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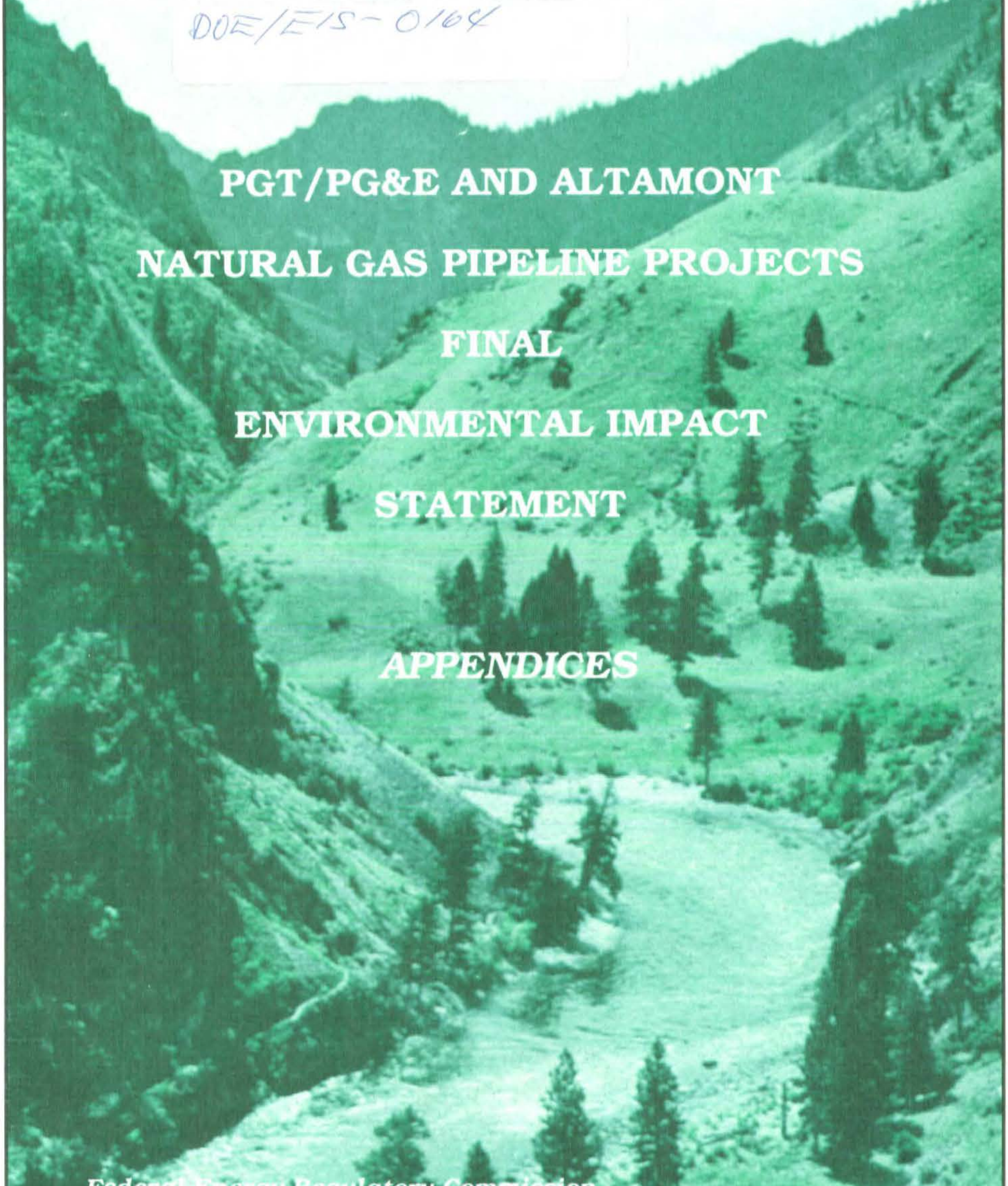

PGT/PG&E AND ALTAMONT NATURAL GAS PIPELINE PROJECTS

FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDICES

Federal Energy Regulatory Commission
Washington, D.C.

MAY 1991

PGT/PG&E and Altamont Natural Gas Pipeline Projects Final Environmental Impact Statement

Appendices

Federal Energy Regulatory Commission
825 North Capitol Street, NE
Washington, D.C. 20426

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Appendix A. Summary Impact Tables from Mojave-Kern River-El Dorado FEIR/FEIS and WyCal Supplemental FEIR/FEIS

Table 1.2-1
(from EOR FEIS Supplement)
MOJAVE SUMMARY OF IMPACTS

	MOJAVE SYSTEM				MOJAVE ROUTE [1]		
	System A [2]	System B [3]	System C [4]	System D [5]	Mojave	Alternative A	Alternative B
AIR QUALITY	NSI [6]	NSI	NSI	NSI	NSI	NSI	NSI
GEOLOGY							
Surface fault rupture	18	19	16	17	16	0 (0)	5 (5)
Miles of landslide potential	27	43	80	179	0	0 (0)	0 (0)
Miles of slope greater than 30%	69	74	44	69	25	0 (0)	2 (1)
SOIL							
Acres of poor reclamation potential	4768	4914	3477	4057	2721	230 (162)	770 (764)
SURFACE WATER							
Number of stream crossings	74	78	67	126	34	3 (3)	2 (1)
Intermittent stream crossings	71	75	64	111	31	3 (3)	1 (0)
Perennial stream crossings	3	3	3	15	3	0 (0)	1 (1)
Moderate/high significance perennial stream crossings	0	0	0	9	0	0 (0)	0 (0)
GROUNDWATER							
Miles of potential impact	30	30	22	22	22	0 (0)	15 (20)
FRESHWATER BIOLOGY							
Number of sensitive stream crossings with fish present	0	0	0	0	0	0 (0)	0 (0)
TERRESTRIAL BIOLOGY							
Vegetation							
Total acres of native vegetation temporarily disturbed	8465	8465	6563	8470	3953	280 (206)	908 (910)
Acres of woody vegetation kept cleared for the life of the project	1765	1765	1774	1774	1535	136 (103)	435 (435)
Acres of riparian habitat crossed	61	61	61	71	59	10 (1)	7 (8)

