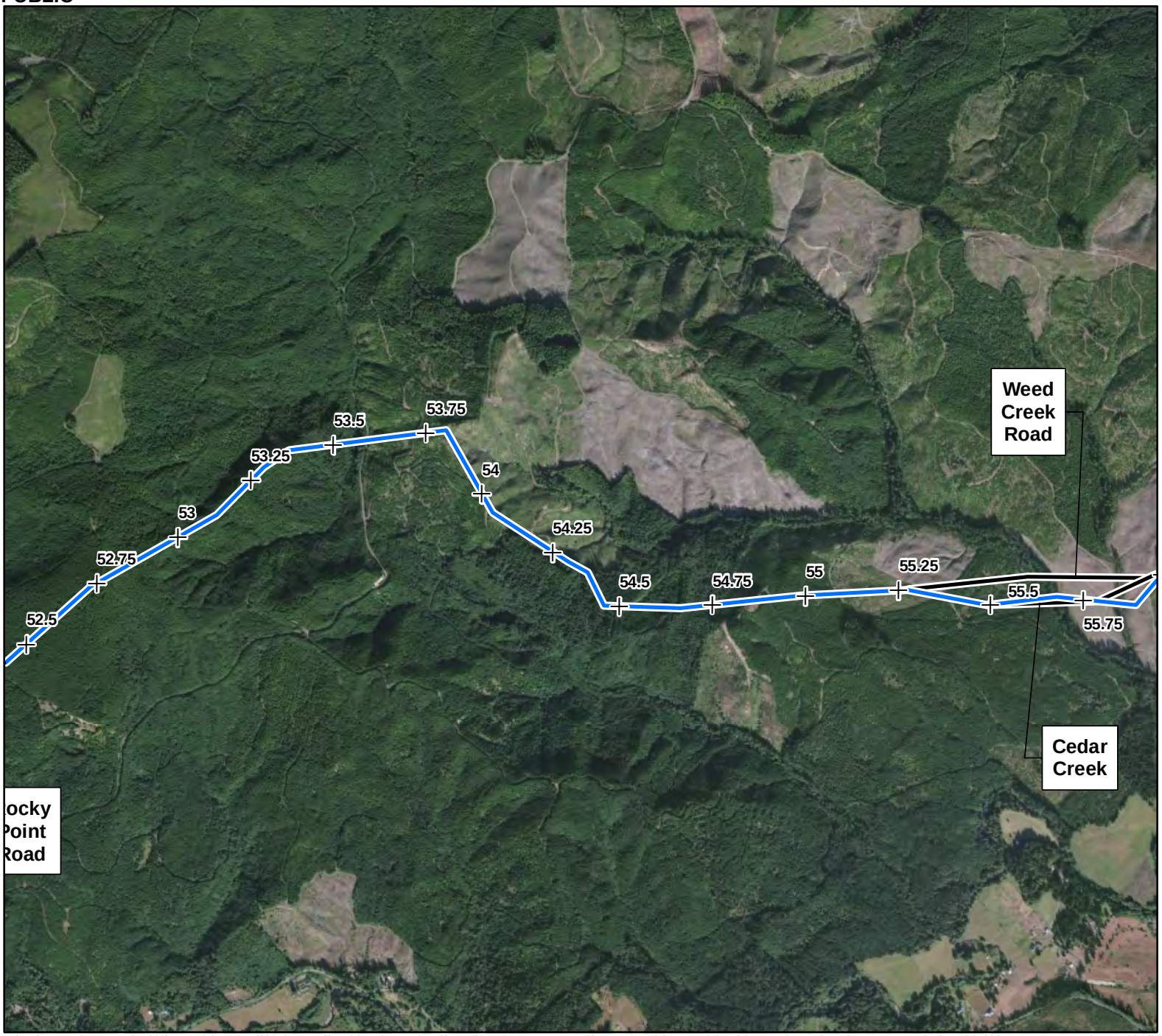
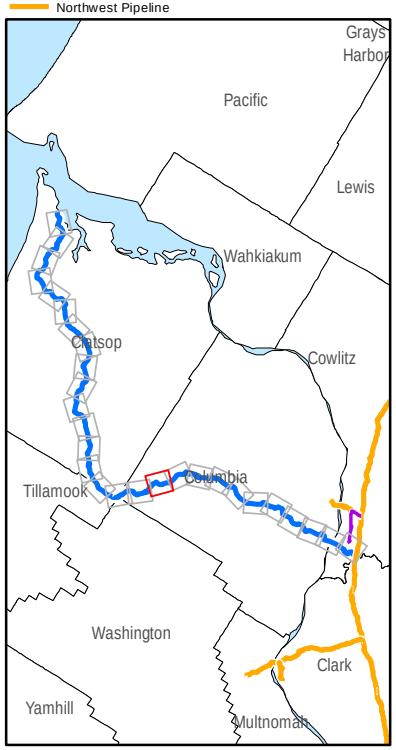


Appendix 10F

Figure 18
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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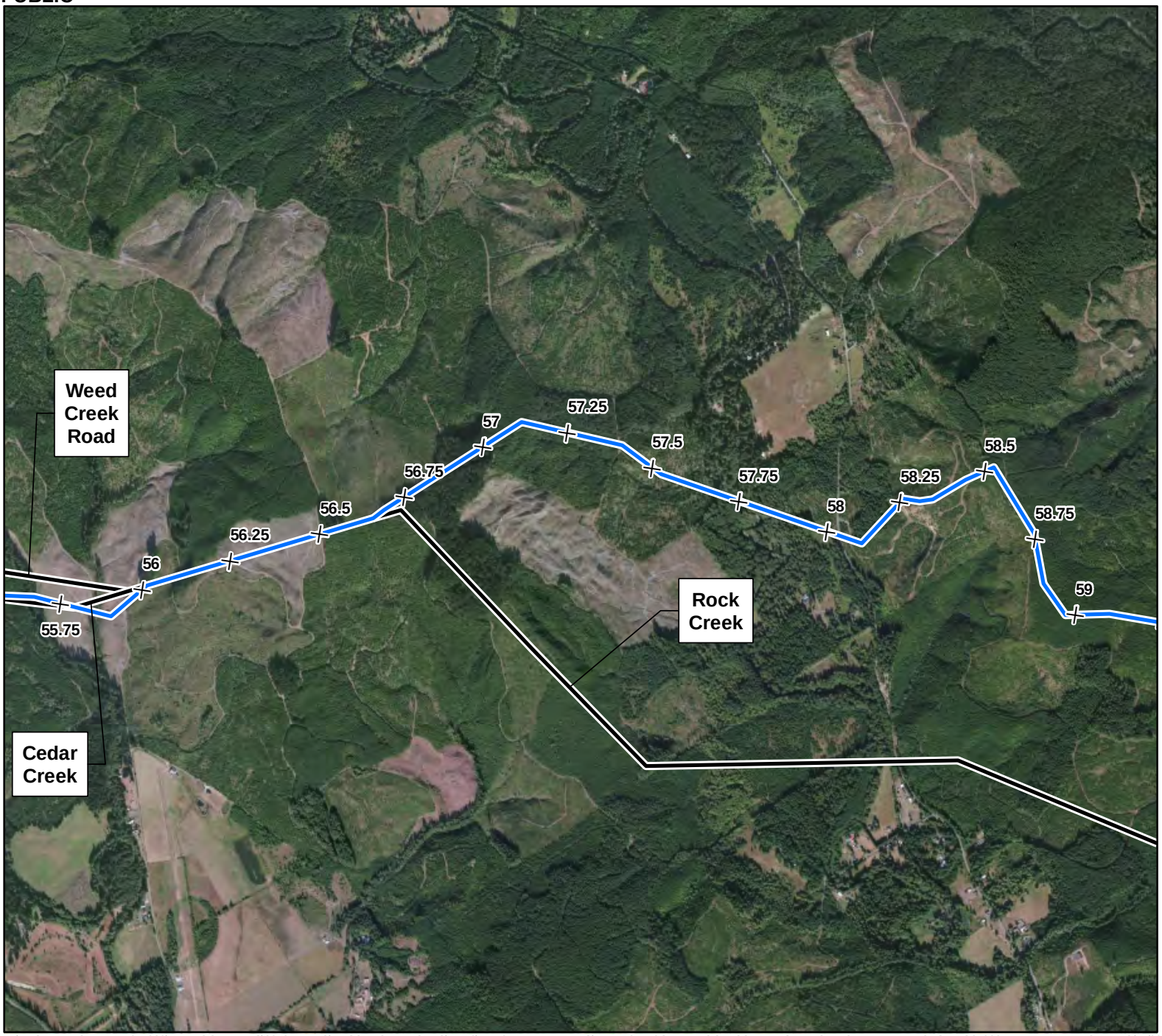
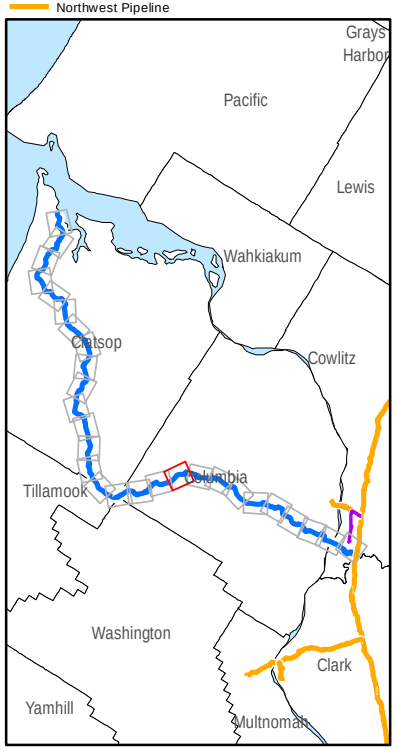


Appendix 10F

Figure 19
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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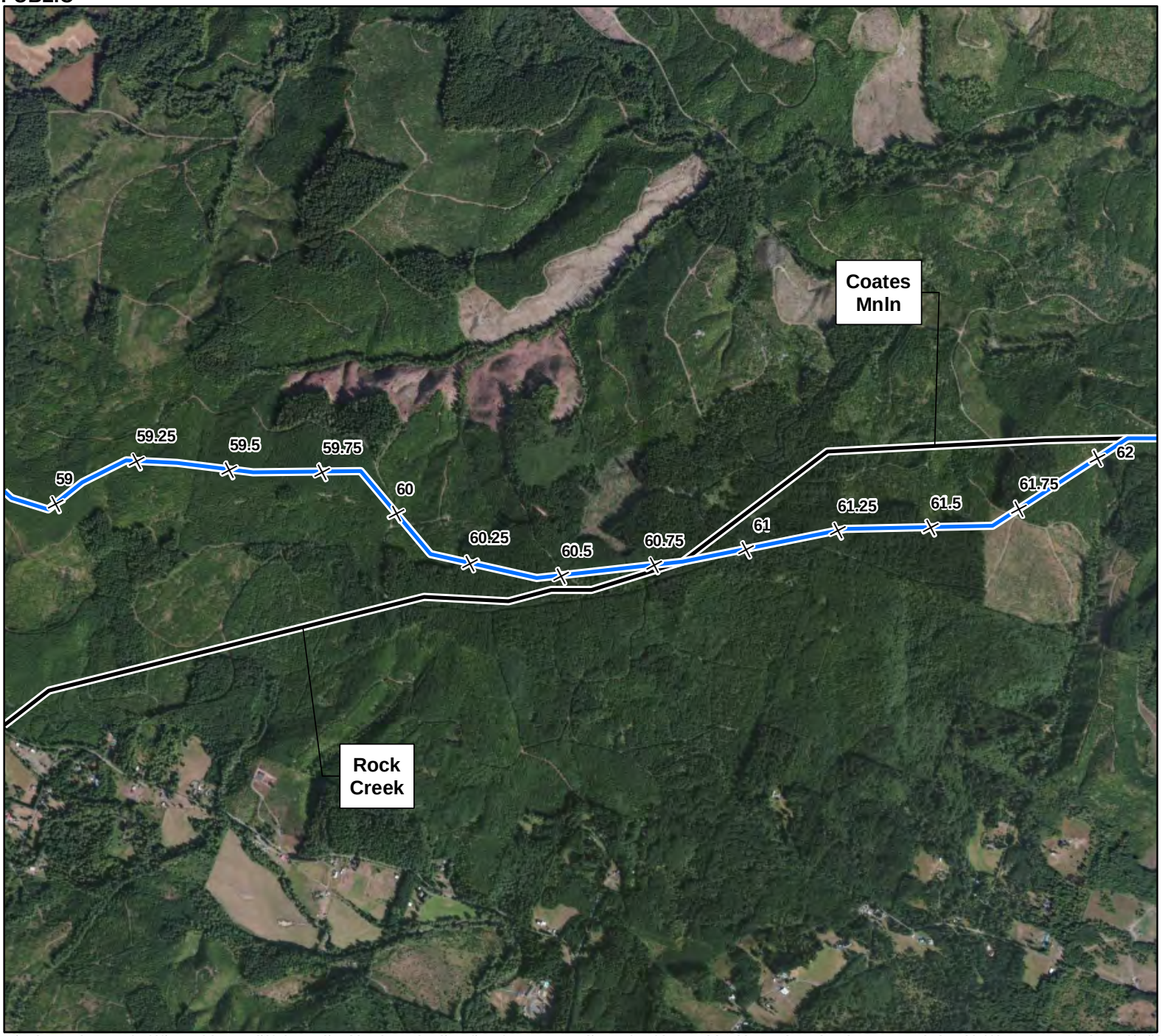
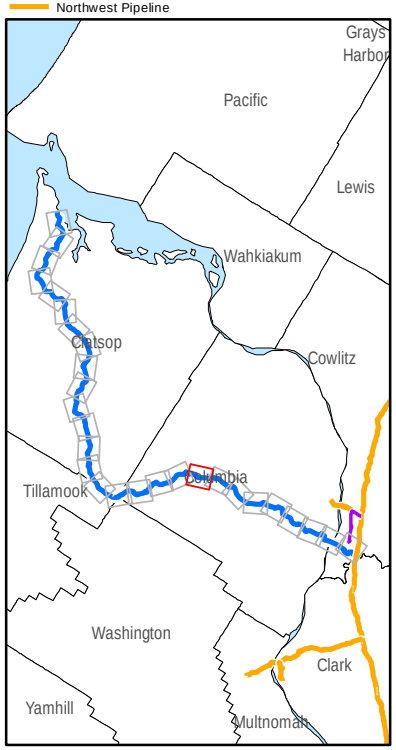


Appendix 10F

Figure 20
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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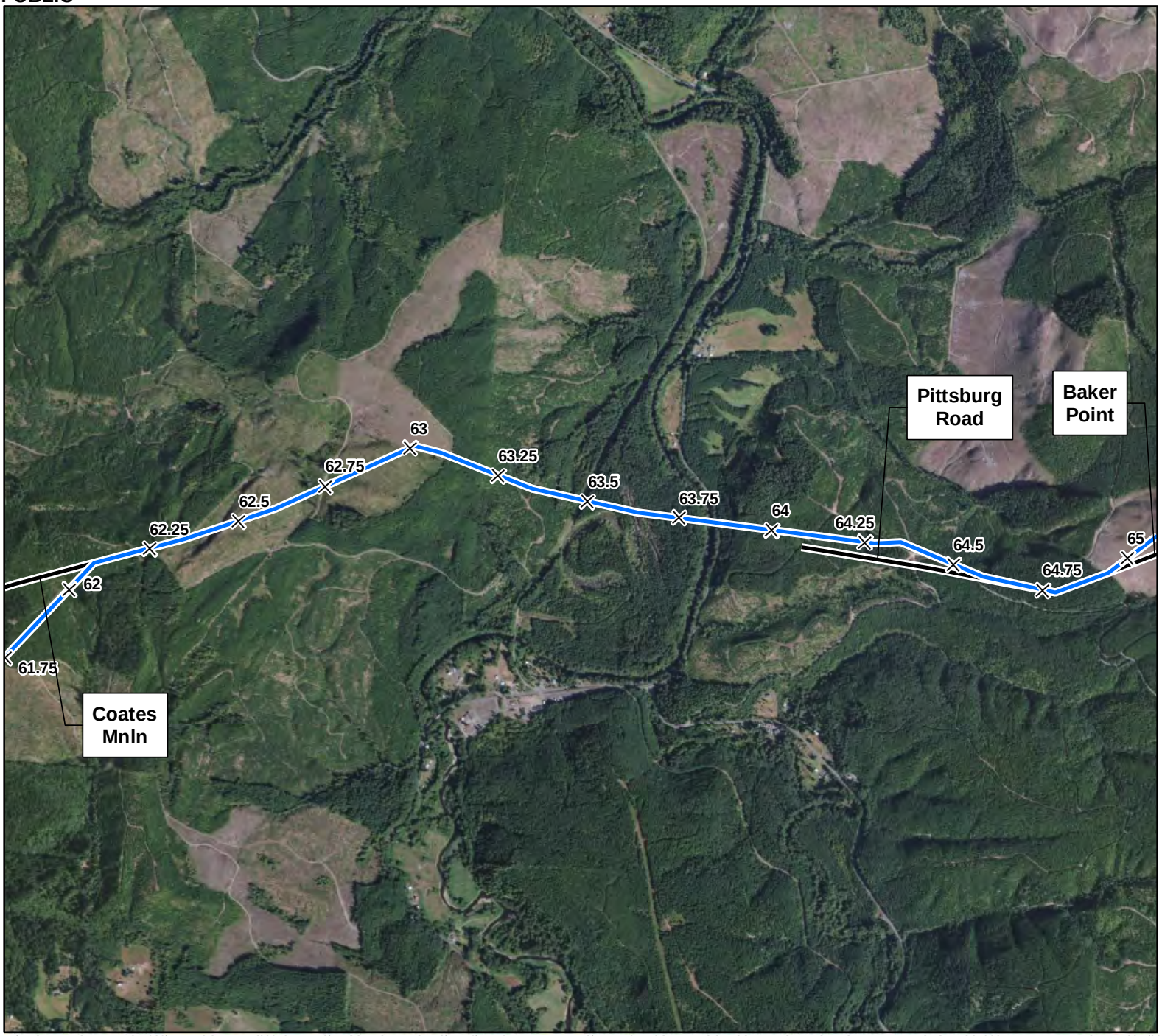
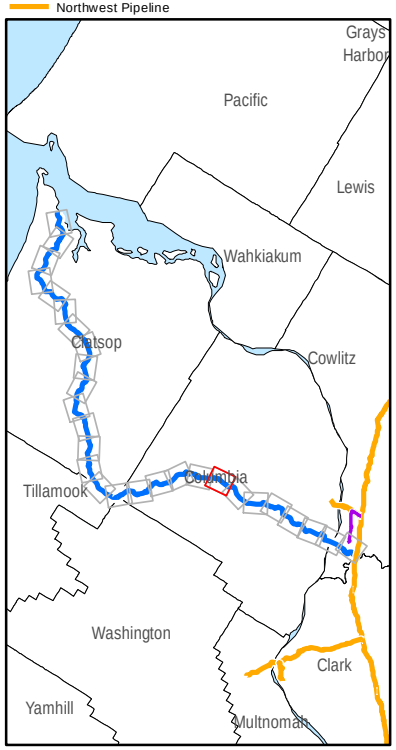


Appendix 10F

Figure 21
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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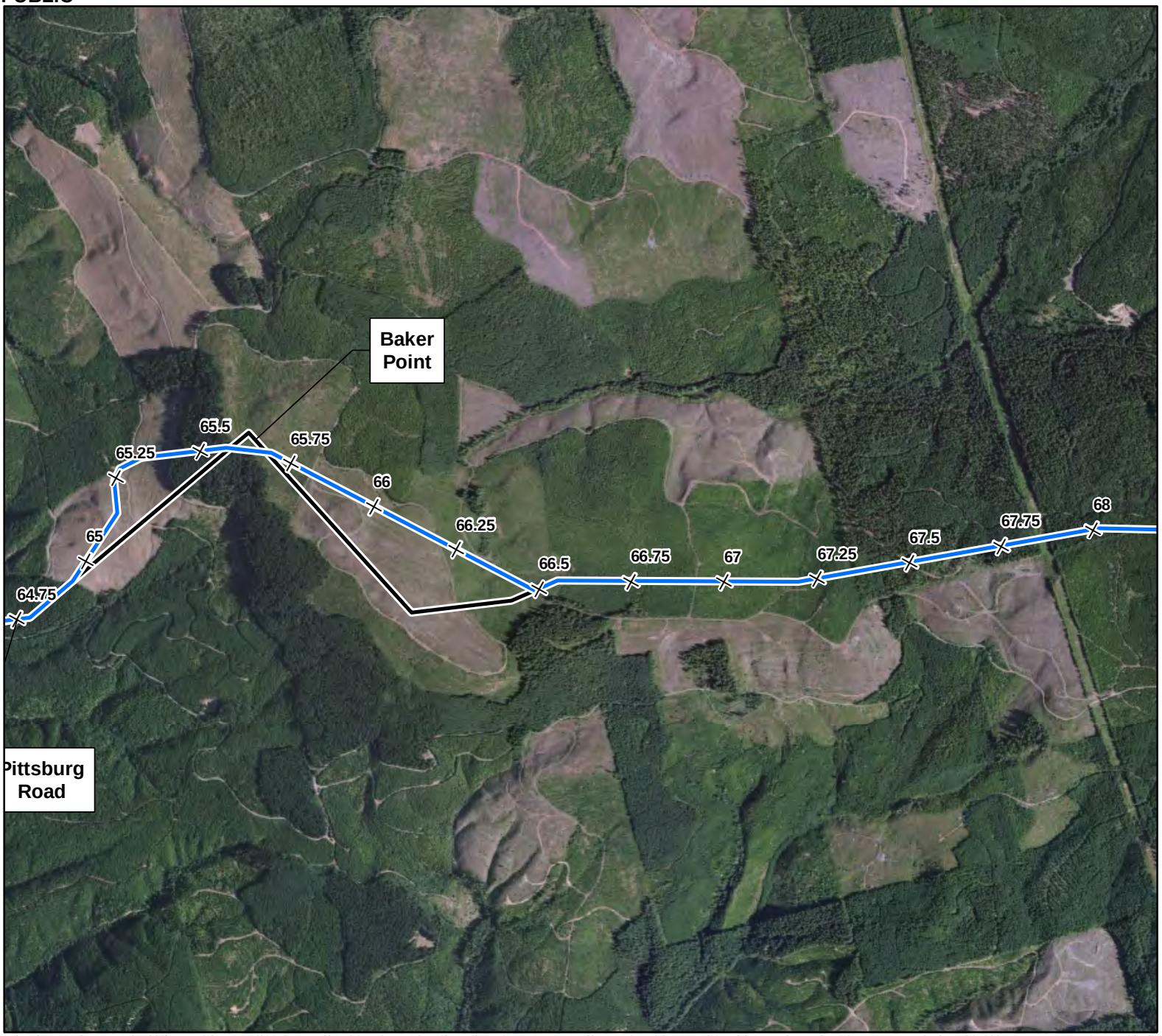
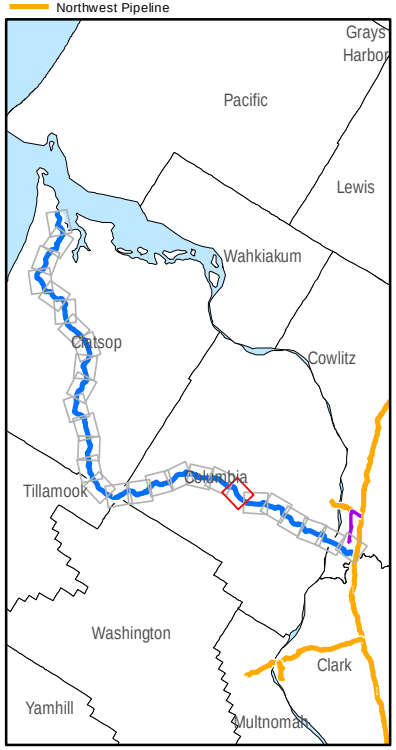