Table 1.2-1 (continued)

MOJAVE SUMMARY OF IMPACTS

	MOJAVE SYSTEM				MOJAVE 1/ ROUTE		
	System A 2/	System B 3/	System C 4/	System D 5/	Mojave	Alternative A	Alternative B
Vegetation (continued)							
Acres of federally threatened or endangered plant habitat affected	60	60	0	75	0	0 (0)	0 (0)
Number of species	1	1	0	2	0	0 (0)	0 (0)
Acres of California state listed plant habitat affected	947	947	947	947	947	0 (0)	12 (12)
Number of species	3	3	3	3	3	0 (0)	1 (1)
Acres of agricultural land temporarily disturbed	767	767	731	915	731	0 (0)	45 (45)
Wildlife							
Big game crucial or high priority habitat (acres)	748	748	564	1553	85	0 (0)	0 (0)
Big game migration corridors (acres)	121	121	121	121	121	0 (0)	0 (0)
Big game fawning/calving area (acres)	56	56	0	0	0	0 (0)	0 (0)
Upland game bird sensitive habitat (acres)	0	0	24	30	0	0 (0)	0 (0)
Waterfowl critical nesting areas (acres)	0	0	0	0	0	0 (0)	0 (0)
Raptor nesting areas (nests)	0	0	0	2	0	0 (0)	0 (0)
Acres of potential threatened or endangered animal habitat	9615	9915	9419	10337	7822	633 (502)	1284 (1236)
Yuma clapper rail	151	151	36	36	127	121 (103)	0 (0)
Bald eagle	187	187	72	84	163	121 (103)	0 (0)
Peregrine falcon	490	490	60	60	163	121 (103)	0 (0)

Table 1.2-1 (continued)

MOJAVE SUMMARY OF IMPACTS

	MOJAVE SYSTEM				MOJAVE 1/ ROUTE		
Wildlife (continued)	System A 2/	System B 3/	System C 4/	System D 5/	Mojave	Alternative A	Alternative B
Whooping crane	0	0	0	0	0	0 (0)	0 (0)
California condor	1355	1355	1355	1355	1355	0 (0)	0 (0)
Desert tortoise	3032	3032	3274	3274	2959	270 (193)	921 (921)
Blunt-nosed leopard lizard	517	517	517	517	517	0 (0)	0 (0)
Tehachapi slender salamander	18	18	18	18	18	0 (0)	0 (0)
San Joaquin kit fox	647	647	647	647	647	0 (0)	0 (0)
Black-footed ferret	1345	1645	1567	2473	0	0 (0)	0 (0)
Mohave ground squirrel	727	727	727	727	727	0 (0)	363 (315)
Nelson's antelope squirrel	412	412	412	412	412	0 (0)	0 (0)
Tipton kangaroo rat	24	24	24	24	24	0 (0)	0 (0)
Short-nosed kangaroo rat	410	410	410	410	410	0 (0)	0 (0)
Giant kangaroo rat	300	300	300	300	300	0 (0)	0 (0)
SOCIOECONOMICS							
Population change >10%	No	No	No	No	No	No	No
Total employment change >10%	No	No	No	No	No	No	No
Income change >10%	No	No	No	No	No	No	No
Vacancy rates of temporary housing <5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local tax base change >10%	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 1.2-1 (continued)

MOJAVE SUMMARY OF IMPACTS

	MOJAVE SYSTEM				MOJAVE 1/ ROUTE		
	System A 2/	System B 3/	System C 4/	System D 5/	Mojave	Alternative A	Alternative B
Traffic	NSI	NSI	NSI	NSI	NSI	NSI	NSI
Operational noise	NSI	NSI	NSI	NSI	NSI	NSI	NSI
Recreation (conflicts)	5	5	5	5	5	0 (1)	0 (0)
LAND USE/OWNERSHIP							
Number of conflicts	9	9	6	8	8	0 (3)	0 (1)
CULTURAL RESOURCES							
Number of sites in the direct impact zone	82	90	91	226	41	0 (0)	8 (11)
NRHP listed or eligible sites in the direct impact zone	2	2	2	6	2	0 (0)	0 (0)
Percentage of line actually surveyed	6	6	8	18	6	0 (22)	15 (1)
High sensitivity segments	8	9	8	13	3	0 (0)	2 (1)
PALEONTOLOGIC RESOURCES							
Acres of impact to significant formations	3205	3263	2724	3580	1941	0 (0)	640 (793)
VISUAL RESOURCES							
Acres of high visual impact	0	0	0	0	0	0 (0)	0 (0)

1/ The first entry for each resource area under alternative routing represents the value for the alternative segment only; the value in parenthesis represents the comparable quanity for the portion of the proposed route which would be avoided by using this alternative.