Appendix 10F

Figure 22
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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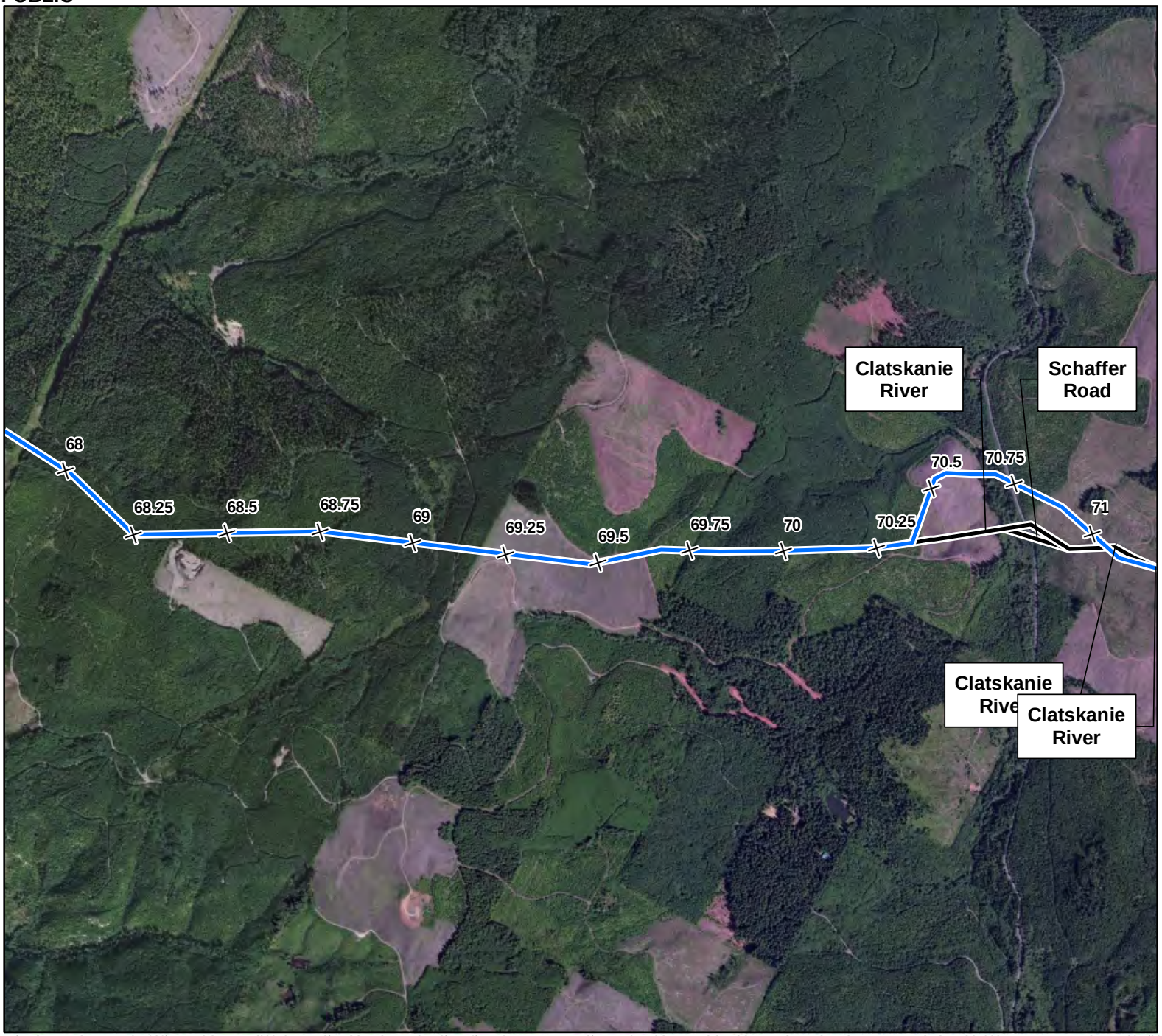
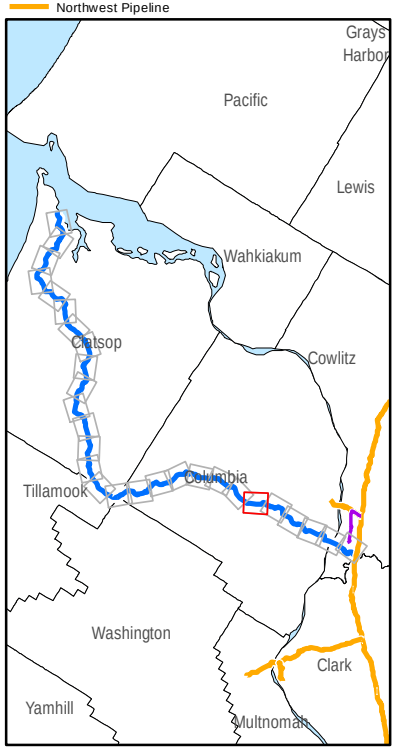


Appendix 10F

Figure 23
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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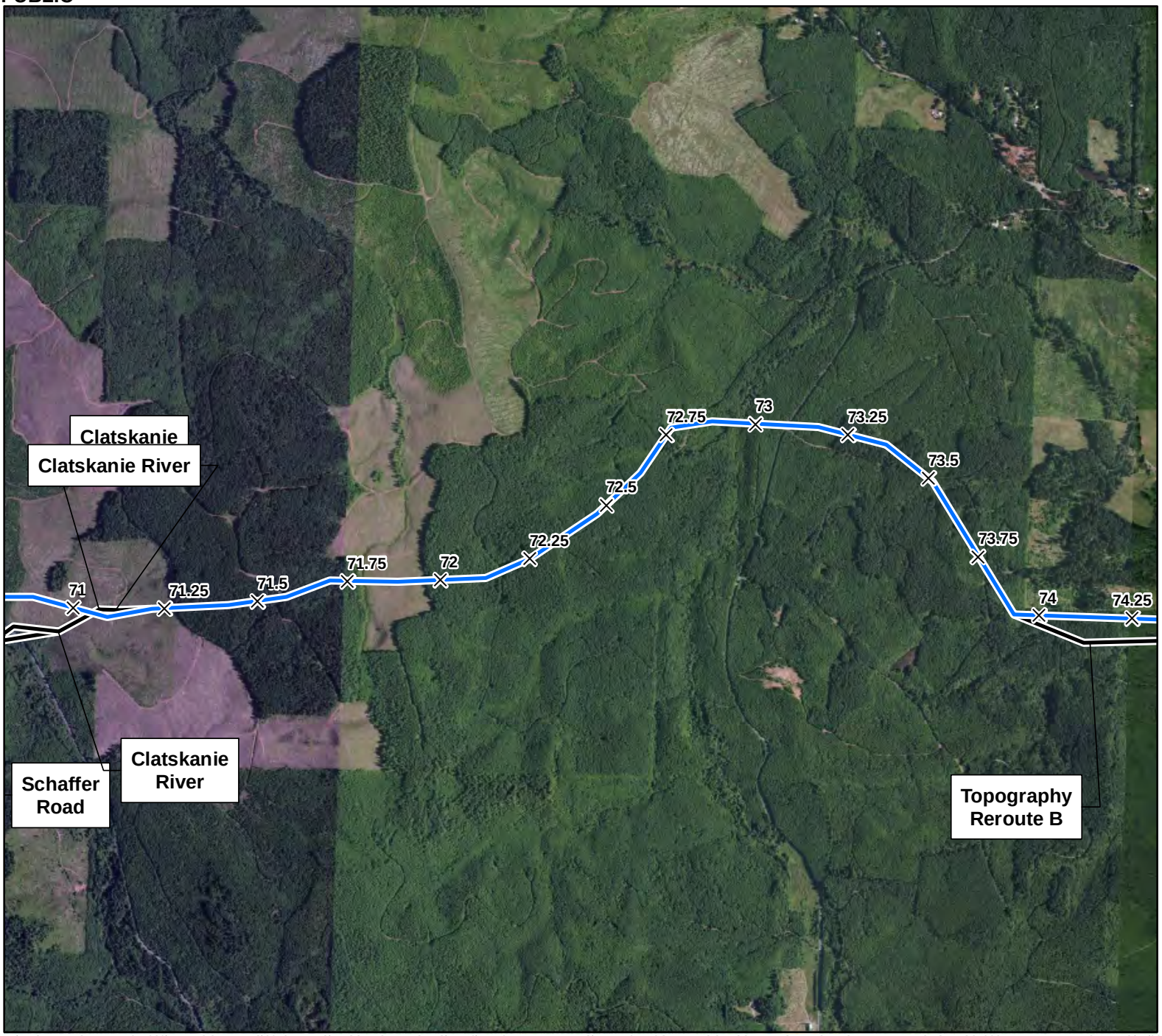
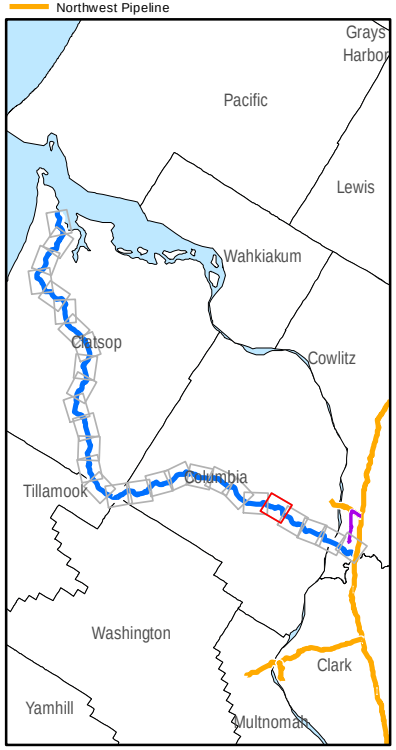


Appendix 10F

Figure 24
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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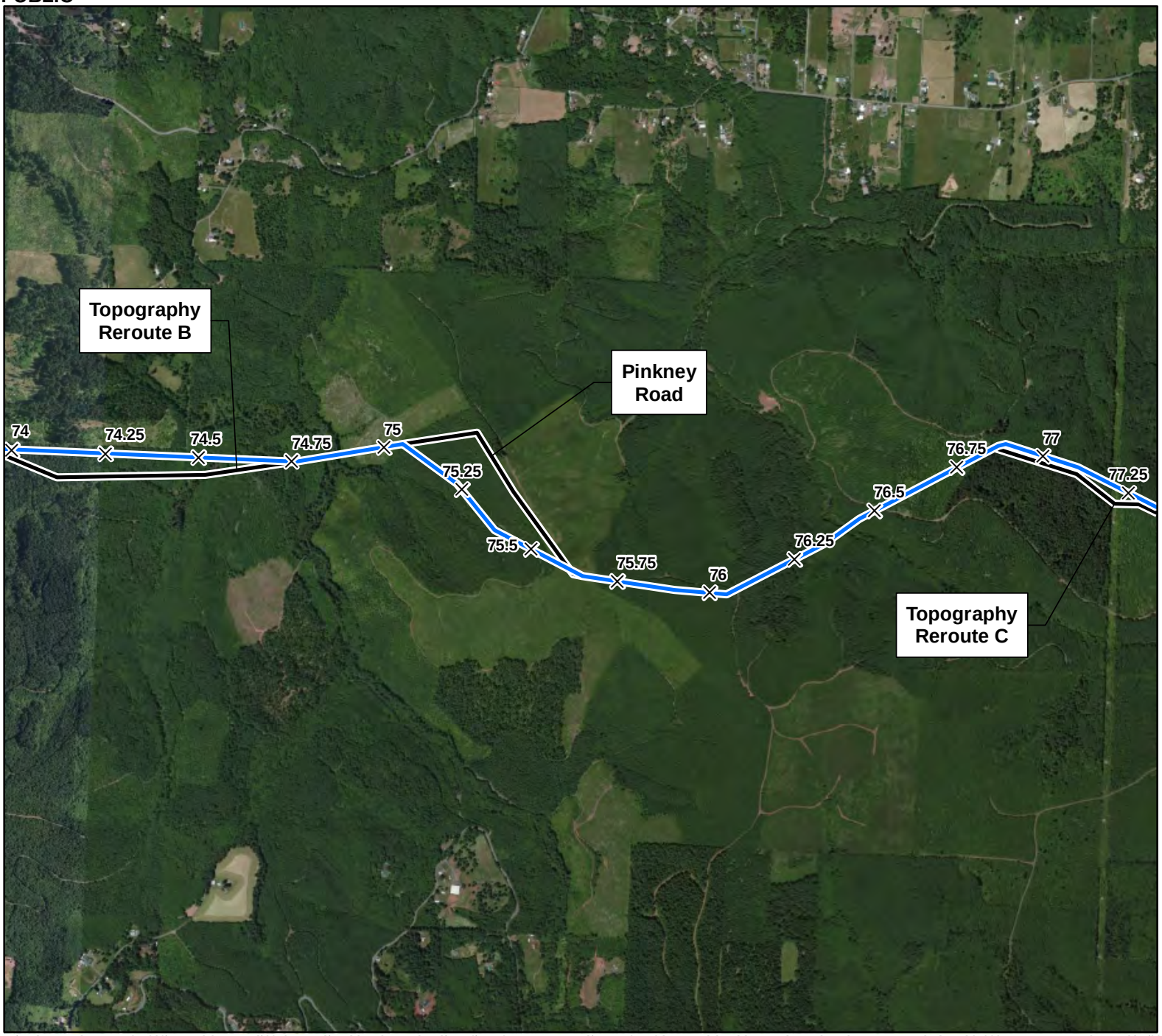
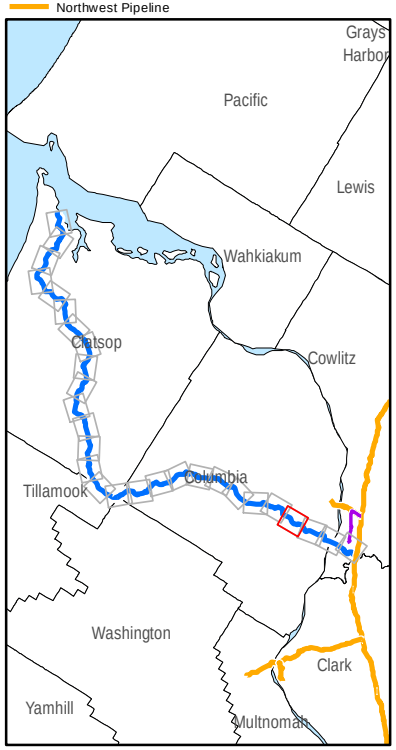


Appendix 10F

Figure 25
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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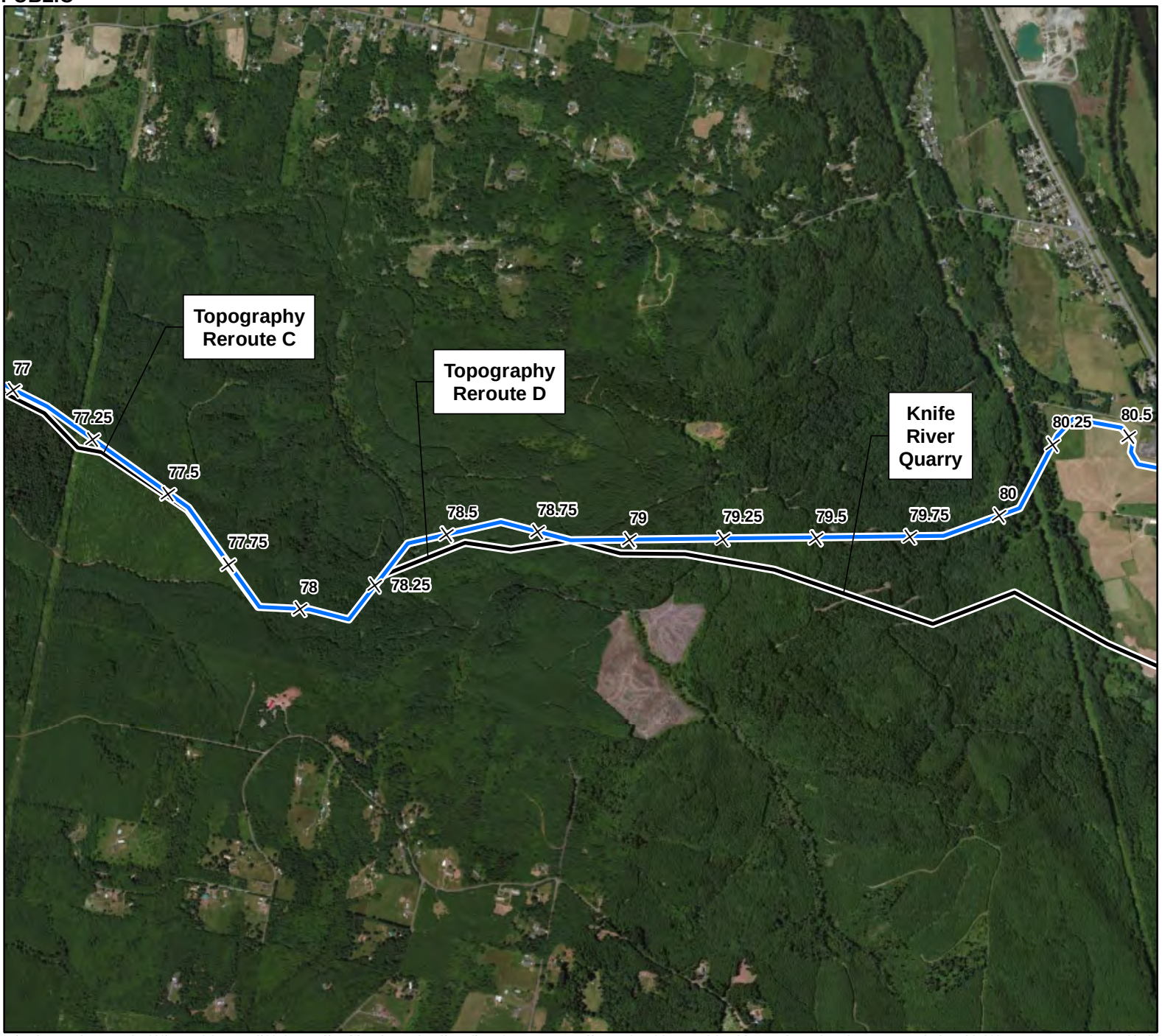
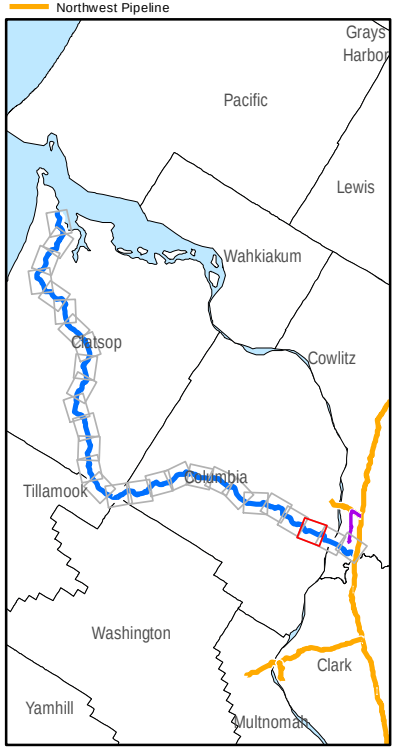