2/ Mojave System A: Mojave, El Paso 400 MMcfd Case (all from Texas) and Transwestern

3/ Mojave System B: Mojave, El Paso 400 MMcfd Alternative 100/300, Northwest 100 MMcfd Case, and Transwestern

4/ Mojave System C: Mojave, El Paso 600 MMcfd Alternative (100/500 Case), and Northwest 100 MMcfd Case

5/ Mojave System D: Mojave, El Paso 600 MMcfd Alternative (200/400 Case), and Northwest 200 MMcfd Case

6/ NSI = No Significant Impact

Table 1.4-2
KERN RIVER BEST CASE 1/
(from EOR FEIS Supplement)

	Kern River Proposed	Wasatch Variation vs. Proposal with West Strawberry and Salt Creek Canyon Variations	North Las Vegas Var. vs. Proposal with Henderson Variation	Kern River with Wasatch and North Las Vegas Variations Best Case
AIR QUALITY	NSI 2/	NSI	NSI	NSI
GEOLOGY				
Surface fault rupture	23	2 (1)	1 (1)	23
Miles of landslide potential	163	42 (42)	0 (0)	136
Miles of slope greater than 30 %	229	44 (36)	8 (5)	215
SOIL				
Acres of poor reclamation potential	4882	703 (976)	1236 (976)	4324
SURFACE WATER				
Number of stream crossings	135	46 (33)	9 (24)	138
Intermittent stream crossings	83	30 (7)	7 (22)	102
Perennial stream crossings	52	16 (26)	2 (2)	36
Moderate/high significance perennial stream crossings	39	12 (17)	0 (0)	27
GROUNDWATER				
Miles of potential impact	10	4 (11)	0 (1)	11
FRESHWATER BIOLOGY				
Number of sensitive stream crossings with fish present	13	6 (7)	0 (0)	7
TERRRESTRIAL BIOLOGY				
Vegetation				
Total acres of native vegetation temporarily disturbed	8646	1370 (1412)	1320 (1211)	8736
Acres of woody vegetation kept cleared for the life of the project	2920	599 (569)	665 (615)	3028
Acres of riparian habitat crossed	98	125 (141)	10 (24)	148

Table 1.4-2 (continued)
KERN RIVER BEST CASE

	Kern River Proposed	Wasatch Variation vs. Proposal with West Strawberry and Salt Creek Canyon Variations	North Las Vegas Var. vs. Proposal with Henderson Variation	Kern River with Wasatch and North Las Vegas Variations Best Case
Vegetation (continued)				
Acres of federally threatened or endangered plant species habitat affected	0	0 (1)	0 (0)	0
Number of species	0	0 (1)	0 (0)	0
Acres of California classified plant species affected Number of species	536	0 (0)	0 (0)	536
Number of species	4	0 (0)	0 (0)	4
Acres of cropland temporarily disturbed	1561	425 (205)	0 (2)	1846
Wildlife				
Big game crucial or high priority habitat (acres)	1350	493 (624)	0 (0)	1155
Big game mitigation corridors (acres)	162	0 (77)	0 (37)	48
Big game fawning/ calving areas (acres)	0	0 (50)	0 (0)	0
Upland game bird sensitive habitat (acres)	404	24 (124)	0 (0)	428
Waterfowl critical nesting areas (acres)	60	22 (0)	0 (0)	46
Raptor nesting areas (nests) affected	12	7 (18)	0 (0)	15
Acres of potential threatened or endangered animal habitat	8404	185 (30)	424 (454)	8341
Yuma clapper rail	0	0 (0)	0 (0)	0
Bald eagle	121	65 (30)	0 (0)	168
Peregrine falcon	0	120 (0)	0 (0)	120
Whooping crane	0	0 (0)	0 (0)	0

Table 1.4-2 (continued)
KERN RIVER BEST CASE

	Kern River Proposed	Wasatch Variation vs. Proposal with West Strawberry and Salt Creek Canyon Variations	North Las Vegas Var. vs. Proposal with Henderson Variation	Kern River with Wasatch and North Las Vegas Variations Best Case
Wildlife (continued)				
California condor	1560	0 (0)	0 (0)	1560
Blunt-nosed leopard lizard	339	0 (0)	0 (0)	339
Tehachapi slender salamander	3	0 (0)	0 (0)	3
Desert tortoise	3716	0 (0)	424 (303)	3837
San Joaquin kit fox	333	0 (0)	0 (0)	333
Black-footed ferret	600	0 (0)	0 (0)	600
Utah prarie dog	0	0 (0)	0 (0)	0
Mohave ground squirrel	751	0 (0)	0 (0)	751
Nelson's antelope squirrel	290	0 (0)	0 (0)	290
Tipton kangaroo rat	24	0 (0)	0 (0)	24
Short-nosed kangaroo rat	290	0 (0)	0 (0)	290
Giant kangaroo rat	177	0 (0)	0 (0)	177
SOCIOECONOMICS				
Population change >10%	NO	NO	NO	NO
Total employment change >10%	NO	NO	NO	NO
Income change >10%	NO	NO	NO	NO
Vacancy rates of temporary housing <5%	YES	YES	YES	YES
Local tax base change >10%	YES	YES	YES	YES
Traffic	NSI	NSI	NSI	NSI

Table 1.4-2 (continued)
KERN RIVER BEST CASE

	Kern River Proposed	Wasatch Variation vs. Proposal with West Strawberry and Salt Creek Canyon Variations	North Las Vegas Var. vs. Proposal with Henderson Variation	Kern River with Wasatch and North Las Vegas Variations Best Case
SOCIOECONOMICS (continued)				
Operational noise	NSI	NSI	NSI	NSI
Recreation (conflicts)	6	2 (1)	1 (3)	4
LAND USE/OWNERSHIP				
Conflicts	5	2 (2)	0 (3)	2
CULTURAL RESOURCES				
Number of sites in the direct impact zone	77	5 (1)	6 (5)	81
NRHP listed or eligible sites	4	0 (0)	0 (0)	4
Percentage of line actually surveyed	5	1 (1)	17 (10)	6
High sensitivity segments	9	0 (1)	1 (1)	9
PALEONTOLOGY				
Acres of impact to significant formations	6119	1716 (931)	1305 (1115)	7240
VISUAL RESOURCES				
Acres of high visual impact	470	28 (329)	0 (76)	236

1/ The first entry for each resource under route variations represents the value for the variation segment only; the value in parenthesis represents the comparable quantity for the portion of the proposed route which would be avoided by using this variation.