Appendix 10F

Figure 26
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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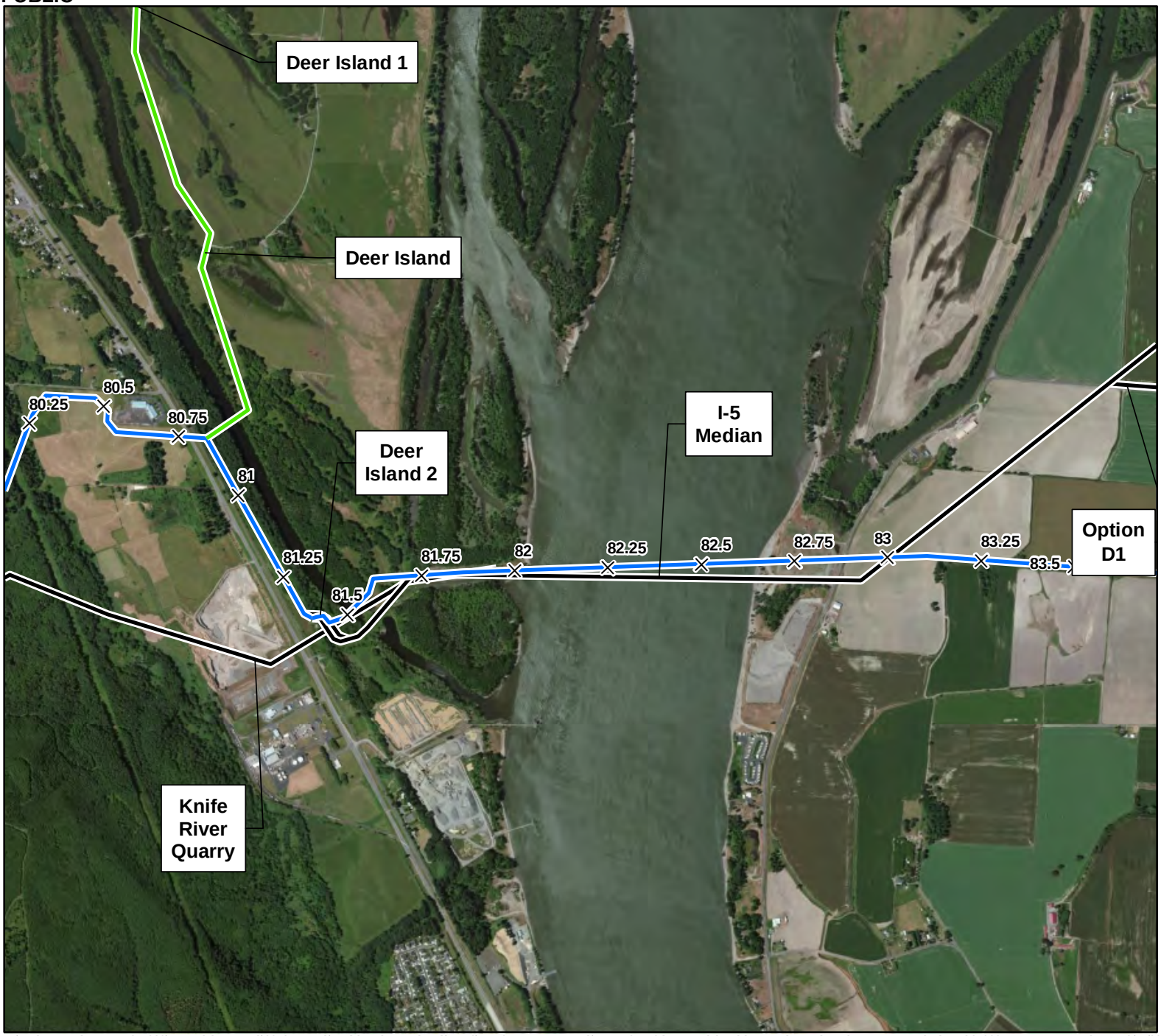
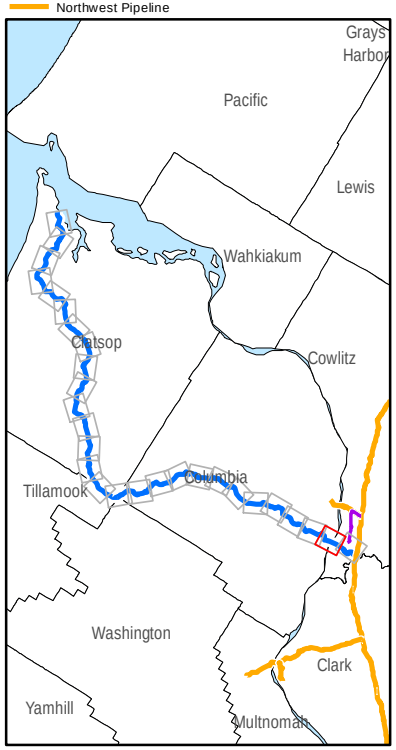


Appendix 10F

Figure 27
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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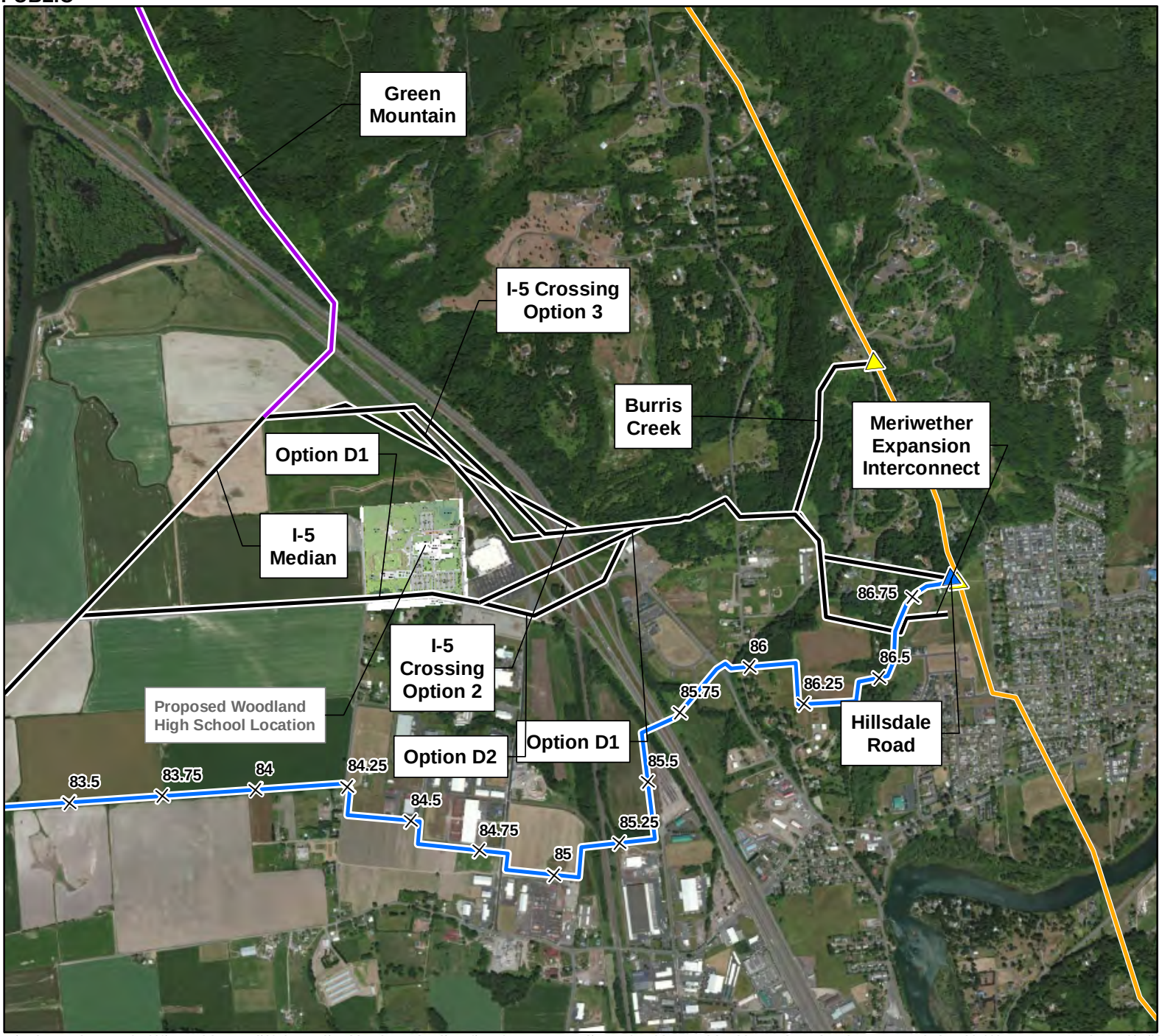
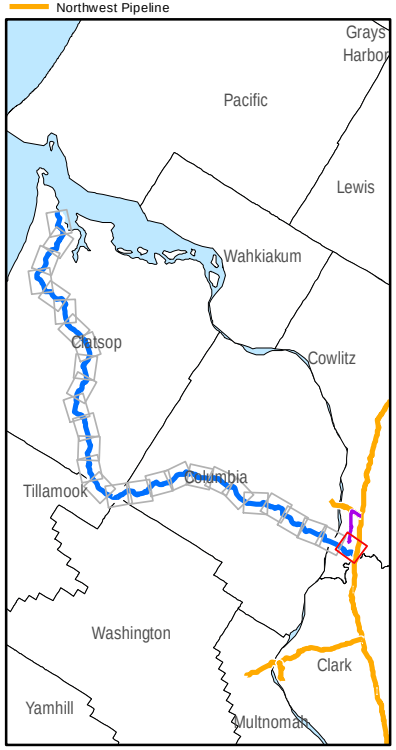


Appendix 10F

Figure 28
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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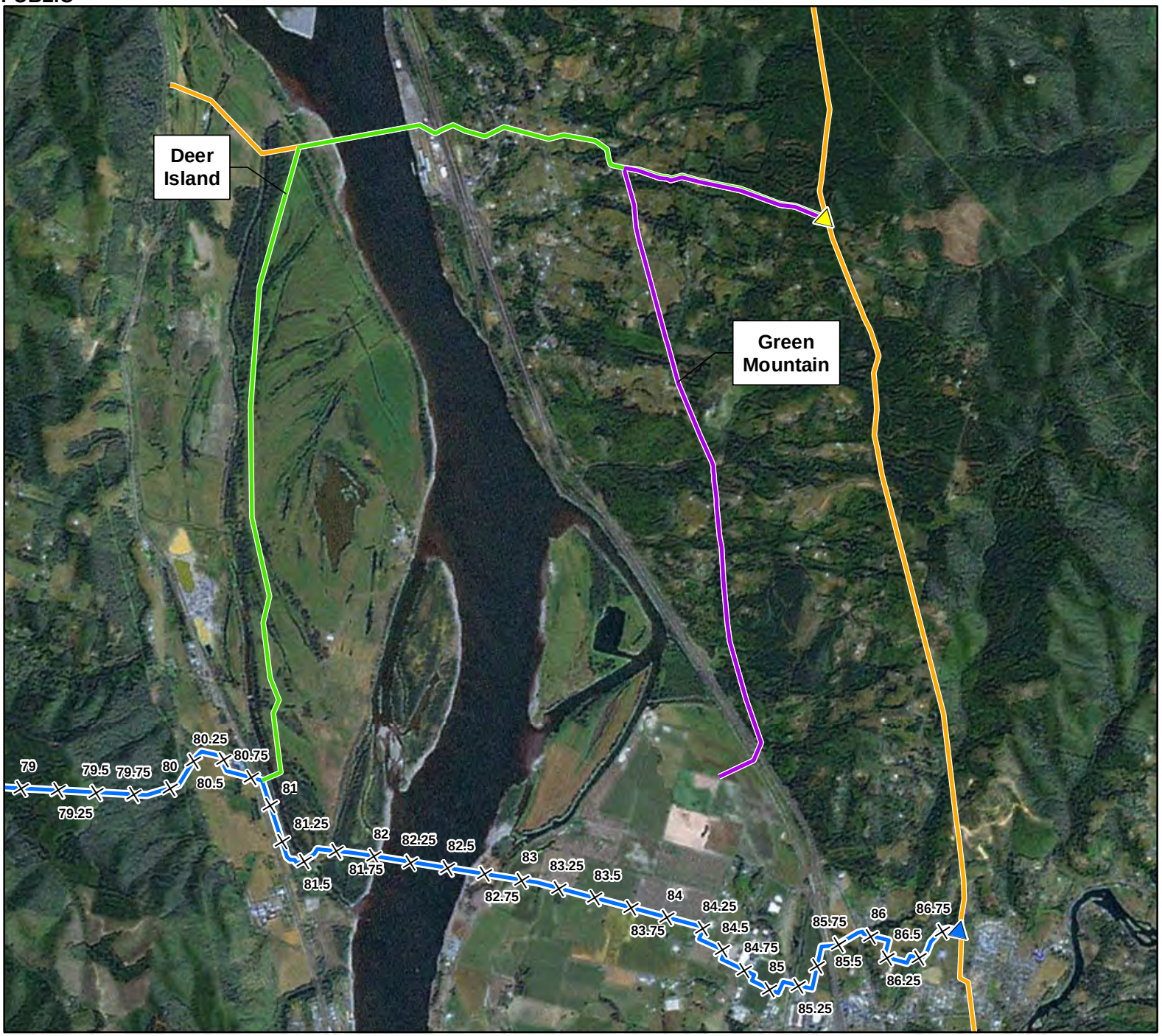


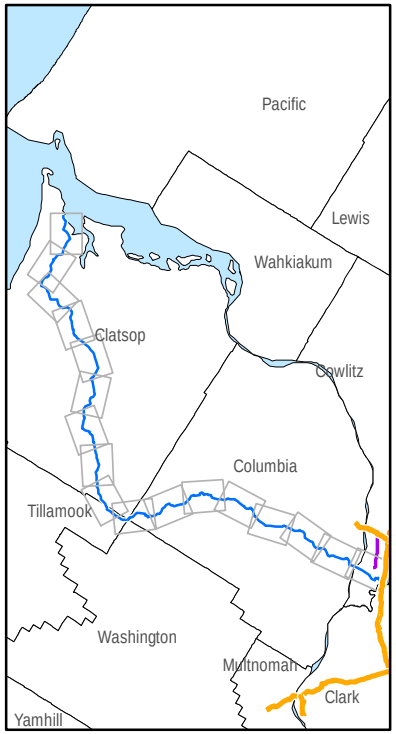
Appendix 10F

Figure 29

Deer Island and Green Mountain Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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Appendix 10G
Proposed and Minor Alternative Pipeline Route Variations [on USGS Topographic Maps]

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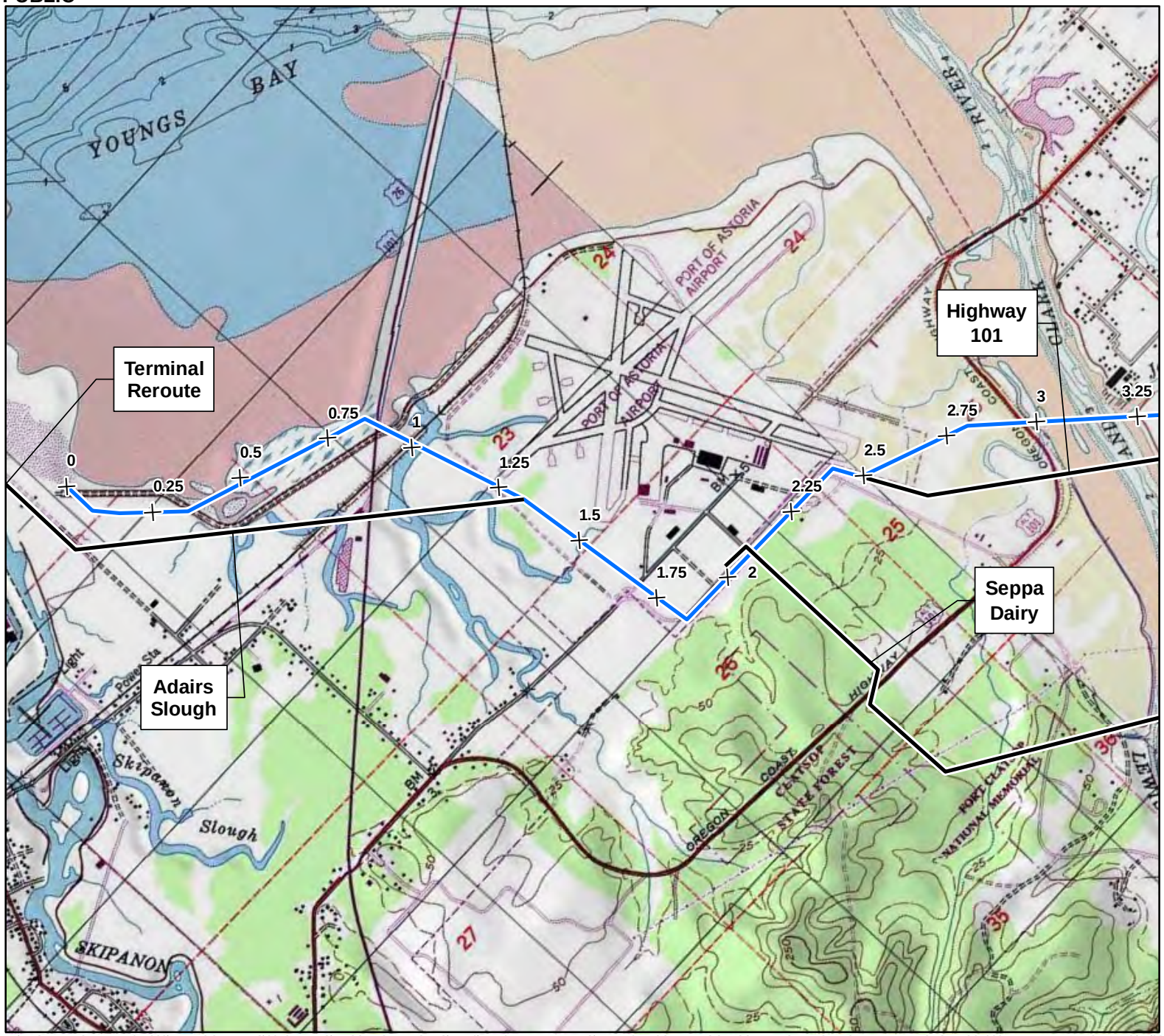
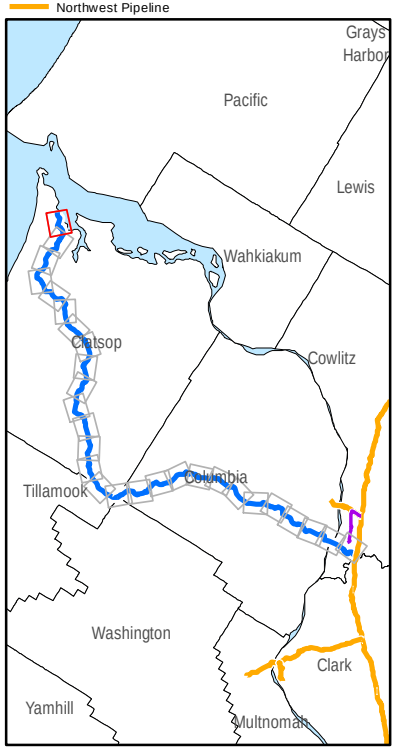


Appendix 10G

Figure 1
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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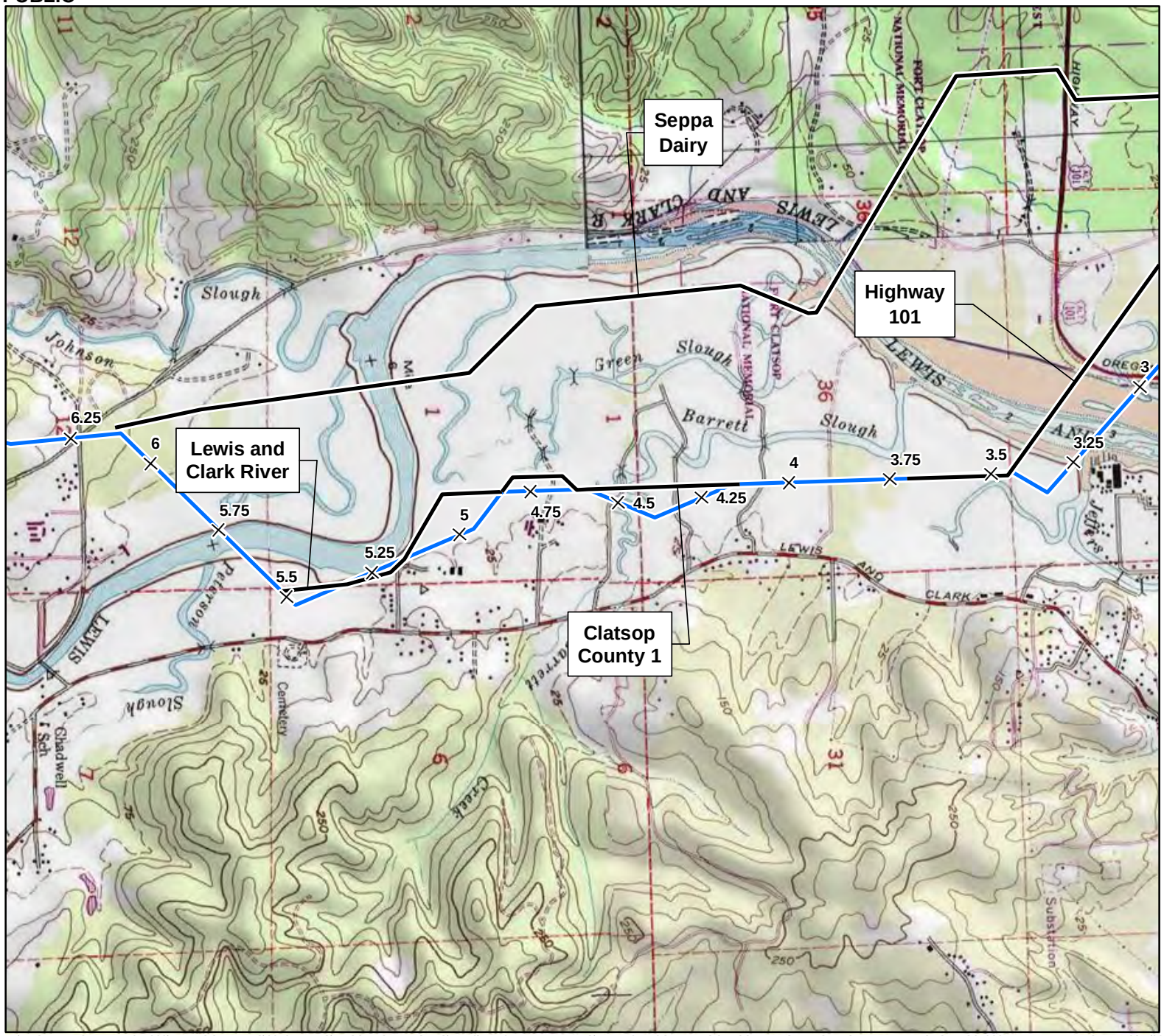
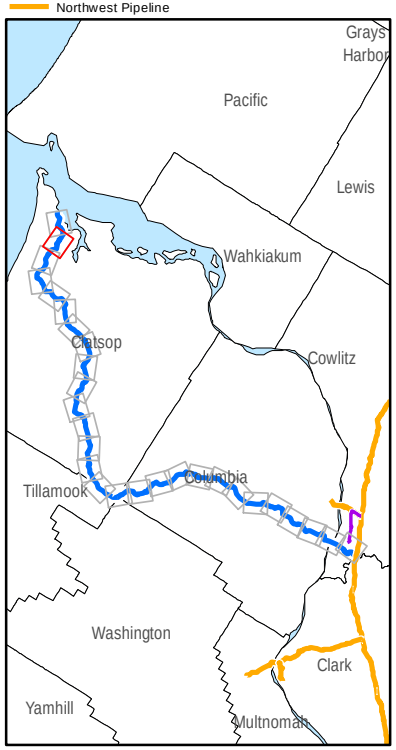