2/ NSI = No Significant Impact.

Table 1.5-1
(from EOR FEIS Supplement)
WYCAL SUMMARY OF IMPACTS [1/]

	Wycal [2/] Proposed	Wasatch Variations [4/]: Wasatch Variation	Bountiful Boulevard Alternative	Pages Lane Alternative	Bountiful Peak Alternative	North Las Vegas Variation
AIR QUALITY	NSI [3/]	NSI	NSI	NSI	NSI	NSI
GEOLOGY						
Surface fault rupture	35	2 (1)	2 (1)	2 (1)	2 (1)	2 (2)
Miles of landslide potential	149	42 (69)	42 (69)	37 (69)	45 (69)	0 (0)
Miles of slope greater than 30%	214	44 (61)	40 (61)	40 (61)	43 (61)	11 (5)
SOIL						
Acres of poor reclamation potential	6176	703 (1570)	685 (1570)	681 (1570)	728 (1570)	1388 (728)
SURFACE WATER						
Number of stream crossings	161	46 (40)	47 (40)	48 (40)	54 (40)	10 (6)
Intermittent stream crossings	96	30 (10)	31 (10)	28 (10)	28 (10)	8 (2)
Perennial stream crossings	54	16 (30)	16 (30)	15 (30)	14 (30)	2 (4)
Moderate/high significance perennial stream crossings	45	12 (24)	12 (24)	12 (24)	13 (24)	0 (0)
GROUNDWATER						
Miles of potential impact	30	4 (2)	4 (2)	4 (2)	4 (2)	0 (1)
FRESHWATER BIOLOGY						
Number of sensitive stream crossings with fish present	17	6 (14)	6 (14)	6 (14)	6 (14)	0 (0)
TERRESTRIAL BIOLOGY						
Vegetation						
Total acres of native vegetation temporarily disturbed	10917	1370 (1438)	1369 (1438)	1296 (1438)	1342 (1438)	1831 (1408)
Acres of woody vegetation kept cleared for the life of the project	3858	599 (612)	599 (612)	567 (612)	590 (612)	903 (695)
Acres of riparian habitat crossed	183	125 (61)	124 (61)	116 (61)	116 (61)	27 (19)

Table 1.5-1 (continued)

WYCAL SUMMARY OF IMPACTS 1/

	Wycal 2/ Proposed	Wasatch Variations 4/ Wasatch Variation	Bountiful Boulevard Alternative	Pages Lane Alternative	Bountiful Peak Alternative	North Las Vegas Variation
Vegetation (continued)						
Acres of federally threatened or endangered plant habitat affected	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Number of species	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Acres of California classified plant species affected	947	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Number of species	3	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Acres of agricultural land temporarily disturbed	1288	425 (138)	426 (138)	484 (138)	520 (138)	0 (25)
Wildlife						
Big game crucial or high priority habitat (acres)	1423	493 (688)	503 (688)	499 (688)	499 (688)	55 (0)
Big game migration corridor (acres)	211	0 (77)	0 (77)	0 (77)	0 (77)	0 (0)
Big game fawning/calving area (acres)	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Upland game bird sensitive habitat (acres)	335	24 (0)	24 (0)	24 (0)	24 (0)	0 (0)
Waterfowl critical nesting areas (acres)	60	22 (36)	22 (36)	22 (36)	22 (36)	0 (0)
Raptor nesting areas (nests)	18	7 (4)	7 (4)	7 (4)	7 (4)	0 (0)
Acres of potential threatened or endangered animal habitat	9283	185 (18)	185 (18)	293 (18)	393 (18)	908 (484)
Yuma clapper rail	127	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bald eagle	284	65 (18)	65 (18)	65 (18)	165 (18)	0 (0)
Peregrine falcon	163	120 (0)	120 (0)	225 (0)	225 (0)	0 (0)
Whooping crane	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 1.5-1 (continued)

WYCAL SUMMARY OF IMPACTS [1]

	Wycal [2] Proposed	Wasatch Variations [4]: Wasatch Variation	Bountiful Boulevard Alternative	Pages Lane Alternative	Bountiful Peak Alternative	North Las Vegas Variation
Wildlife (continued)						
California condor	1355	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Blunt-nosed leopard lizard	517	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tehachapi slender salamander	18	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Desert tortoise	3659	0 (0)	0 (0)	0 (0)	0 (0)	908 (484)
San Joaquin kit fox	647	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Black-footed ferret	640	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Utah prairie dog	0	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mohave ground squirrel	727	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Nelson's antelope squirrel	412	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Tipton kangaroo rat	24	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Short-nosed kangaroo rat	410	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Giant kangaroo rat	300	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
SOCIOECONOMICS						
Population change >10%	no	no	no	no	no	no
Total employment change >10%	no	no	no	no	no	no
Income change >10%	no	no	no	no	no	no
Vacancy rates of temporary housing <5%	yes	yes	yes	yes	yes	yes
Local tax base change >10%	7 counties	1 county	1 county	1 county	1 county	0 county
Traffic	NSI	NSI	yes	yes	NSI	NSI

Table 1.5-1 (continued)