Appendix 10G

Figure 2
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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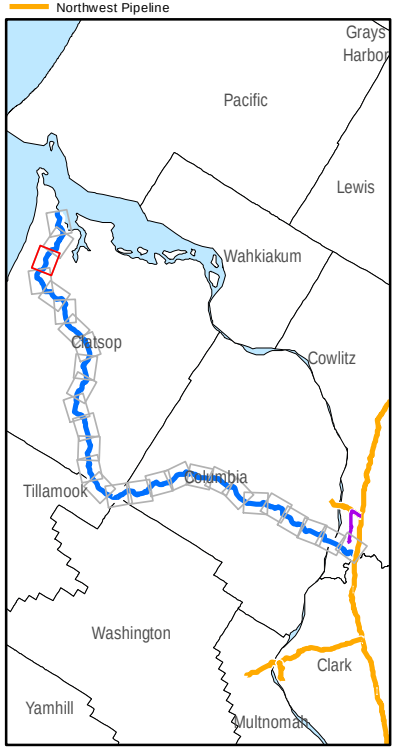
Appendix 10G

Figure 3
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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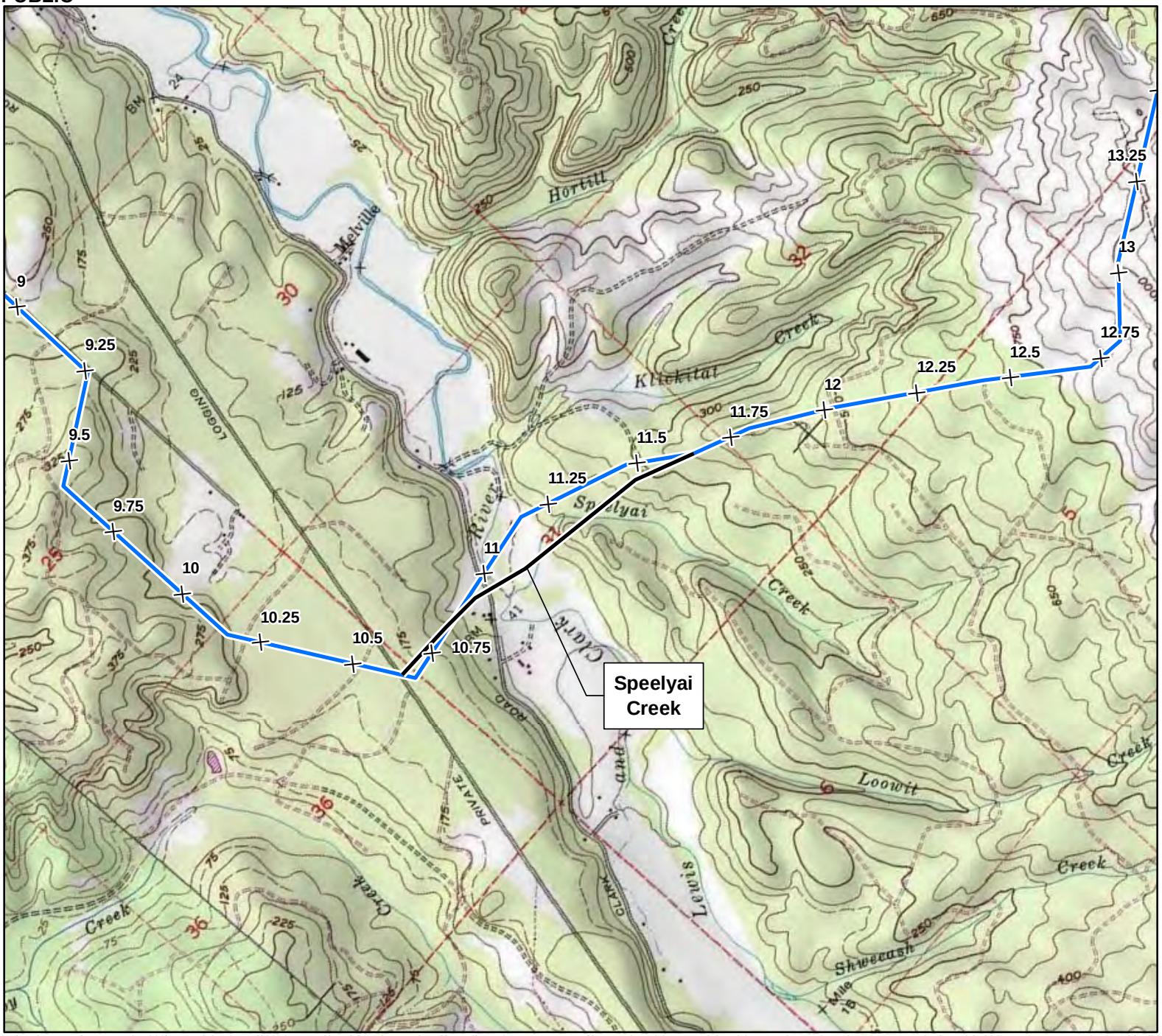

Appendix 10G

Figure 4
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

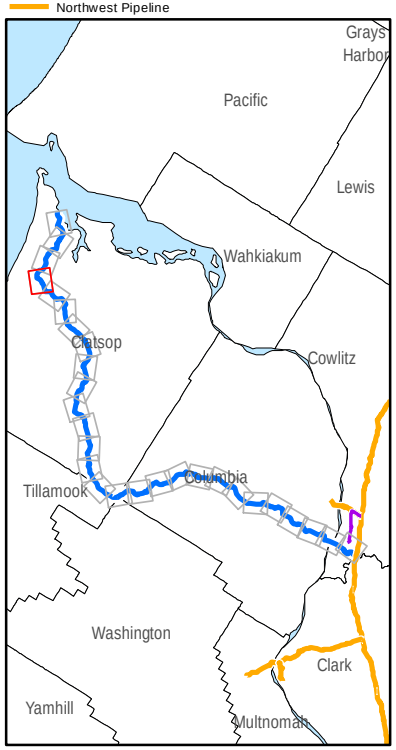

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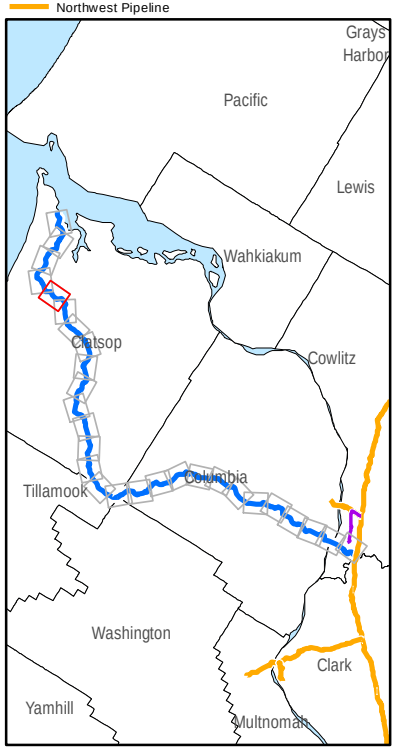
Figure 5
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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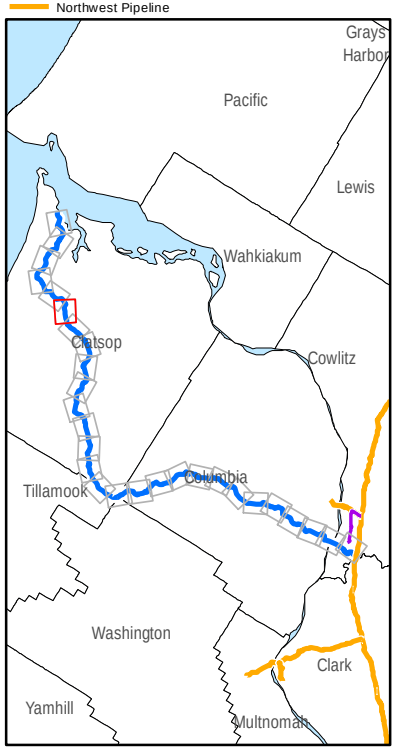
Appendix 10G

Figure 6
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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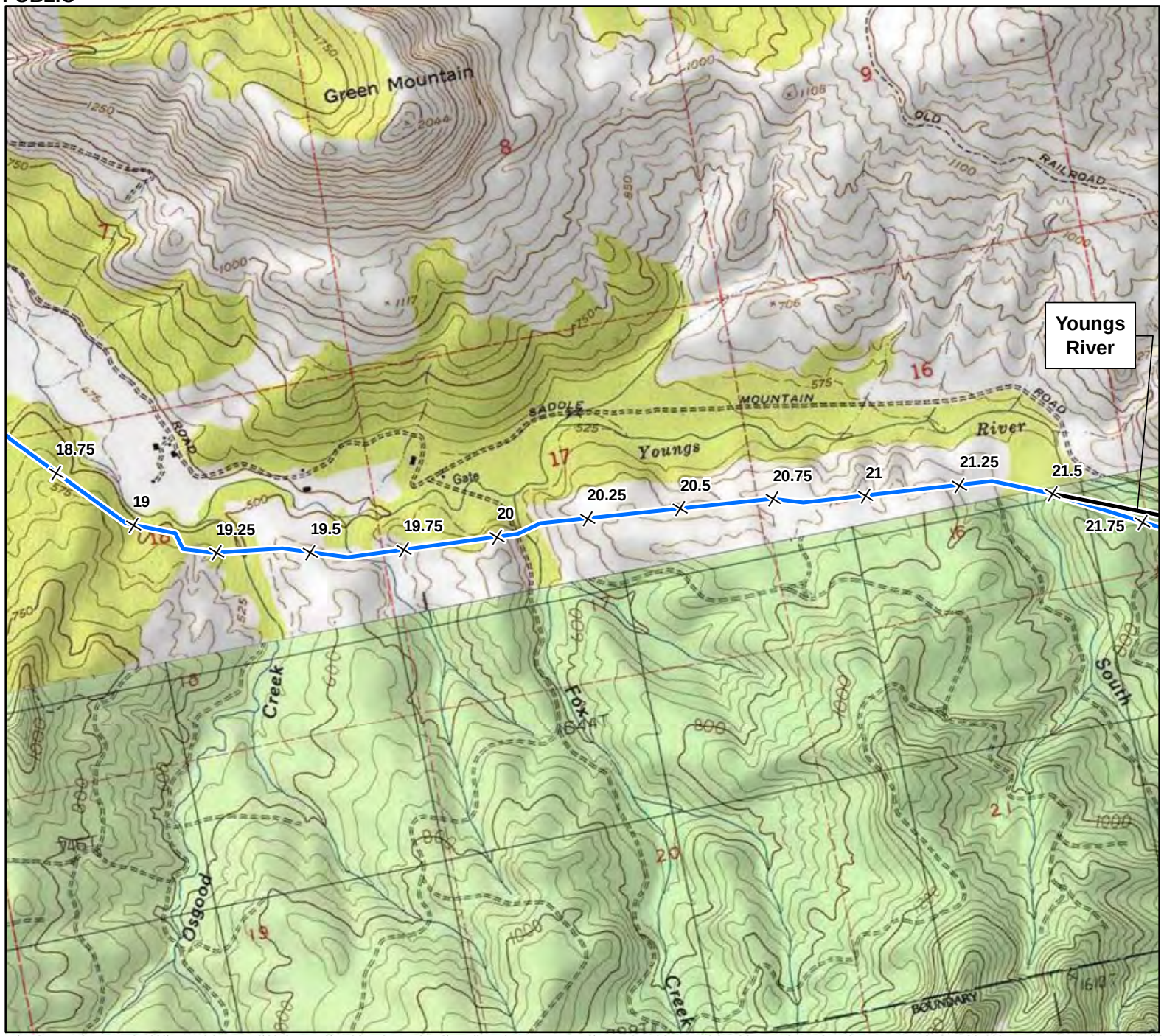

Appendix 10G

Figure 7
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

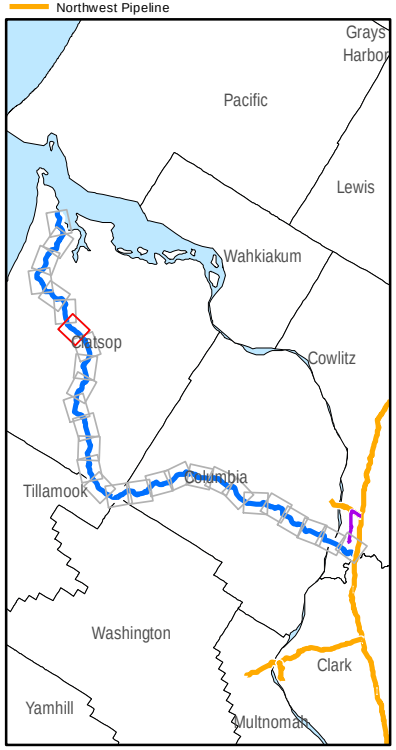

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Figure 8
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

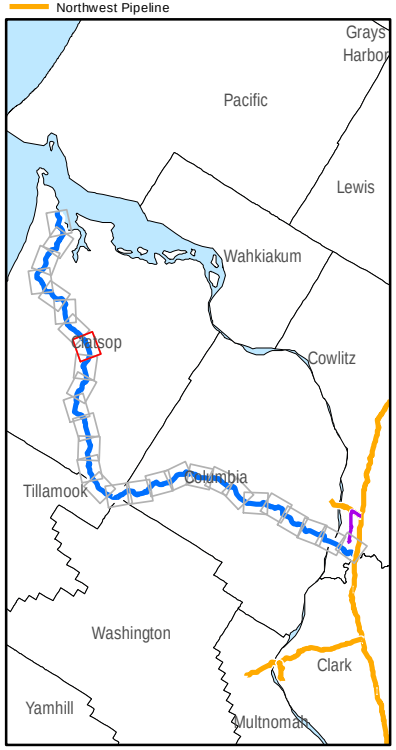

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Figure 9
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

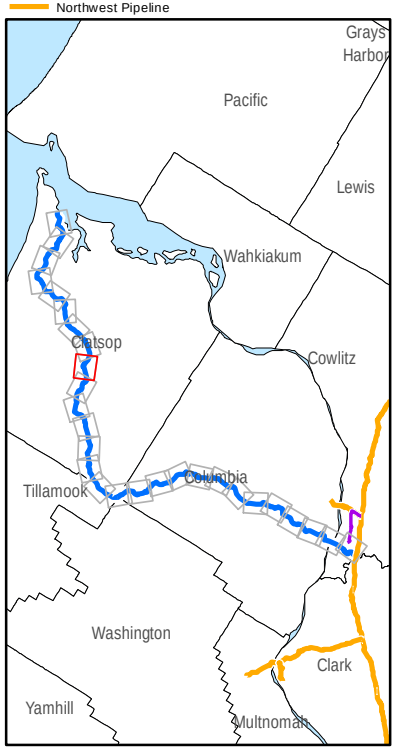

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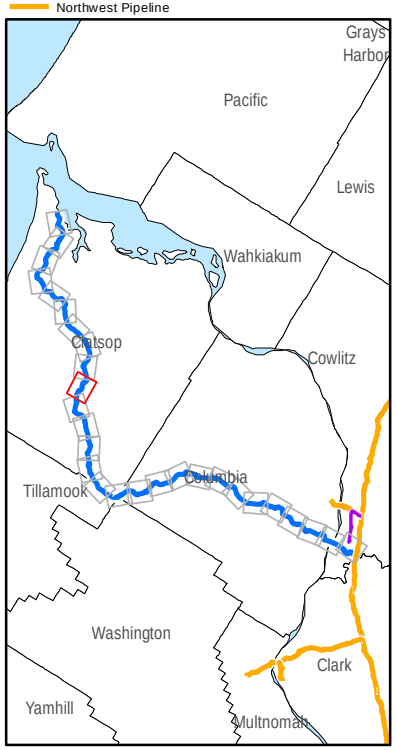
Figure 10
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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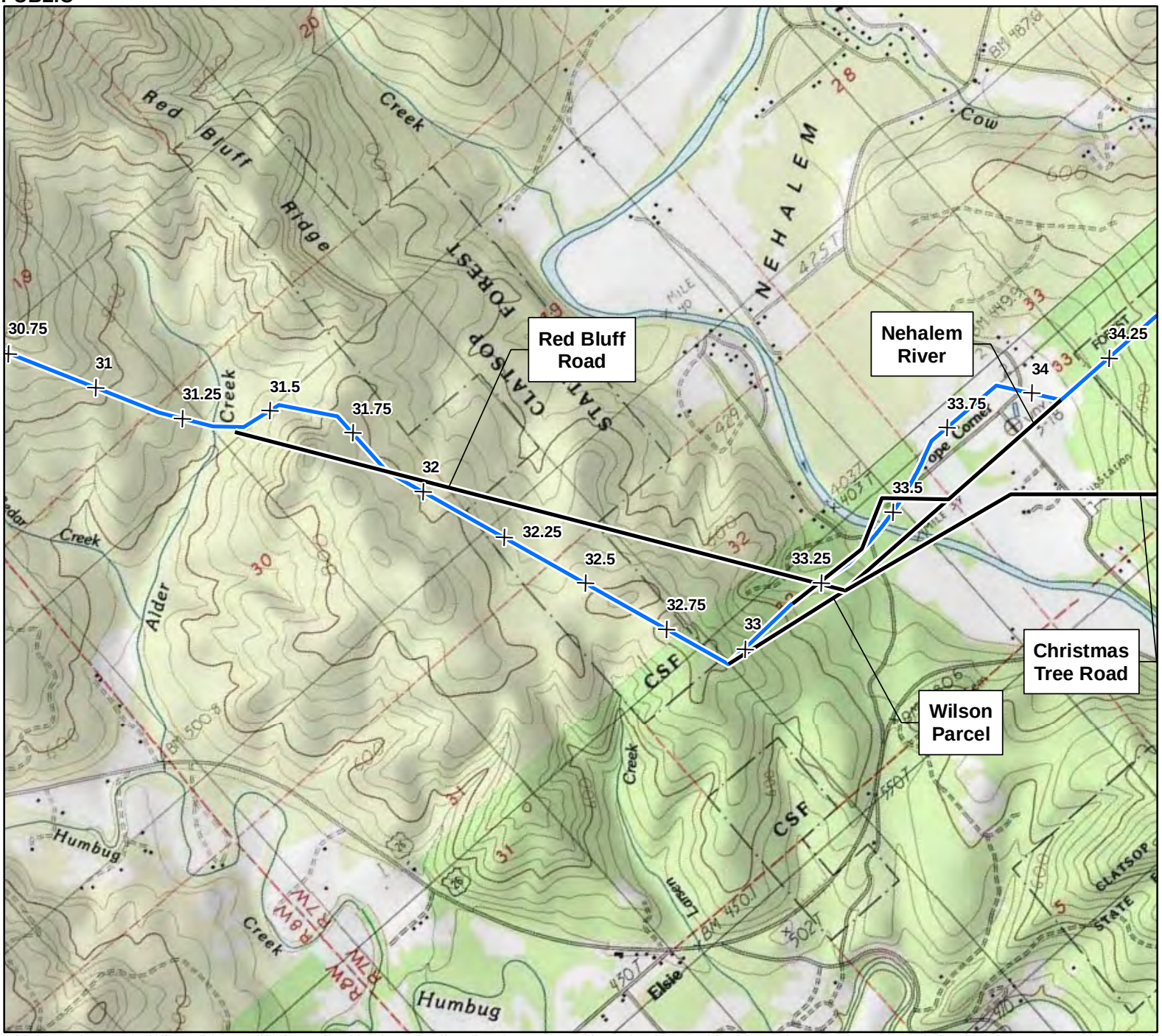
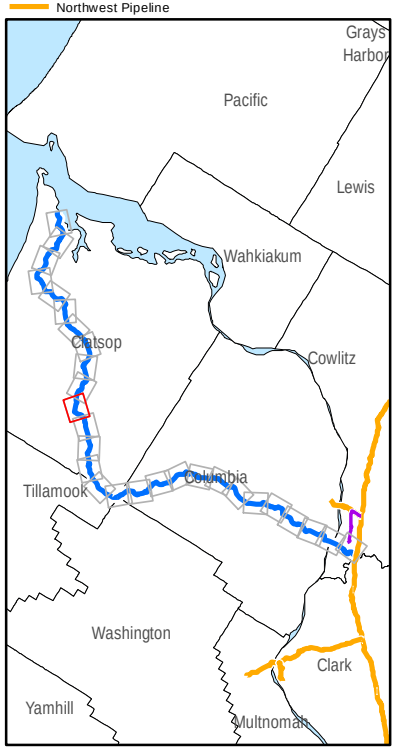


Appendix 10G

Figure 11
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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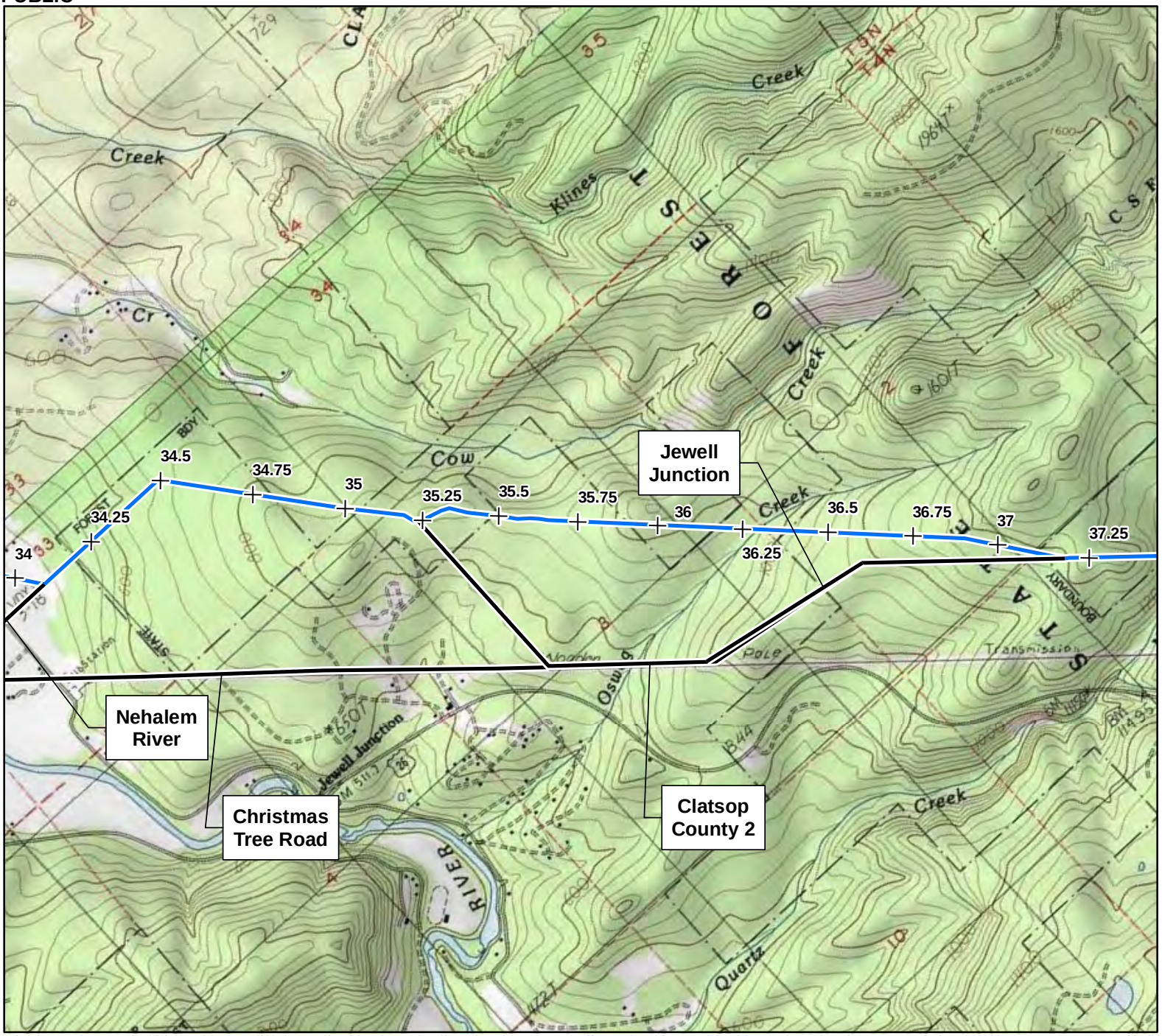
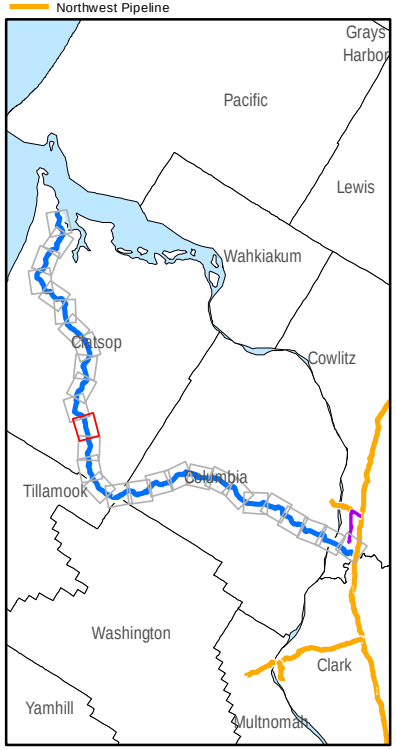


Appendix 10G

Figure 12
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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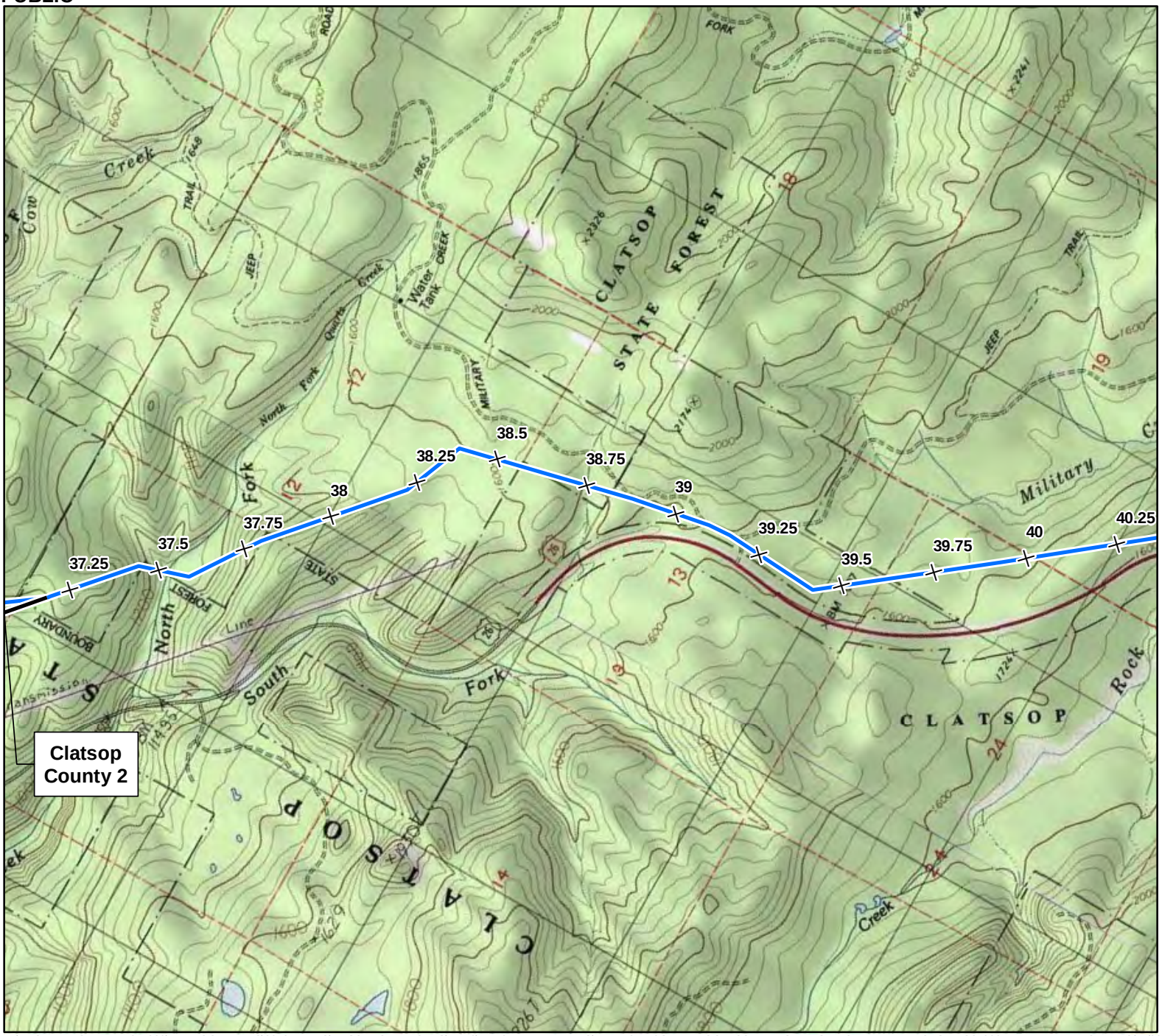
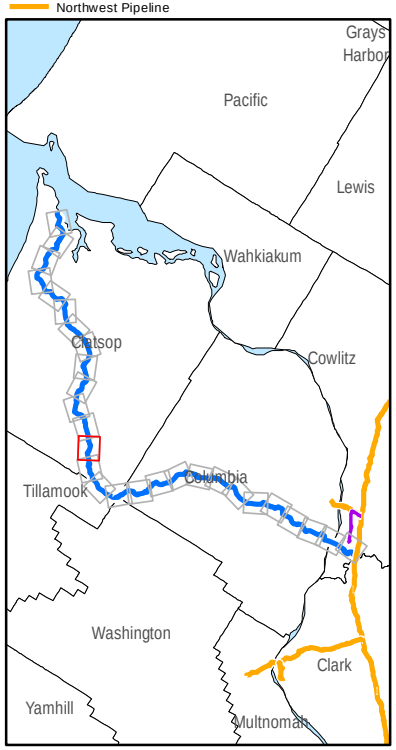


Appendix 10G

Figure 13
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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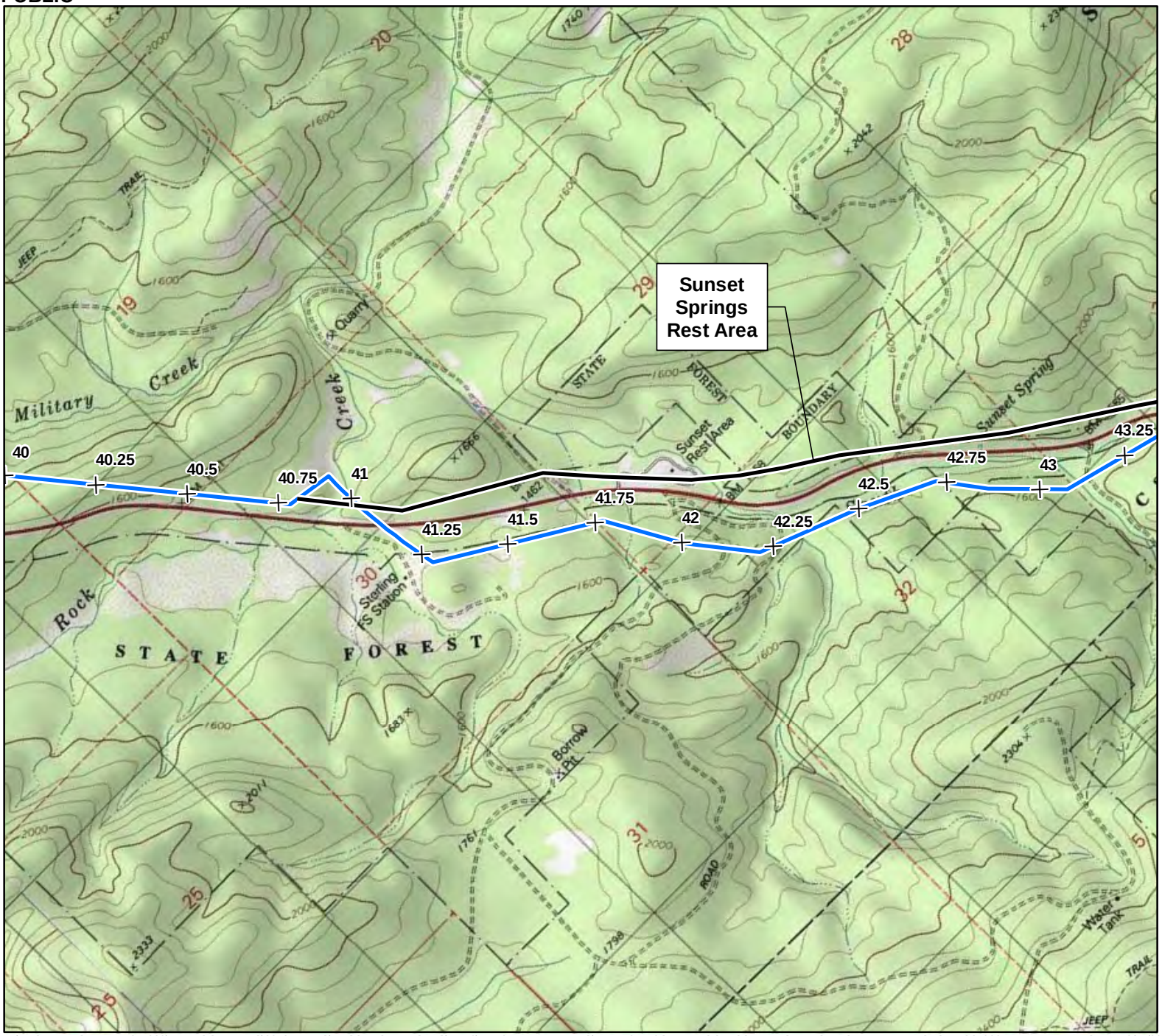
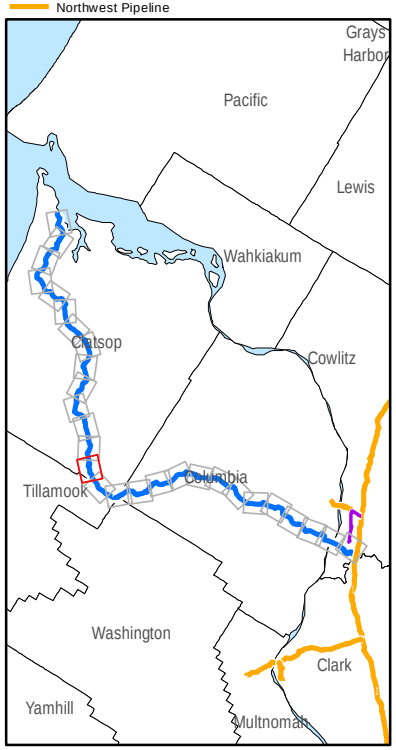


Appendix 10G

Figure 14
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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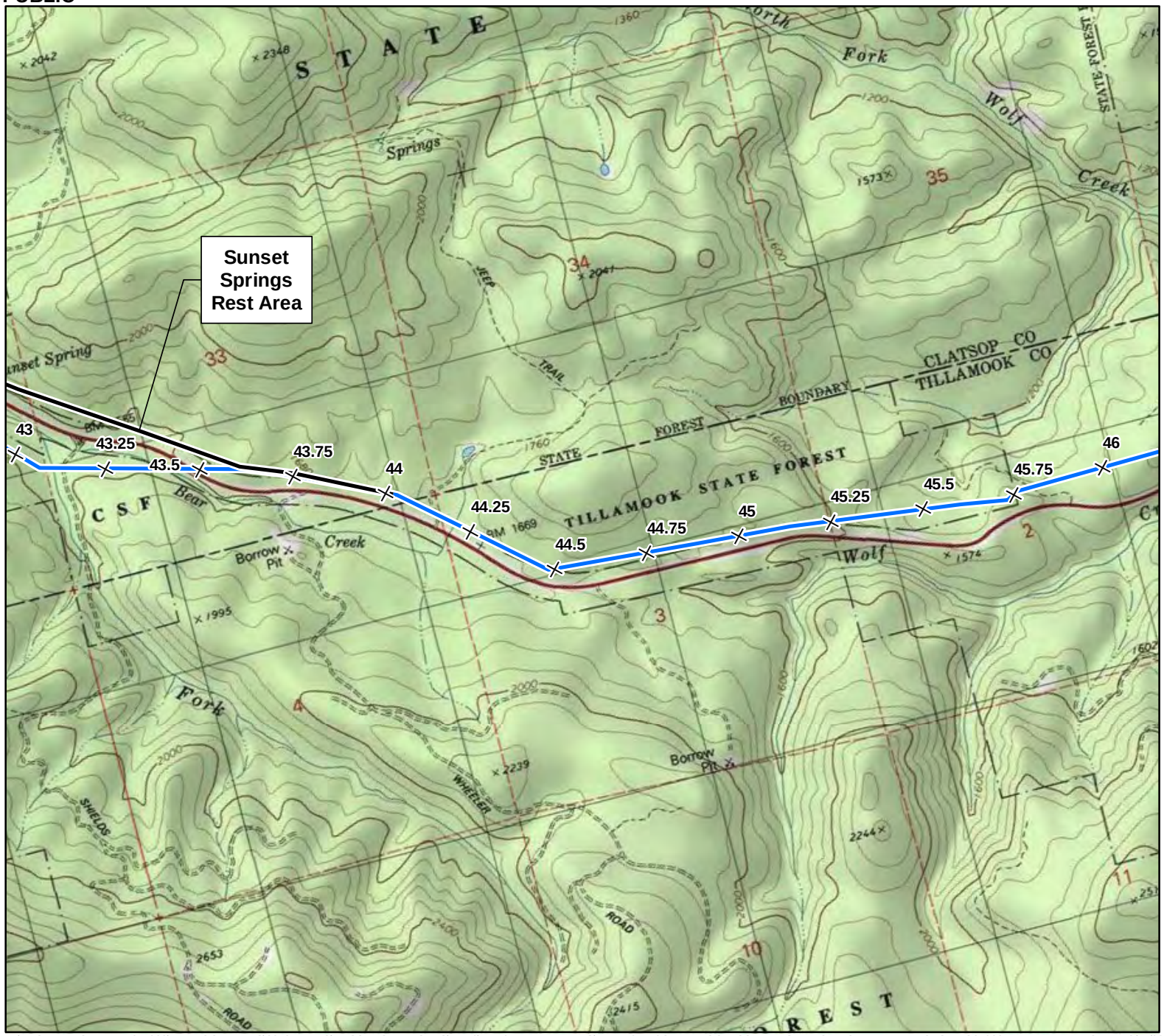
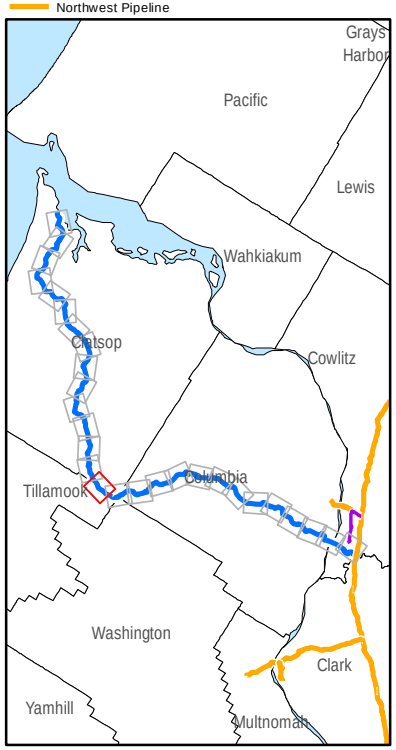