WYCAL SUMMARY OF IMPACTS 1/

	Wycal 2/ Proposed	Wasatch Variations 4/				North Las Vegas Variation
		Wasatch Variation	Bountiful Boulevard Alternative	Pages Lane Alternative	Bountiful Peak Alternative	
SOCIOECONOMICS (continued)						
Operational noise	NSI	NSI	NSI	NSI	NSI	NSI
Recreation (conflicts)	10	2 (1)	1 (1)	1 (1)	3 (1)	2 (3)
LAND USE/OWNERSHIP						
Number of conflicts	13	2 (1)	1 (1)	1 (1)	2 (1)	0 (4)
CULTURAL RESOURCES						
Number of sites in the direct impact zone	109	5 (2)	5 (2)	5 (2)	5 (2)	7 (10)
NRHP listed or eligible sites in the direct impact zone	6	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Percentage of line actually surveyed	6	1 (1)	1 (1)	1 (1)	1 (1)	12 (11)
High sensitivity segments	8	0 (0)	0 (0)	0 (0)	0 (0)	1 (1)
PALEONTOLOGIC RESOURCES						
Acres of impact to significant formations	6458	1716 (776)	1806 (776)	1731 (776)	1768 (776)	1692 (1267)
VISUAL RESOURCES						
Acres of high visual impact	263	28 (186)	0 (186)	0 (186)	12 (186)	0 (76)

1/ The first entry for each resource under route variations represents the value for the variation segment only; the value in parenthesis represents the comparable quanity for the portion of the proposed route which would be avoided by using this variation.

2/ Includes impacts associated with the El Paso Base Case.

3/ NSI = No Significant Impact

4/ These columns present impacts associated with the original Wasatch Variation route which was covered in the FEIR/S, and with routes which incorporate the identified alternative into the Wasatch Variation. The first entry for each resource under each alternative to the Wasatch Variation represents the value for the entire alternative route; the value in parenthesis represents the comparable quantity for the portion of the proposed route which would be avoided by using this alternative of the Wasatch Variation.

Table 1.6-1
(from EOR FEIS Supplement)
INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C [1] with Alternative B	Proposed El Dorado System A	Preferable El Dorado [2] System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations	WyCal with El Paso Base Case	Preferable WyCal with the Wasatch, North Las Vegas, and Alternative B Variations, with El Paso Base Case
AIR QUALITY	NSI [3]	NSI	NSI	NSI	NSI	NSI	NSI	NSI
GEOLOGY								
Surface fault rupture	18	16	18	16	23	23	35	36
Miles of landslide potential	27	80	27	80	163	136	149	122
Miles of slope greater than 30%	69	45	82	57	229	215	214	204
SOIL								
Acres of poor reclamation potential	4768	3483	4343	3052	4882	4324	6176	5969
SURFACE WATER								
Number of stream crossings	74	68	68	61	135	138	161	172
Intermittent stream crossings	71	65	65	58	83	102	96	122
Perennial stream crossings	3	3	3	3	52	36	54	38
Moderate/high significance perennial stream crossings	0	0	0	0	39	27	45	33
GROUNDWATER								
Miles of potential impact	30	17	15	7	10	11	30	26
FRESHWATER BIOLOGY								
Number of sensitive stream crossings with fish present	0	0	0	0	13	7	17	9
TERRESTRIAL BIOLOGY								
Vegetation								
Total acres of native vegetation temporarily disturbed	8465	6561	8549	6697	8646	8736	10917	11270

Table 1.6-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C 1/ with Alternative B	Proposed El Dorado System A	Preferable El Dorado 2/ System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations	WyCal with El Paso Base Case	Preferable WyCal with the Wasatch, North Las Vegas, and Alternative B Variations, with El Paso Base Case
Vegetation (continued)								
Acres of woody vegetation kept cleared for the life of the project	1765	1774	1838	1797	2920	3028	3858	4353
Acres of riparian habitat crossed	61	60	24	24	98	148	183	254
Acres of federally threatened or endangered plant habitat affected	60	0	60	0	0	0	0	0
Number of species	1	0	1	0	0	0	0	0
Acres of California classified plant habitat affected	947	947	947	947	536	536	947	947
Number of species	3	3	3	3	4	4	3	3
Acres of agricultural land temporarily disturbed	767	731	525	489	1561	1846	1288	1550
Wildlife								
Big game crucial or high priority habitat (acres)	748	564	748	564	1350	1155	1423	1283
Big game migration corridors (acres)	121	121	121	121	162	48	211	134
Big game fawning/calving areas (acres)	56	0	56	0	0	0	0	0
Upland game bird sensitive habitat (acres)	0	24	0	24	404	428	335	359
Critical waterfowl nesting areas (acres)	0	0	0	0	60	46	60	46
Raptor nesting areas (nests)	0	0	0	0	12	15	18	21
Acres of potential threatened or endangered animal habitat affected	9615	9467	8819	8799	8404	8341	9283	9922

Table 1.6-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C 1/ with Alternative B	Proposed El Dorado System A	Preferable El Dorado 2/ System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations	WyCal with El Paso Base Case	Preferable WyCal with the Wasatch, North Las Vegas, and Alternative B Variations, with El Paso Base Case
Wildlife (continued)								
Yuma clapper rail	151	36	97	36	0	0	127	127
Bald eagle	187	72	169	115	121	168	284	331
Peregrine falcon	490	60	490	121	0	120	163	283
Whooping crane	0	0	0	0	0	0	0	0
California condor	1355	1355	1492	1492	1560	1560	1355	1355
Blunt nosed leopard lizard	517	517	388	388	339	339	517	517
Tehachapi slender salamander	18	18	0	0	3	3	18	18
Desert tortoise	3032	3274	2756	2998	3716	3837	3659	4083
San Joaquin kit fox	647	647	410	410	333	333	647	647
Black-footed ferret	1345	1567	1345	1567	600	600	640	640
Utah prairie dog	0	0	0	0	0	0	0	0
Mohave ground squirrel	727	775	667	667	751	751	727	775
Nelson's antelope squirrel	412	412	412	412	290	290	412	412
Tipton kangaroo rat	24	24	24	24	24	24	24	24
Short-nosed kangaroo rat	410	410	436	436	290	290	410	410
Giant kangaroo rat	300	300	133	133	177	177	300	300
SOCIOECONOMICS								
Population change >10%	No	No	No	No	No	No	No	No
Total employment change >10%	No	No	No	No	No	No	No	No