Appendix 10G

Figure 15
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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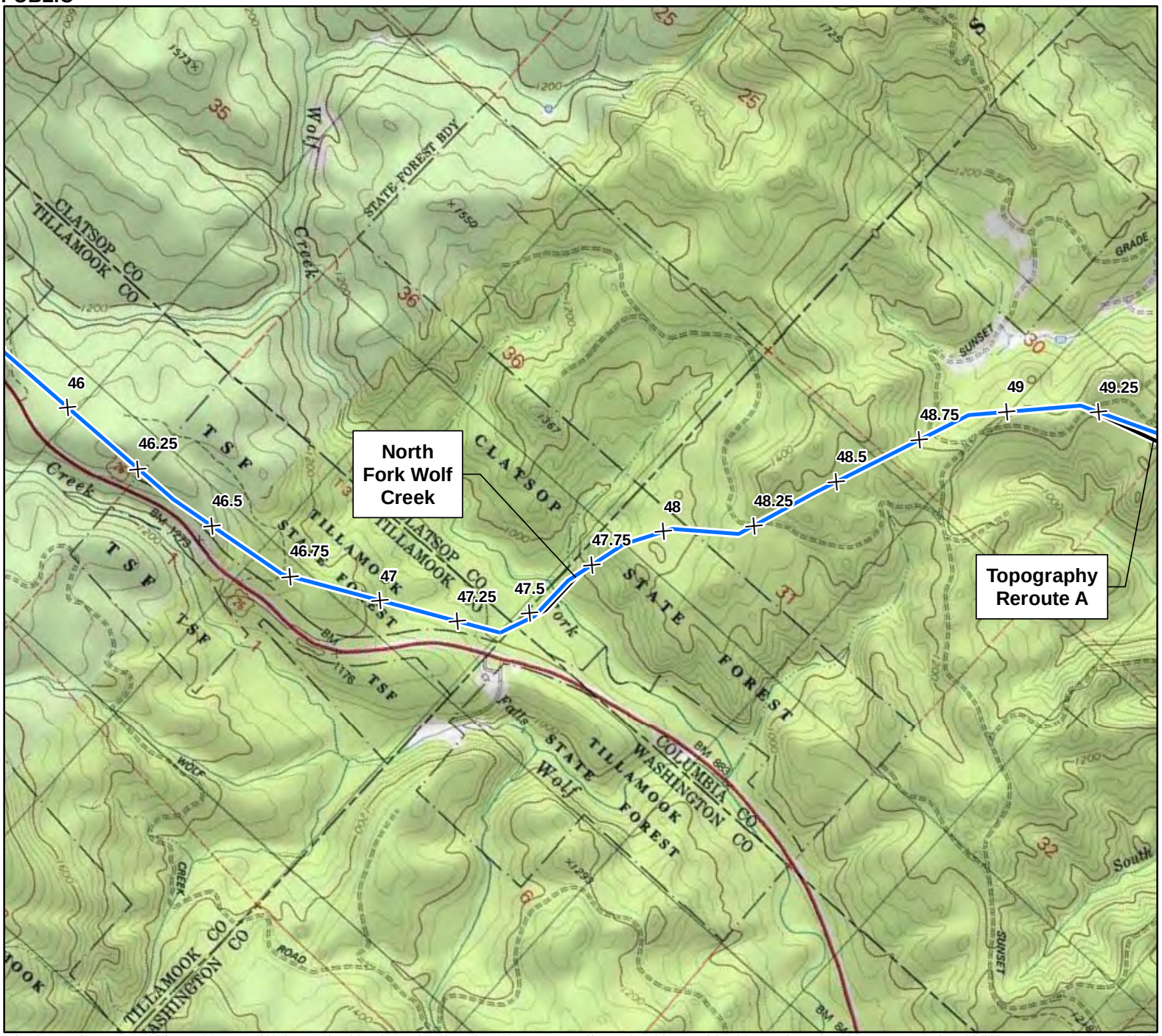
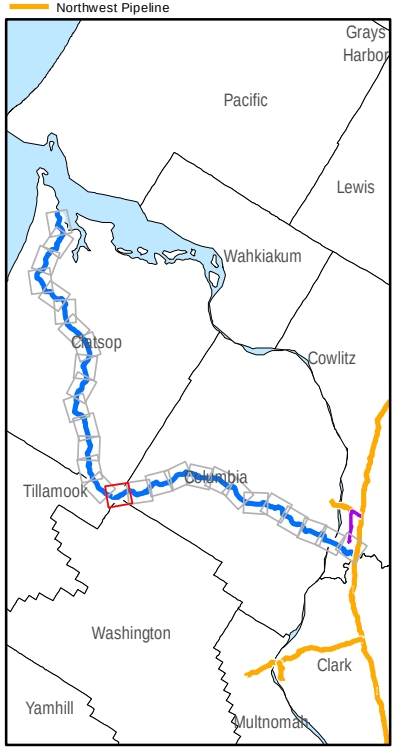


Appendix 10G

Figure 16
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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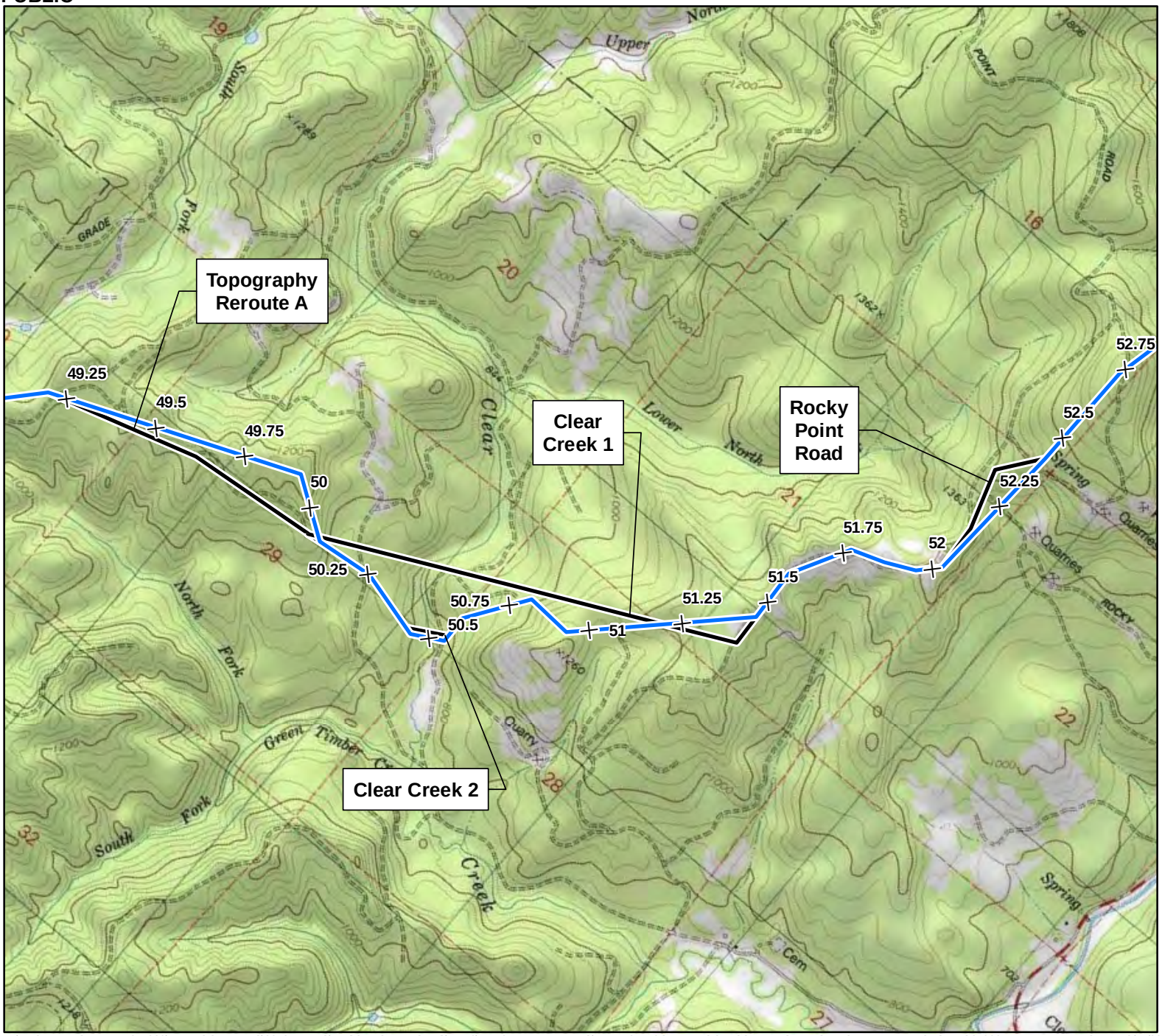
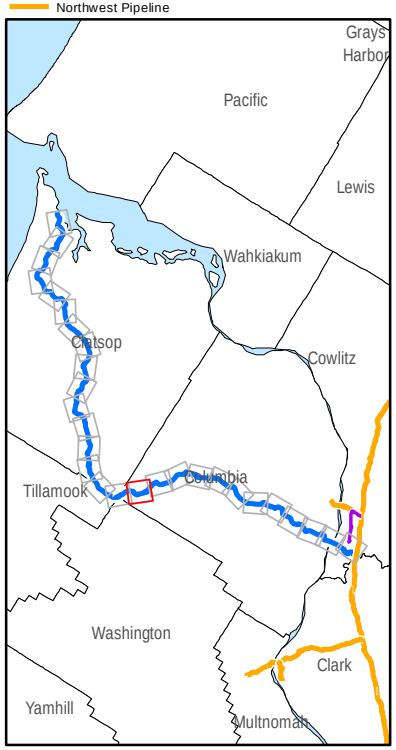


Appendix 10G

Figure 17
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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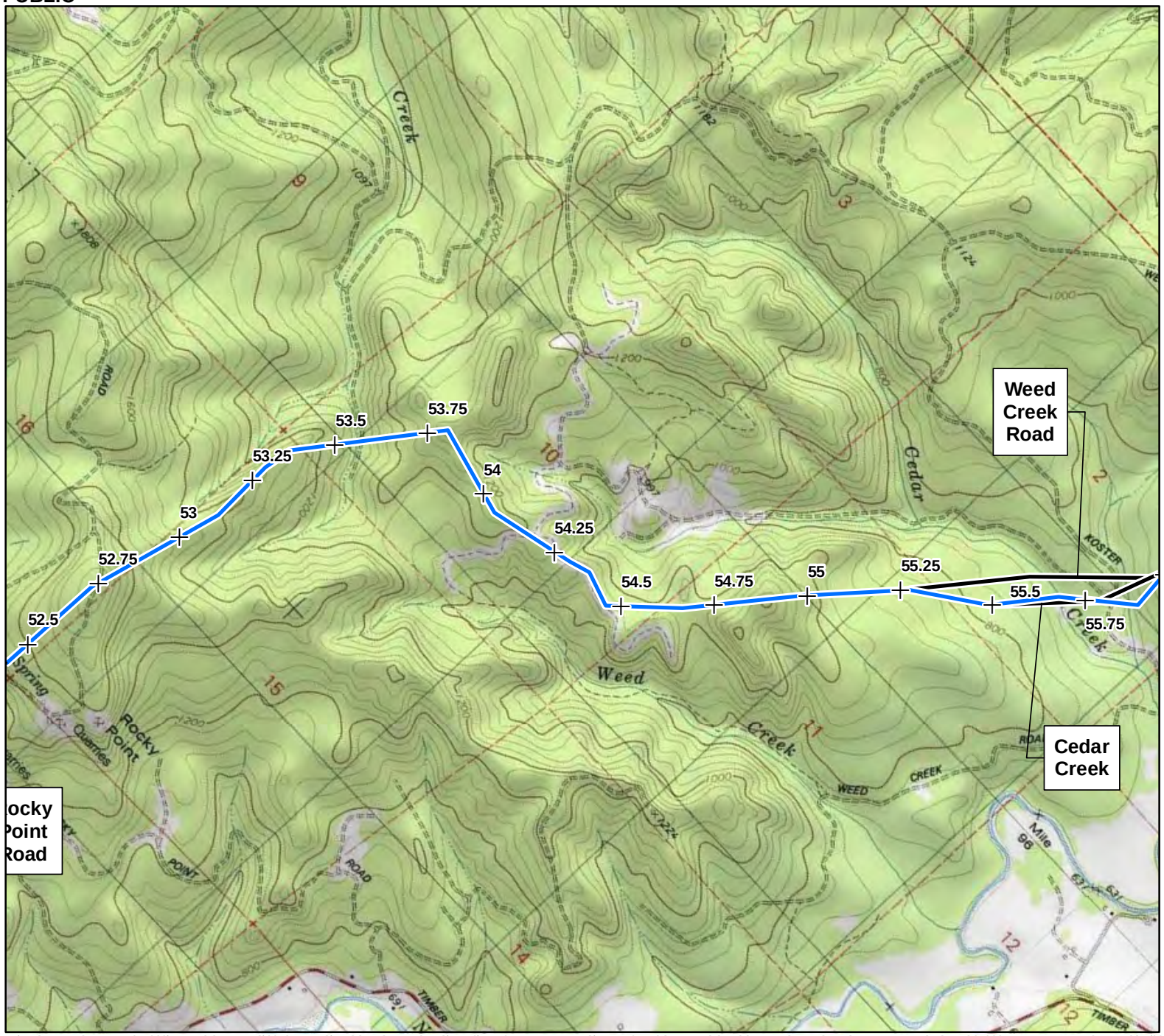
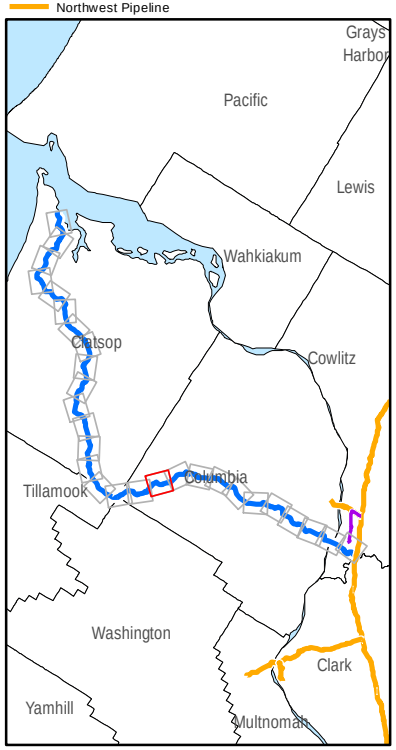


Appendix 10G

Figure 18
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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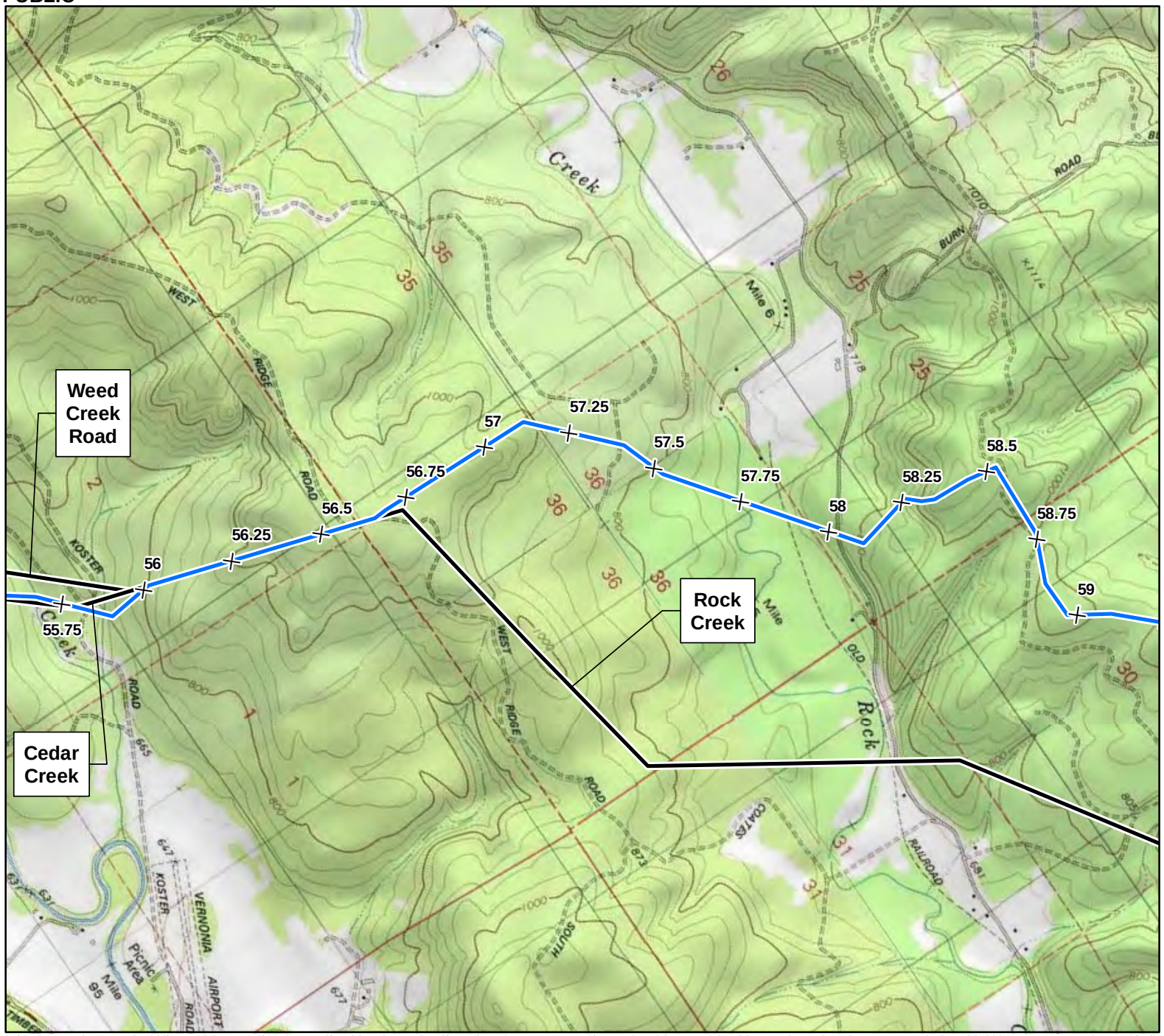
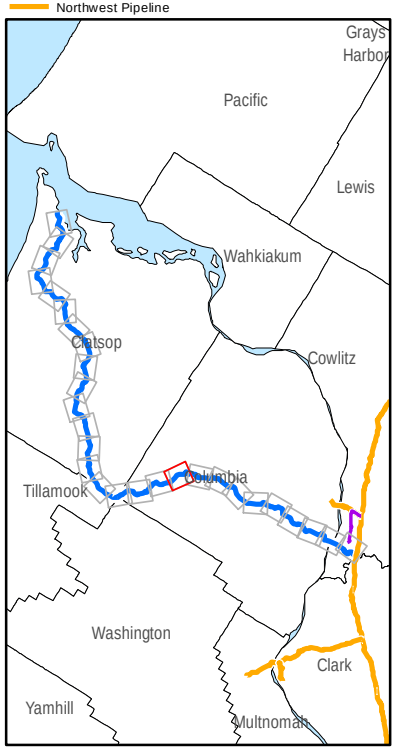


Appendix 10G

Figure 19
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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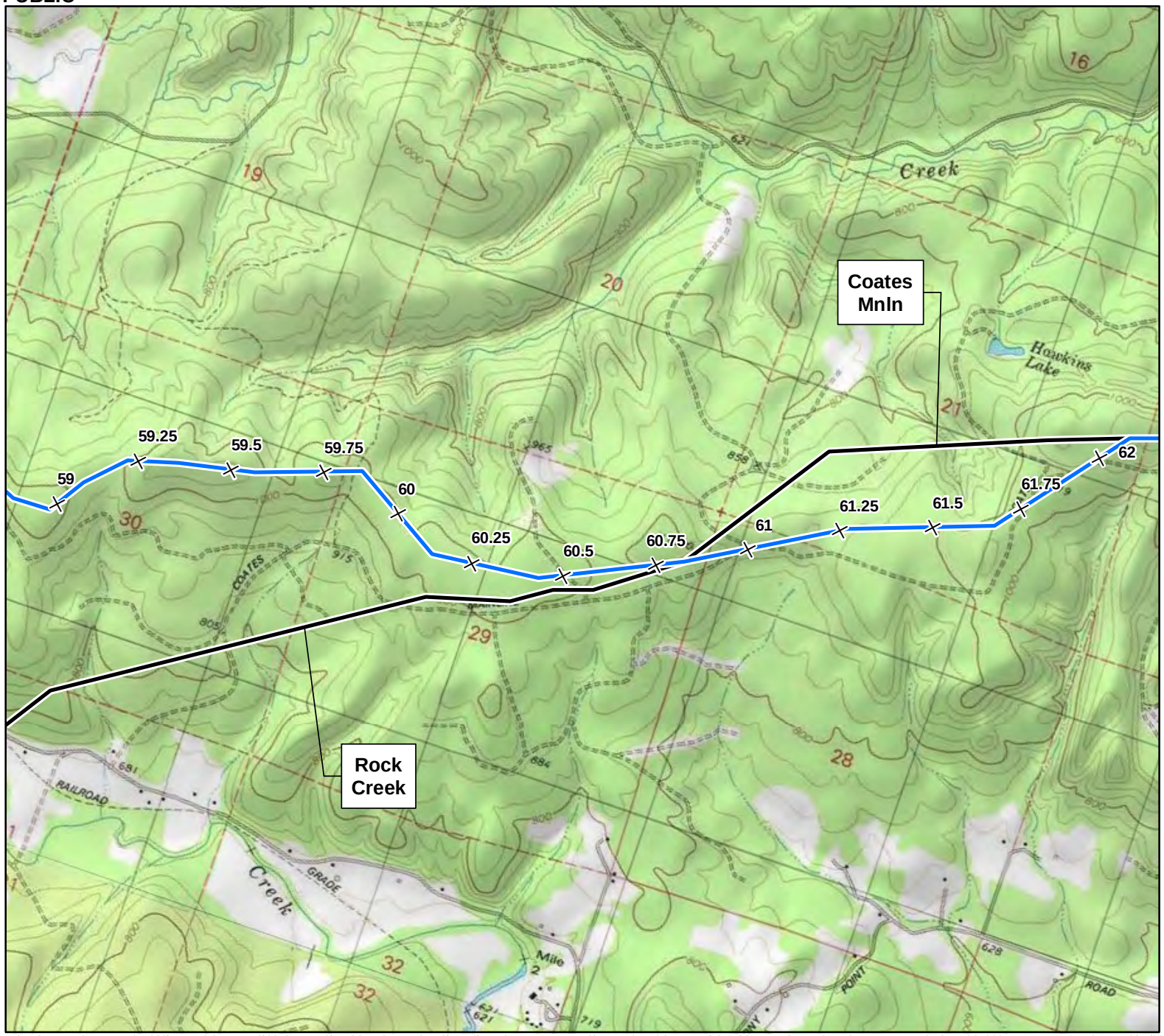
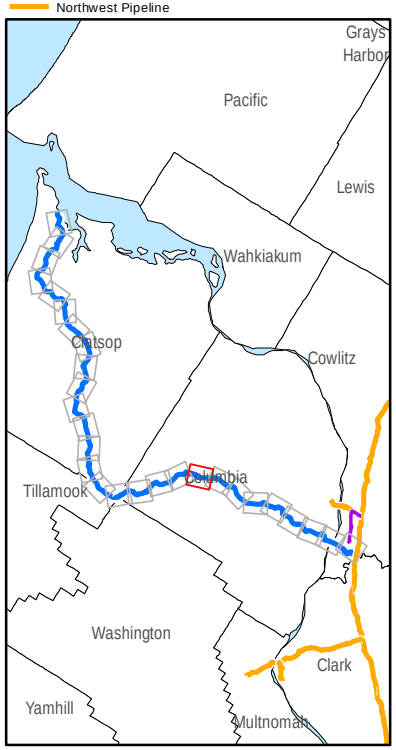