Table 1.6-1 (continued)

INTERSTATE SYSTEMS COMPARISONS

	Proposed Mojave System A	Preferable Mojave System C [1] with Alternative B	Proposed El Dorado System A	Preferable El Dorado [2] System C	Proposed Kern River	Preferable Kern River with Wasatch and North Las Vegas Variations	WyCal with El Paso Base Case	Preferable WyCal with the Wasatch, North Las Vegas, and Alternative B Variations, with El Paso Base Case
SOCIOECONOMICS								
Income change >10%	No	No	No	No	No	No	No	No
Vacancy rates of temporary housing <5%	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Local tax base change >10%	5 counties	1 county	5 counties	1 county	7 counties	6 counties	7 counties	6 counties
Traffic	NSI	NSI	NSI	NSI	NSI	NSI	NSI	NSI
Operational Noise	NSI	NSI	NSI	NSI	NSI	NSI	NSI	NSI
Recreation (conflicts)	5	4	3	2	6	4	8	8
LAND USE/OWNERSHIP conflicts	9	5	6	3	5	2	13	9
CULTURAL RESOURCES Number of sites in the direct impact zone	82	88	86	95	77	81	109	106
NRHP listed or eligible sites in the direct impact zone	2	2	2	2	4	4	6	6
Percentage of line actually surveyed or survey coverage within analysis corridor	6	12	12	15	5	6	6	10
High sensitivity segments	8	9	9	9	9	9	8	8
PALEONTOLOGY Acres of impact to significant formations	3205	2571	2935	2454	6119	7240	6458	7670
VISUAL RESOURCES Acres of high visual impact	0	0	318	318	470	236	263	29

1/ Mojave System C = Mojave/El Paso (100/500)/Northwest (100)
2/ Alternative B keeps Mojave within the desert corridor near Barstow, California
El Dorado System C = El Dorado/El Paso (100/500)/Northwest (100)
3/ NSI = No Significant Impacts

Appendix B. Soils

Appendix B-1. Erosion Control, Revegetation, and Maintenance Plan

EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

I. SUPERVISION AND INSPECTION

The following plan requires that some judgment be applied in the field and shall thus be implemented under the supervision of the Environmental Inspector or other qualified professional with knowledge of soil conditions and conservation plantings in the project area. Problems with contractor compliance shall be reported to the Environmental Inspector for remedial action. All uncultivated and non-wetland areas and residential turfs disturbed by construction shall be treated in accordance with this plan except for areas where landowners specify other seeding requirements. Deviations from this plan that involve less protective measures will only be permitted with the written approval of the Director, Office of Pipeline and Producer Regulation.

Environmental Inspectors shall have the direct responsibility to represent the applicant and to enforce these requirements. They shall have peer status with all other activity inspectors. A chief inspector shall be responsible for enforcing stop-work authority.

Duties of the Environmental Inspectors shall include monitoring and/or supervision of the following:

A. compliance with requirements of this and other required erosion and sedimentation control plans; Stream and Wetland Construction and Mitigation Procedures; applicable conditions of the FERC certificate; and other environmental permits and approvals;

B. marking of surface and subsurface drainage system locations identified by landowners and/or soil conservation authorities;

C. identification of stabilization needs in all areas;

D. performance of appropriate tests of subsoil and topsoil to determine the extent of compaction across the project right-of-way;

E. restoration of soil profile as requested or required;

F. approval of imported soils used as fill and/or additional cover material;

G. documentation of the revegetation programs;

H. monitoring of crop productivity for not less than 2 years for purposes of additional restoration, in case of inadequate restorative practices, and preparation of weekly activity reports documenting problems and solutions;

I. documentation of all public and private roadway crossings/access points to insure safe and accessible conditions exist relative to pre-construction conditions.

Within 30 days of the in-service date for the facilities, a summary shall be filed with the Commission detailing the quantity and type of fertilizer for each pipeline segment; lime, seed, mulch, and equipment used to implement this plan; the acreage treated, and the dates of backfilling and seeding. The number of landowners specifying other seeding requirements and a description of the requirements shall be reported. In the event that the in-service date precedes the seeding season, the materials, equipment, and dates for future seeding shall be stated as well as the temporary stabilization measures utilized.

II. PRECONSTRUCTION PLANNING

A. Locate all drainage tiles prior to construction by contacting landowners and local soil conservation authorities.

B. Undertake an assessment of vegetation requirements for screening and landscaping of new compression and metering facilities. A report shall be filed with the Secretary of the Commission for review and approval by the Director of OPPR prior to construction.

C. Locate all roadway crossings/access points to document and insure that safe and accessible conditions exist throughout the construction phase. Use of 50-foot-long crushed stone access pads, sweeping, culvert installation, matting and other forms of rutting protection shall be utilized depending on local permit conditions. If crushed stone access pads are used, place stone on a synthetic fabric in active agricultural areas.

D. Grazing deferment plans must be developed with willing landowners.

III. CLEARING AND INSTALLATION

A. Prevent the mixing of topsoil with subsoil by using topsoil segregation construction methods in all agricultural lands (including permanent or rotated crop lands, hayfields and pasture), rangelands, residential areas and other improved areas. When implementing these methods, topsoil shall be stockpiled on topsoil and subsoil shall be stockpiled on subsoil as illustrated in figure B-1. For deep soils (such as floodplains and stream terraces), at least 12 inches of topsoil shall be segregated. Where soils are shallow to bedrock or have a stony subsoil, all available topsoil shall be separated out.