Appendix 10G

Figure 20
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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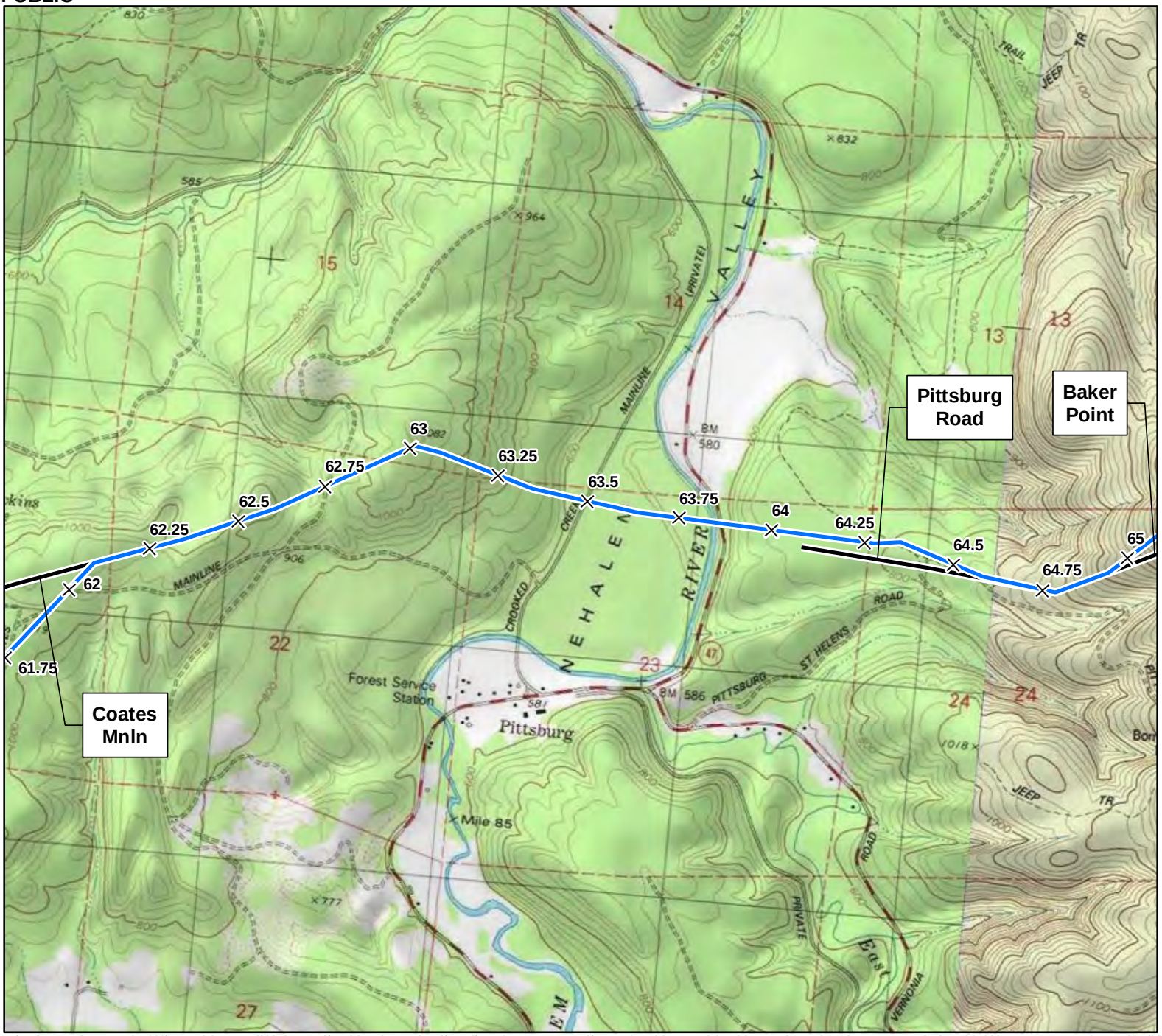
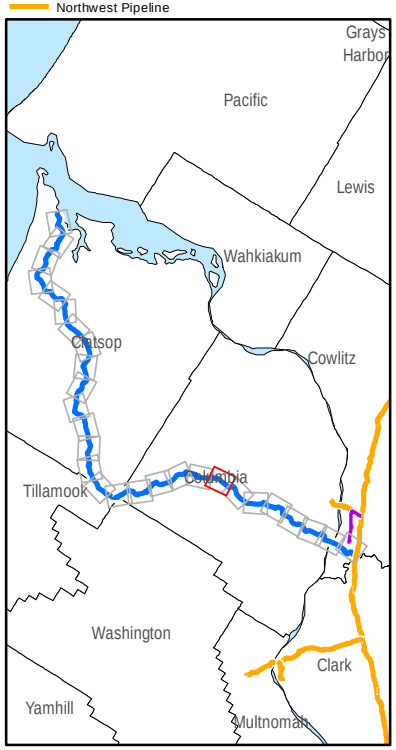


Appendix 10G

Figure 21
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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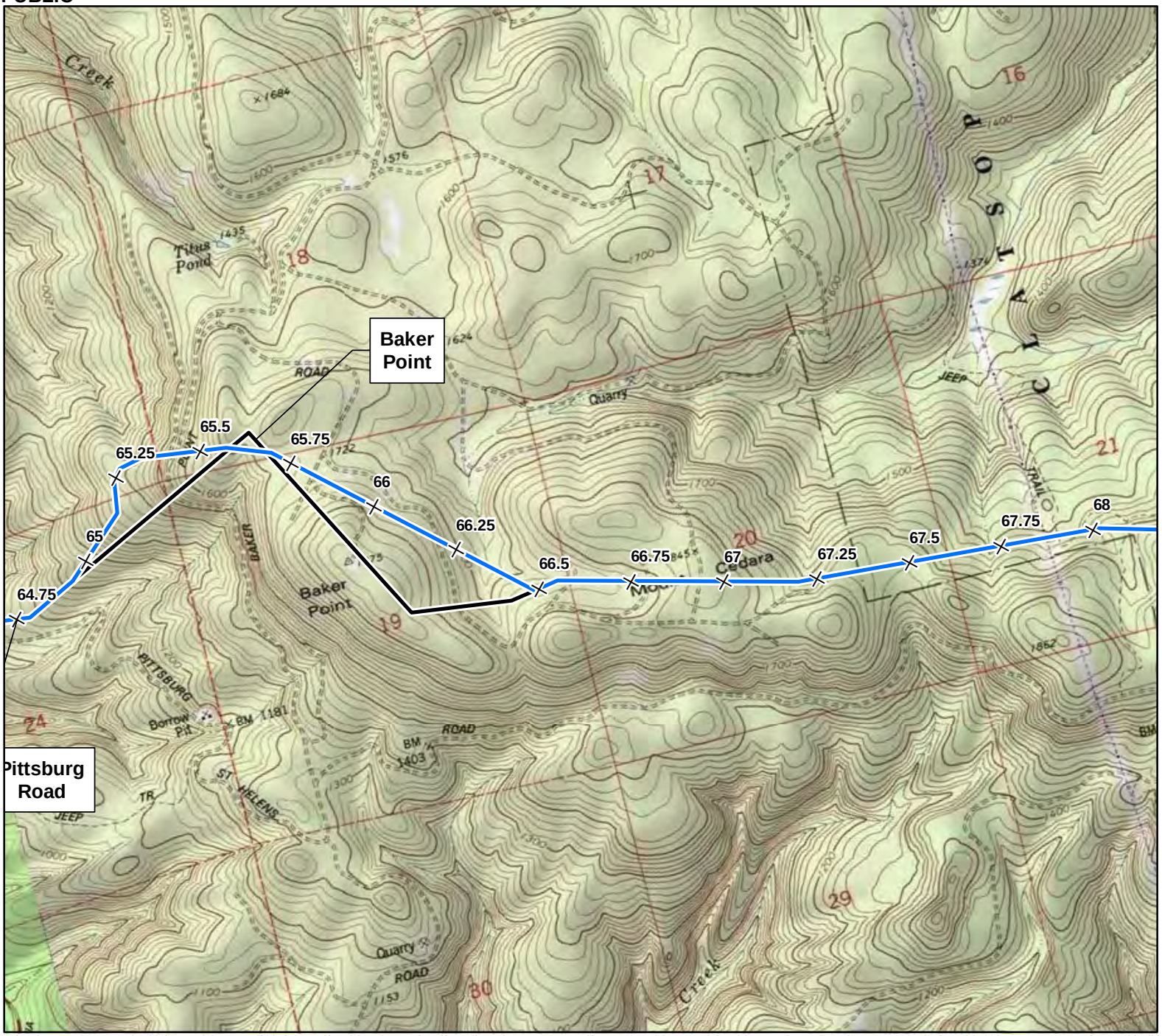
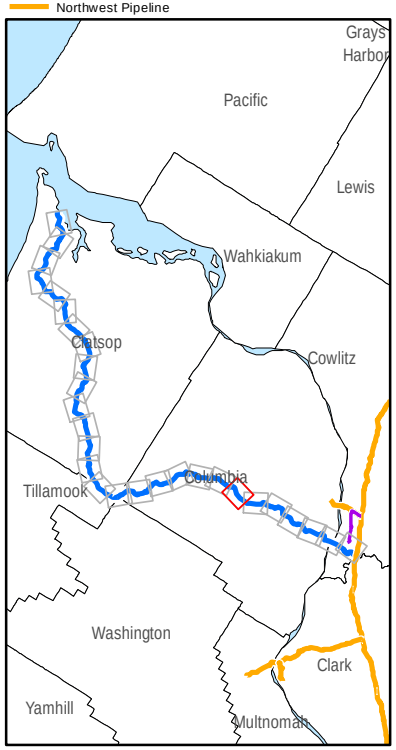


Appendix 10G

Figure 22
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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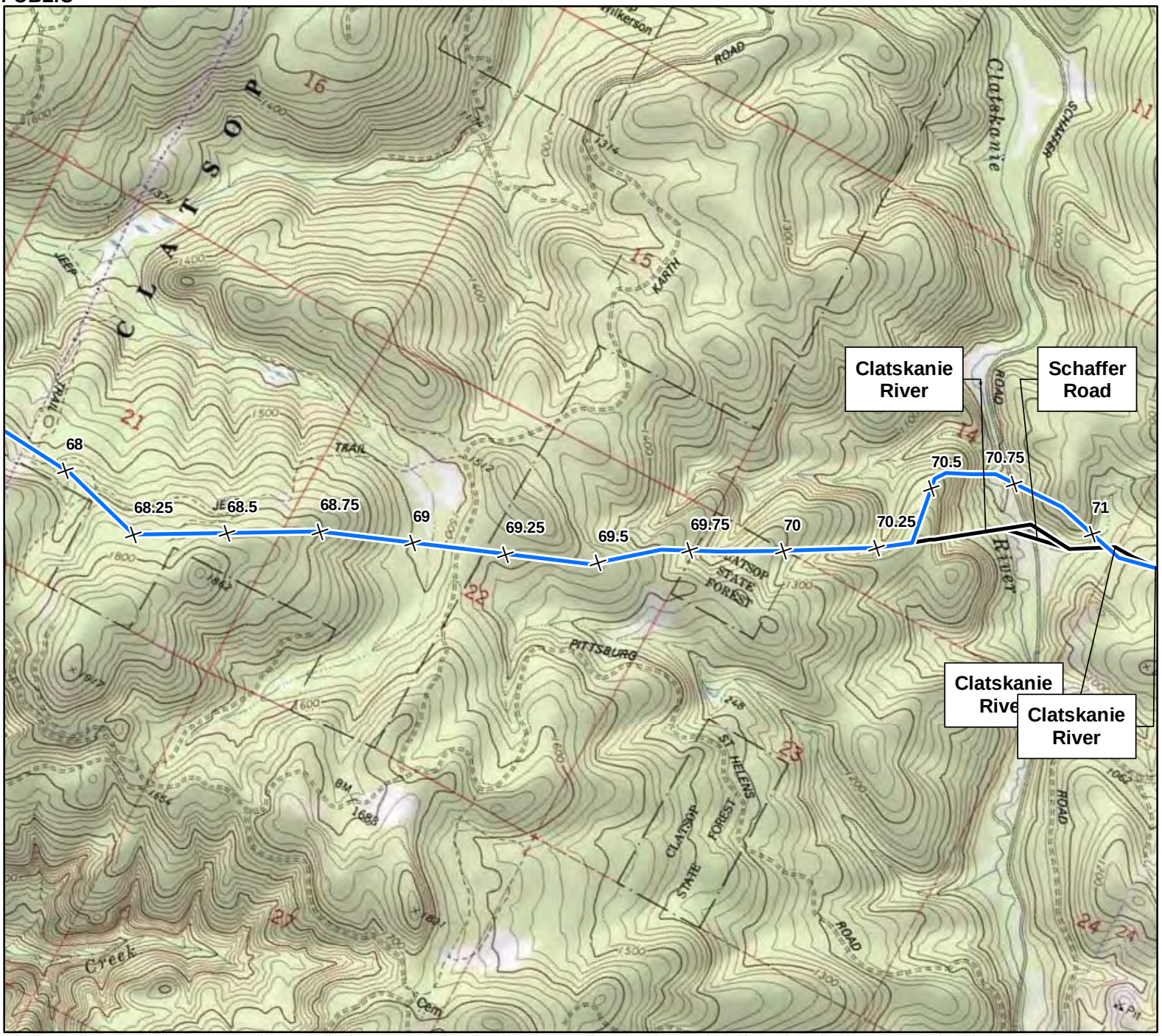
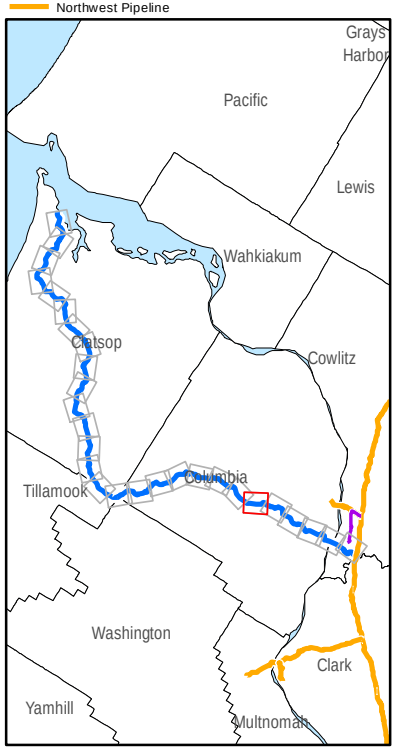


Appendix 10G

Figure 23
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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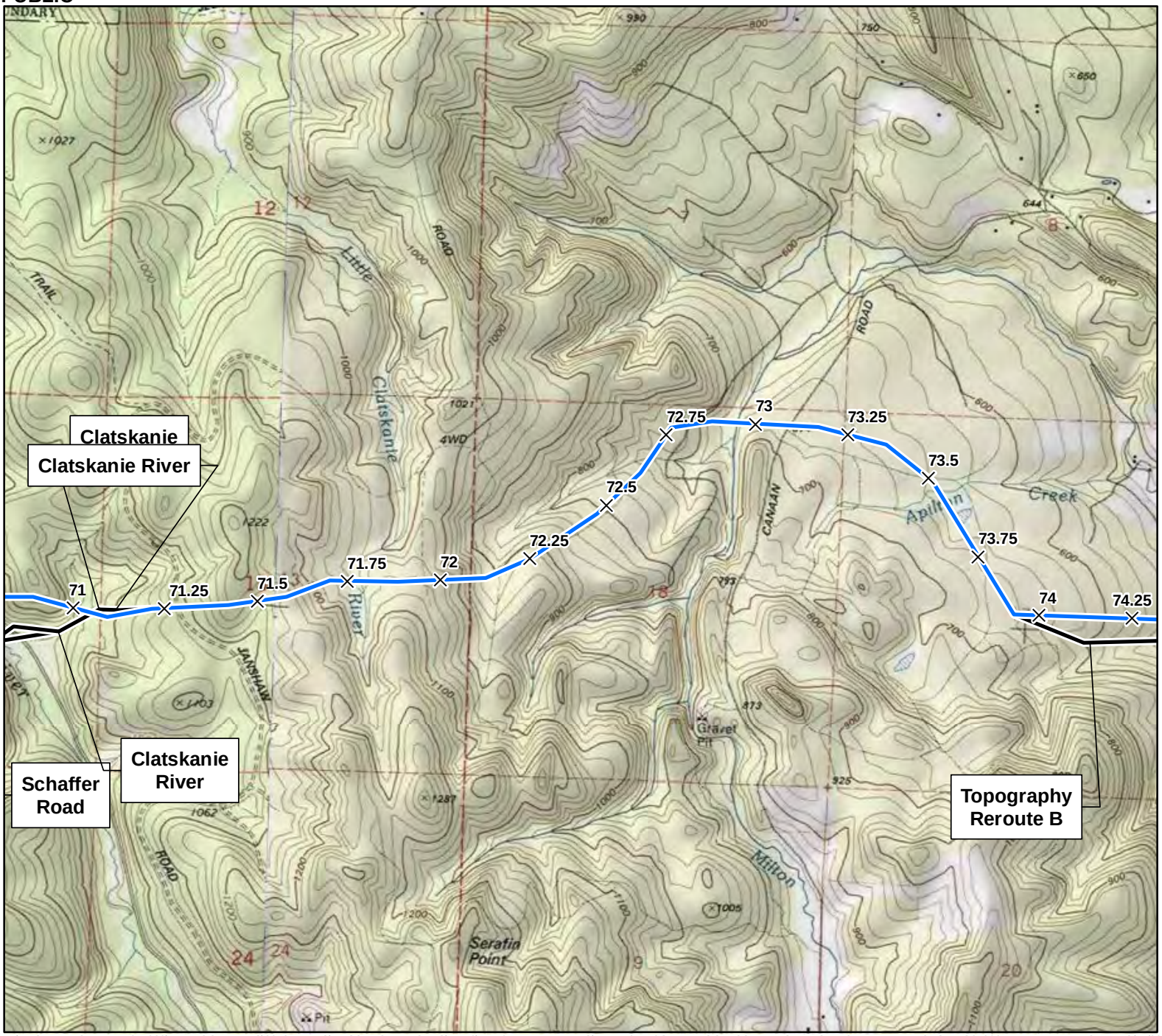

Appendix 10G

Figure 24
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

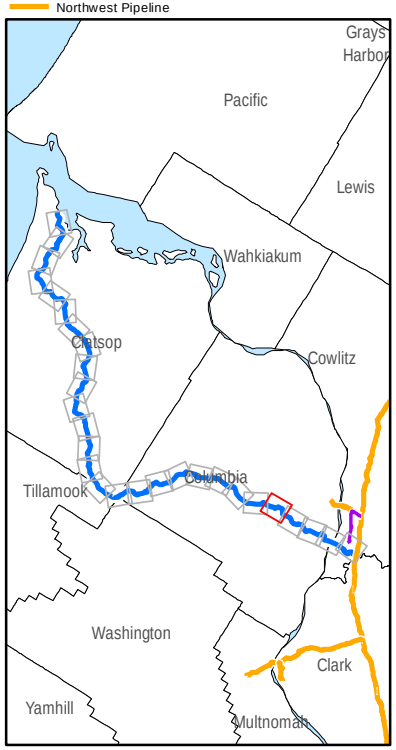

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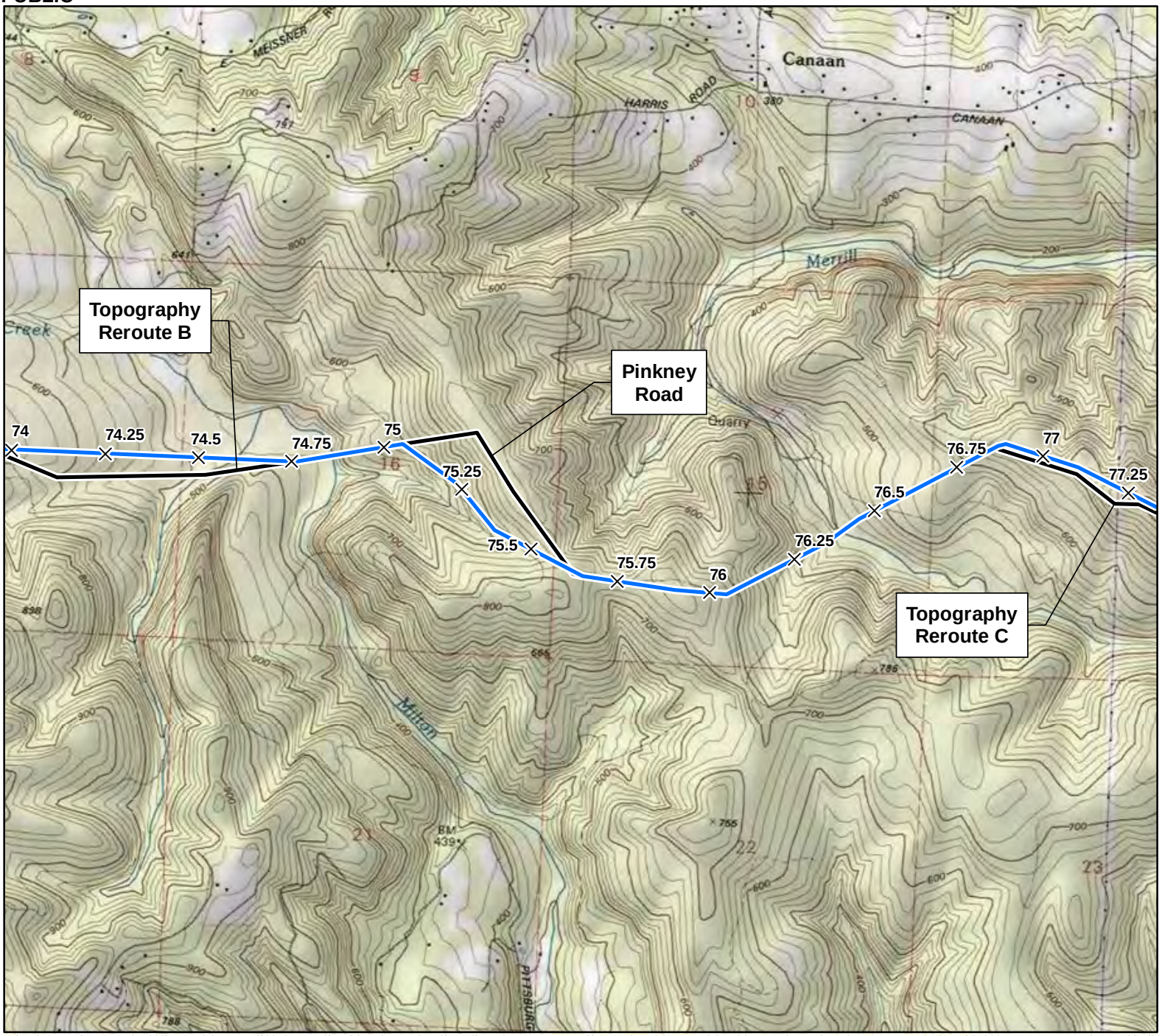
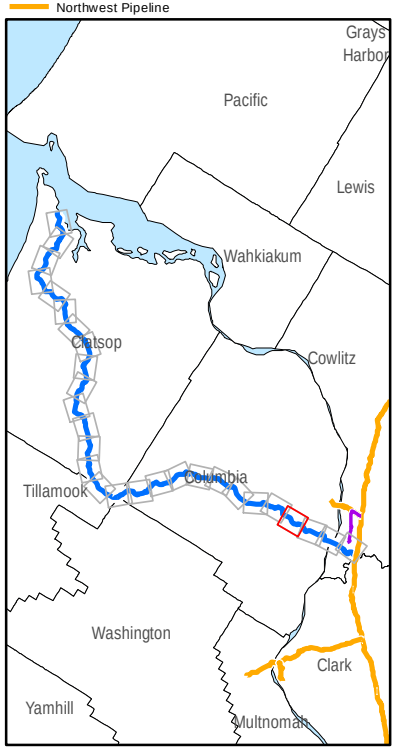
Figure 25
Proposed and Minor Alternative Pipeline Route Variations



Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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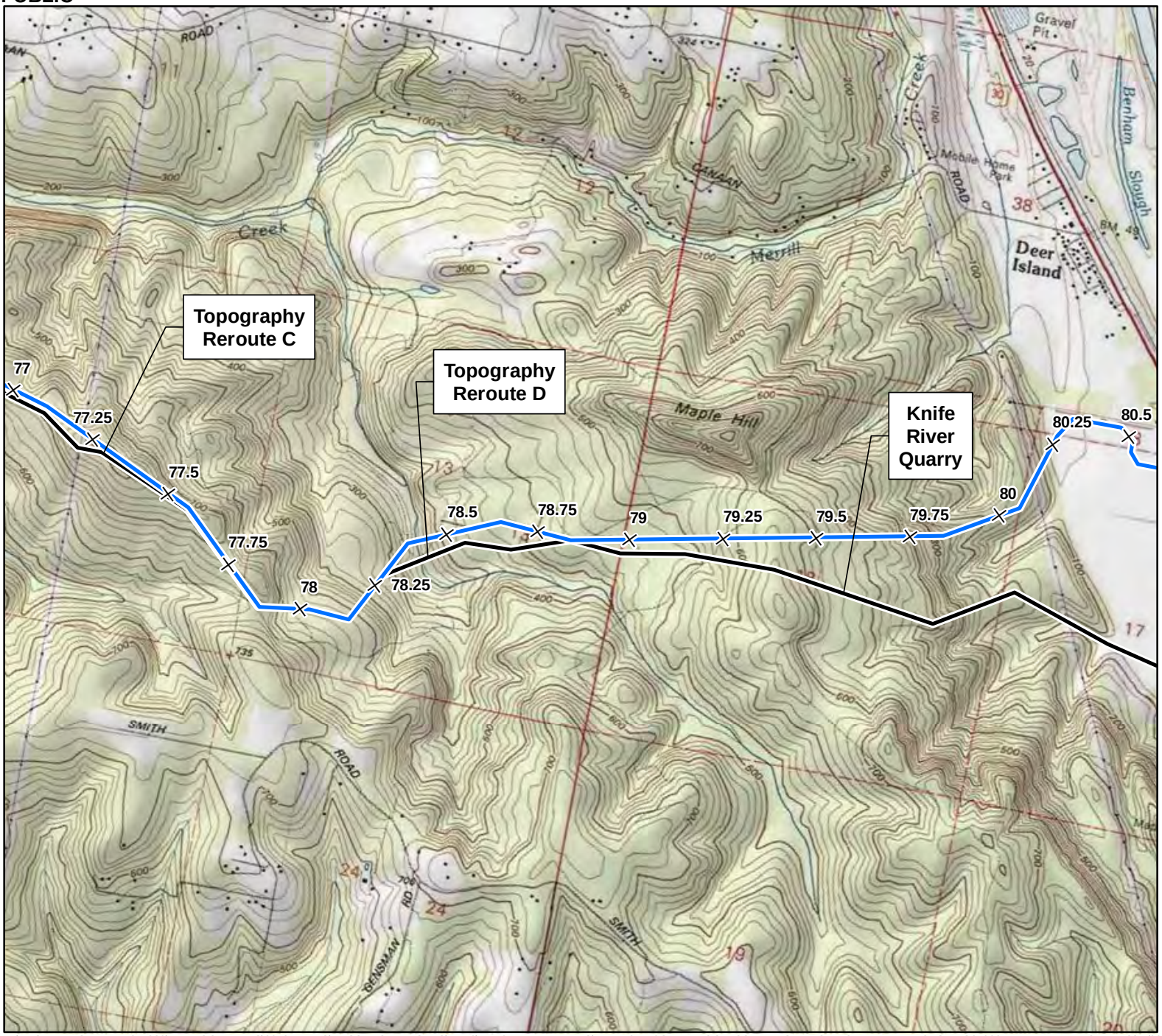

Appendix 10G

Figure 26
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

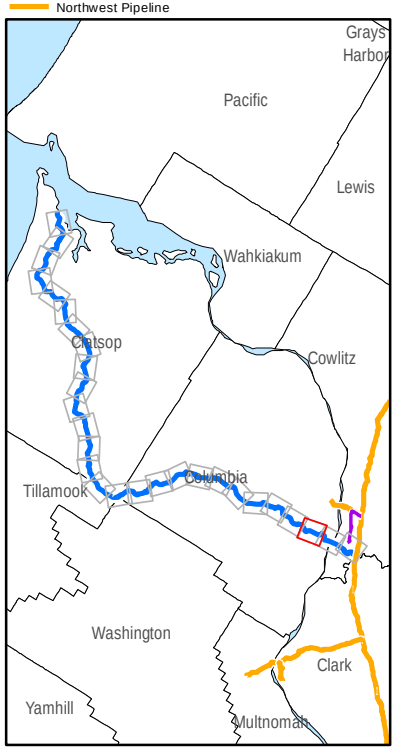

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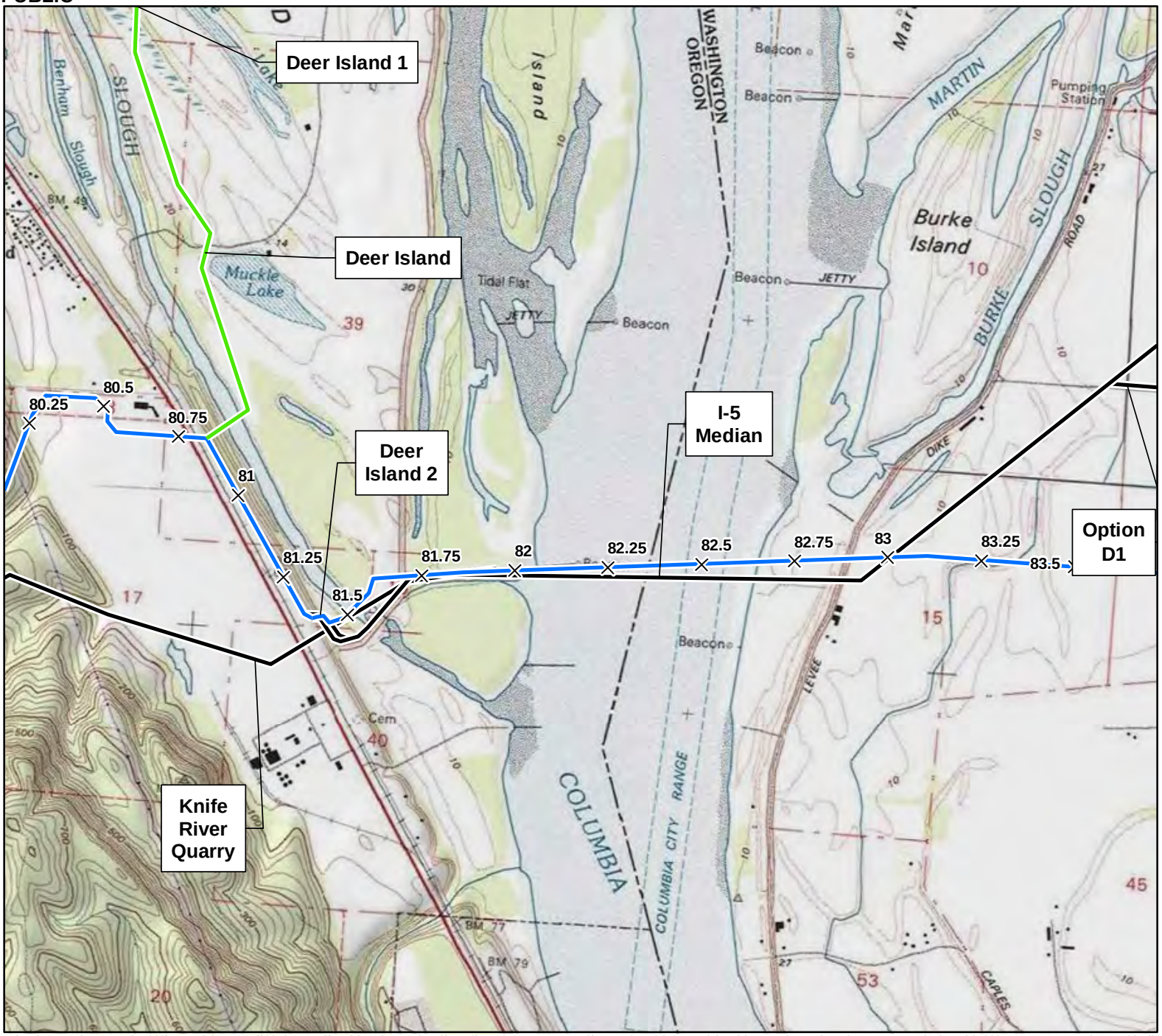
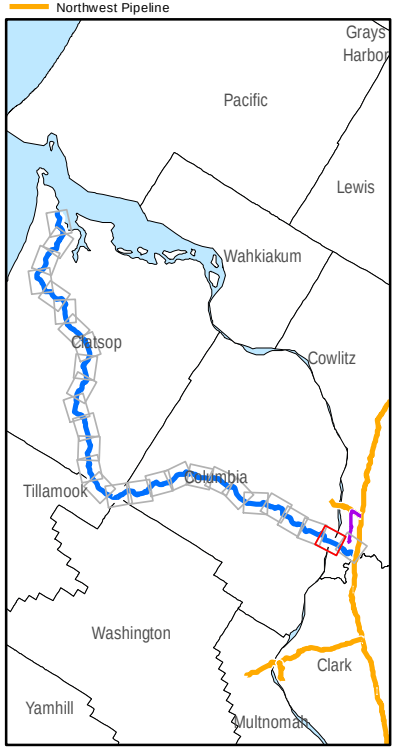
Figure 27
Proposed and Minor Alternative Pipeline Route Variations



Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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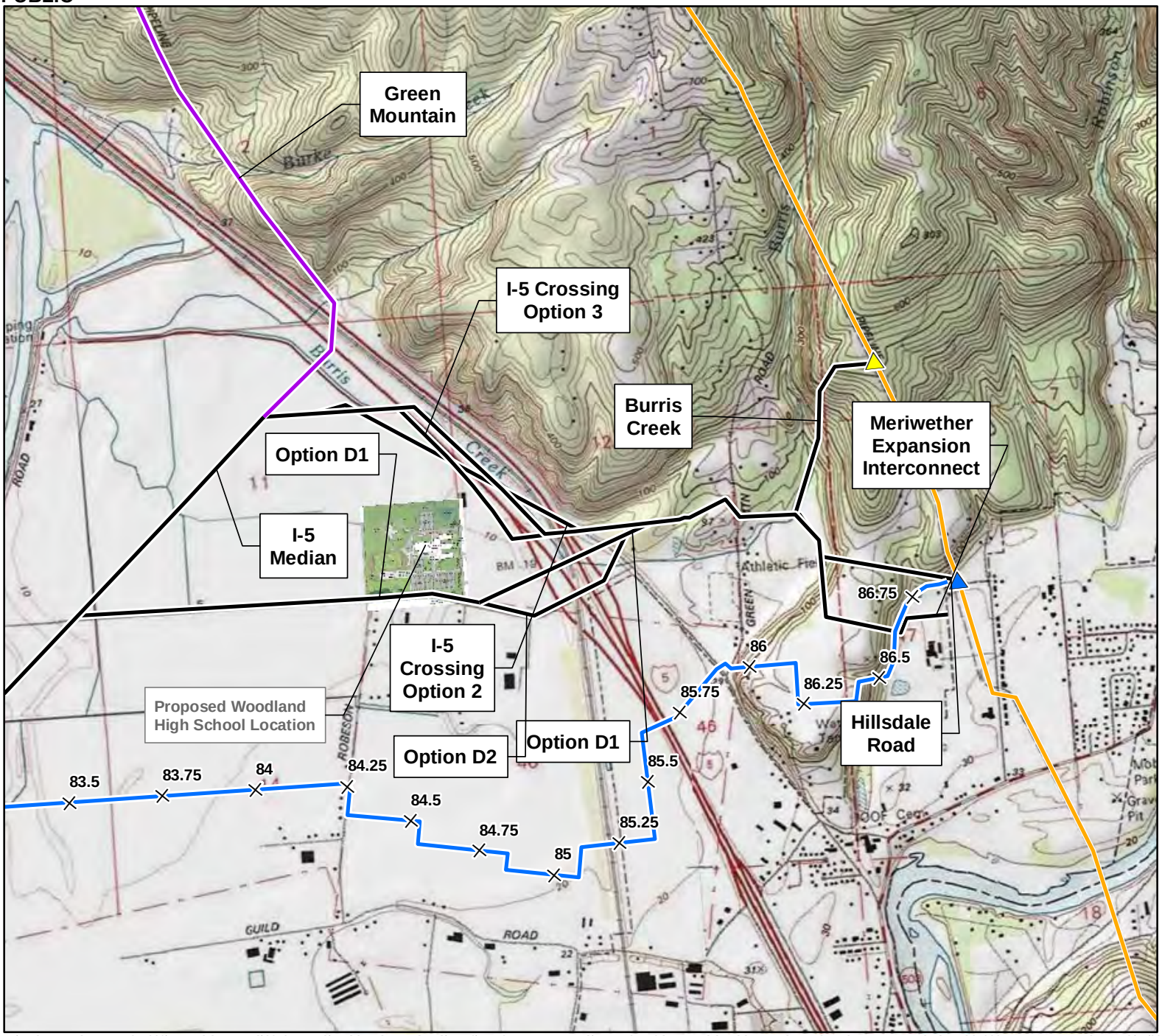

Appendix 10G

Figure 28
Proposed and Minor Alternative Pipeline Route Variations

Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Variation Not Selected
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline

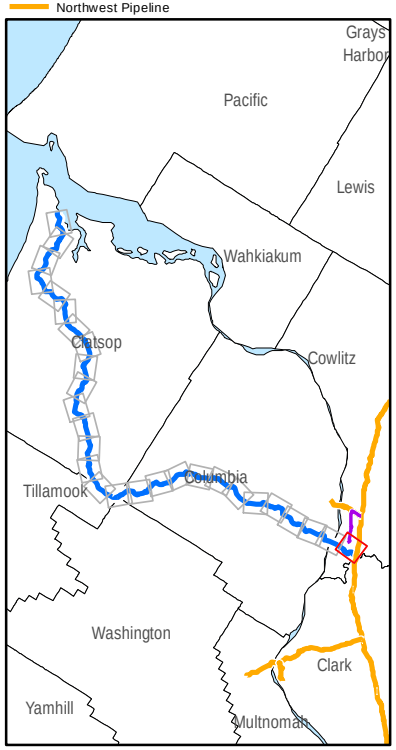

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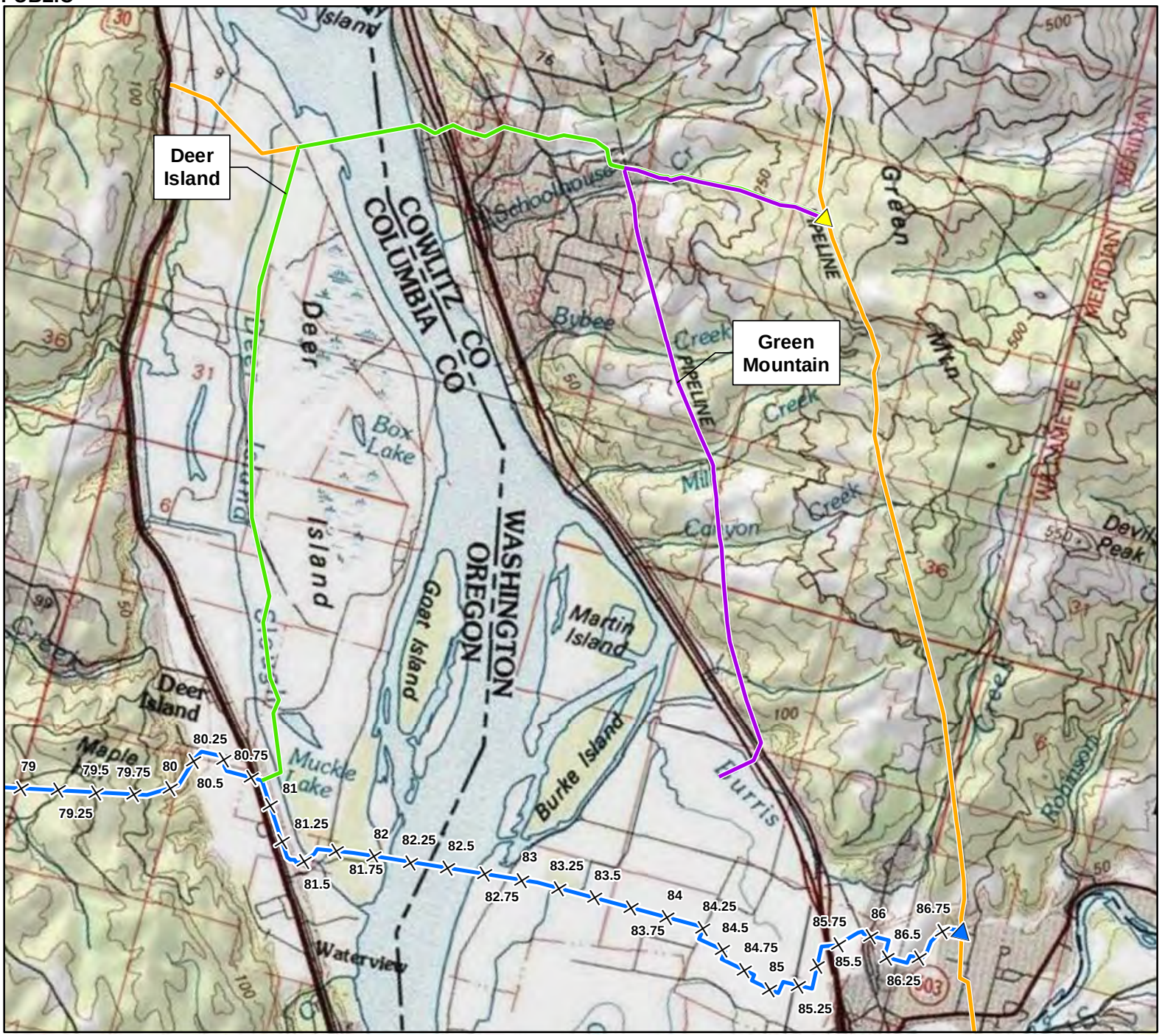
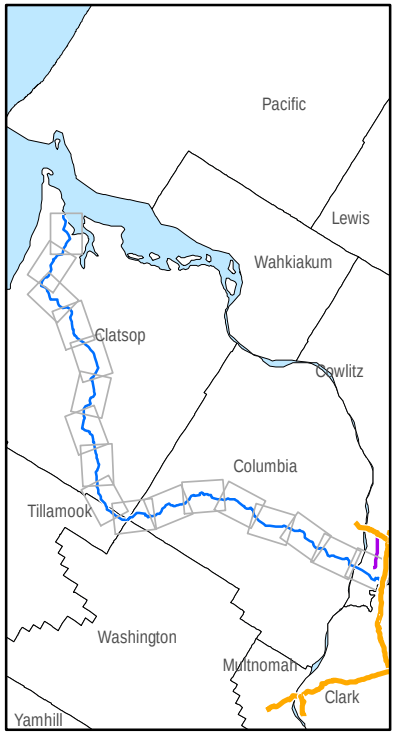
Figure 29

Deer Island and Green Mountain Alternative Pipeline Route Variations



Legend

- Pipeline Route Milepost (Qtr Mile)
- Northwest Pipeline Interconnect
- Alternative Interconnect
- Pipeline Route
- Deer Island Route Variation
- Green Mountain Route Variation
- Northwest Pipeline



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