   Topsoil shall be stripped from either the full work area (full work area method), or from a width no less than that encompassing the ditch line and adjacent subsoil storage area (ditch plus spoilside method). The landowner or managing agency shall determine which method is implemented. In either case, the construction right-of-way, including topsoil storage area, shall not exceed a width of 100 feet. Remove stones greater than 4 inches in any shape or dimension from the segregated topsoils of actively cultivated or rotationally cultivated agricultural lands with a tractor mounted stonepicker.

B. Probe all drainage systems with a sewer rod or pipe snake to determine if damage has occurred. All tiles damaged during construction shall be flagged by the trench inspector, then repaired to their original or better condition. Filter-covered drain tiles should only be used after consultation with the local soil conservation authorities. Qualified specialists shall be used to insure proper repairs and adequate probing/testing of the repaired drainage systems. Detailed records of drainage system repairs should be kept and given to the landowner for future reference.

C. Contact landowners and local soil conservation authorities to determine future drain tile locations. Increase depth of cover over the pipeline to 4 feet or more, if needed, so the pipeline is below the anticipated depth of drain tile installations.

D. Construct and maintain temporary slope breakers at the following spacing:

Slope (%)	Spacing (ft)
5 - 15	300
16 - 30	200

Temporary slope breakers shall be repaired at the end of each working day.

E. Where the pipeline crosses roads at the base of slopes, the following vegetative strips should be maintained. If vegetation is disturbed within these limits, temporary sediment barriers such as silt fences and/or staked hay/straw bales shall be employed at the base of the slope adjacent to the road crossing.

Slope (%)	Vegetation Strip Required (ft)
< 5	25
5-15	50
15-30	75
> 30	100

These temporary sediment barriers should remain in-place until permanent revegetation measures have been judged successful by the Environmental Inspector.

F. Use temporary sediment barriers, such as silt fences and/or staked hay/straw bales, at the base of slopes at all stream crossings, as recommended in the Stream and Wetland Construction and Mitigation Procedures. These temporary sediment barriers should remain in-place until permanent revegetation measures have been judged successful by the Environmental Inspector.

G. Construct trench breakers so that the bottom of one breaker is at the same elevation as the top of the next breaker down slope. The use of topsoil in trench breakers shall be prohibited.

IV. CLEANUP

A. Final clean-up and permanent erosion control measures, as appropriate, shall be completed within 10 days after the trench is backfilled, weather and soil conditions permitting.

B. Blast rock shall not be used as backfill in rotated or permanent cropland. It may be used to backfill the trench to the top of the existing bedrock profile in hayfields and pastures. Excess loose rock generated by blasting shall be removed from at least the top 12 inches of topsoil in all rotated and permanent cropland and hayfields as well as residential areas, pastures, and other areas at the landowners' request.

C. Test for soil compaction across the project right-of-way in agricultural areas. Tests shall be done on the same soil type under the same moisture conditions and should include the following areas: soil from undisturbed areas, soil stockpile areas, the trenched zone, the work area, and any traffic areas related to the project. Devices such as U.S. Army Corps of Engineers-style cone penetrometers or other appropriate devices may be utilized to test for compaction.

D. Plow severely rutted areas with a paraplow (or similar "winged" plow) or arrange with the landowner to plant and plow under a "green manure" crop, such as alfalfa, to decrease soil bulk density and to improve soil structure. If plowing is employed, the stripped construction right-of-way shall be plowed first followed by replacement of the segregated topsoil. Where necessary, additional plowing of the topsoil shall be undertaken to prevent subsurface compaction. If subsequent construction and cleanup activities result in further compaction, additional tilling shall be undertaken.

E. Remove construction debris from the right-of-way and grade it to leave the soil in the proper condition for planting, taking care to remove all construction debris and woody material.

F. On slopes, divert concentrations of surface flow to a stabilized outlet using runoff diversions with a 2 percent outslope directed toward appropriate energy-dissipating devices. Permanent slope breakers shall be constructed and maintained according to the following spacing:

Slope (%)	Spacing (feet)
5 - 15	150
16 - 30	100
> 30	75

G. Restore all turf, ornamental shrubs, and other landscaping in accordance with the landowner's requests or compensate the landowner the amount equal to replacement of said landscaping. Such restoration work shall be performed by a landscaping contractor familiar with local horticultural and turf establishment practices.

H. Insure public and private roadway crossings/access points are restored to safe and acceptable conditions relative to pre-construction status.

V. REVEGETATION

A. GENERAL REQUIREMENTS

1. In areas with acidic soils apply finely ground agricultural or dolomitic limestone to obtain a soil pH of at least 6.0. If applicable, lime temporarily seeded sites to a pH of 6.0 to insure optimum growing conditions with regard to pH. Incorporate lime into the top 2 inches of the soil prior to seeding.

2. Do not apply fertilizer unless it is recommended by the FERC, landowner, land managing agency, or soil conservation authority. Where fertilizer is recommended, it should include at least 50 percent slow-release type fertilizer and it must be incorporated into the soil.

3. Prepare the seedbed to a depth of 3 to 4 inches where possible using appropriate equipment to provide a firm seedbed, free of construction debris. If hydroseeding is to be employed, or where soil conservation authorities or the appropriate land managing authorities specify to do so, scarify the seedbed to ensure sites for seeds to lodge and germinate.

4. The project area should be seeded in accordance with the recommendations for seed mixes and seeding dates obtained from the FERC or where required, by the local SCS office(s), landowners, land managing agencies, or other soil conservation authority. Any soil disturbance that occurs outside of the recommended permanent seeding season, or any bare soil left unstabilized by vegetation, should be treated as a winter construction problem and mulched.

See section V(B) and (D) of this Plan. If seeding cannot be done within the recommended seeding dates, temporary erosion control shall be used and seeding of permanent cover shall be done at the beginning of the next seeding season.

5. Seed slopes steeper than 3:1 immediately after final grading, weather permitting, subject to the limitations addressed in section V(A.4).

6. Seed rights-of-way within 6 working days of final grading, weather permitting, subject to the limitations addressed in section V(A.4).

B. TEMPORARY EROSION CONTROL

1. In the event that construction is completed more than 30 days before the seeding season for perennial vegetation, all areas adjacent to perennial and intermittent streams shall be covered with jute matting for a minimum of 100 feet on either side of the waterway. Where there is a slope in excess of 10 percent, two tons per acre of a weed free mulch of hay or straw must be applied and anchored with a mulch anchoring tool, as discussed in section D.

2. Seeding during recommended times as specified in this document will eliminate the need for temporary seedings. If backfilling is completed more than 30 days from the seeding dates for perennial seeding, there may be a need for temporary seeding. If so, the applicants shall consult with local soil conservation and/or land managing agencies for recommended species, and seeding rates.

3. Do not plant annual rye as a temporary ground cover near any areas where wheat is grown as a cash crop.

4. Fertilize any temporary plantings in accordance with the recommendations of the local SCS office(s) or other soil conservation authority. Incorporate lime and fertilizer where used into the top 2 inches of soil.

C. SEED SPECIFICATIONS

1. Purchase seed in accordance with the Pure Live Seed (PLS) specifications for seed mixes. Use this formula to determine percent PLS:

$$\text{PLS, \%} = \frac{(\text{\% purity})(\text{\% germination})}{100}$$

Purchase certified seed of the specified variety where indicated.

2. Use seed within 12 months of testing.

3. Treat legume seed with an inoculant specific to the species.

4. Drill seed where drilling is feasible to 1/2 inch depth with a cultipacker on a firm seedbed to ensure contact with the soil. Spacings should be 6-12 inches. The broadcast or hydroseeding method can be used at double the recommended seeding rates on only those areas where drilling is not possible or in arid areas where drilling would be incompatible with a location's visual sensitivity. When seed is broadcasted, firm the seedbed with a cultipacker or roller.

5. Mix rice hulls with seed mixes when grain drills are used for seeding or take other appropriate measures to prevent settling out of seeds of differing densities. Inoculate legume seeds before mixing with the hulls.

D. MULCH SPECIFICATIONS

1. Mulch all dry sandy sites and all slopes greater than 10 percent immediately after seeding with 2 tons/acre or 1/4 to 1/2 inch depth of a weed-free straw or hay or its equivalent. Spread mulch uniformly over the area so that at least 75 percent of the ground surface is covered. If a mulch blower is used, the strands shall not be shredded less than 8 inches in length to allow anchoring.

2. Anchor mulch immediately after placing to minimize loss by wind and water. Use a mulch anchoring tool, which is a series of straight notched disks specifically designed for the purpose, to crimp the mulch to a depth of 2 to 3 inches. To maintain proper seed depth, a regular farm disc should not be used.

3. Mulch may be anchored using a mulch anchoring tool or a liquid mulch binder if so specified by local SCS or land managing authorities. Cutback asphalt (rapid or medium curing), or emulsified asphalt applied at 200 gallons/acre may be used. A variety of synthetic binders are also available, which should be used at rates recommended by the manufacturer for mulch anchoring. Use caution in residential areas or areas of pedestrian traffic, because asphaltic and some synthetic binders can damage shoes, clothing, automobile paint, etc.

4. To stabilize soil around stream and river banks or areas with high erosion potential, jute thatching or bonded fiber blankets (instead of straw or hay) should be applied immediately after seeding. Anchor the thatching with pegs or staples.

5. Up to 1 ton/acre of wood chips may be added as mulch if areas so mulched are top-dressed with 11 lbs/acre available nitrogen or a similar quantity of 50 percent slow-release fertilizer.

6. Wind erosion is a serious problem particularly on the sandier soils and where the disturbed areas are aligned with the direction of the wind. The Environmental Inspector shall determine on a site-by-site basis whether water, mulches, and/or barriers such as straw bales or snow fences should be used to reduce the impact of wind erosion.

7. In extremely dry areas where mulch degradation would be slow, mulching rates may be reduced to 1-1.5 tons/acre, depending on site-specific conditions and consultation with local Soil Conservation Service or other soil conservation officials.

VI. OFF-ROAD VEHICLE CONTROL

For each landowner and land management agency, offer to install and maintain, based on state and local regulations, the following off-road vehicle (ORV) control measures and install one or more of them, as requested, at the completion of clean-up and reseeding:

A. Install a locking, heavy steel gate with fencing extending a reasonable distance to prevent bypassing the gate, and post appropriate signs.

B. Plant conifers across the right-of-way. The spacing of trees and length of right-of-way planted should be sufficient to limit access and to screen the right-of-way from view.

C. Install a slash and timber barrier, a pipe barrier, or a line of boulders across the right-of-way to restrict vehicle access.

D. Post signs at all points of access and along the right-of-way at intervals not to exceed 2,000 feet, saying "This Area Seeded for Wildlife Benefits and Erosion Control."

E. Where the above measures are inappropriate or inadequate, develop a plan in consultation with the landowner or appropriate land management agency to control ORV use on the right-of-way.

VII. MAINTENANCE

A. Follow-up inspections shall occur after the first and second growing season, normally 3 to 6 months and 12 to 15 months after planting, respectively, to determine the success of revegetation. If the Environmental Inspector determines that the desired perennial cover is not optimal, given the revegetation potential of the soil (see section VII.F), the Environmental Inspector shall consult with a professional agronomist to determine the need for reseeding and other treatments based on site conditions. Those actions shall then be undertaken at the beginning of the next growing season. As part of the noxious weed control efforts outlined below in paragraph E, the Environmental Inspector shall also determine the need for additional noxious weed control measures on and adjacent to the right-of-way. To the extent that additional control measures are deemed necessary, they should be implemented after consultation with local land managing or other appropriate authorities.

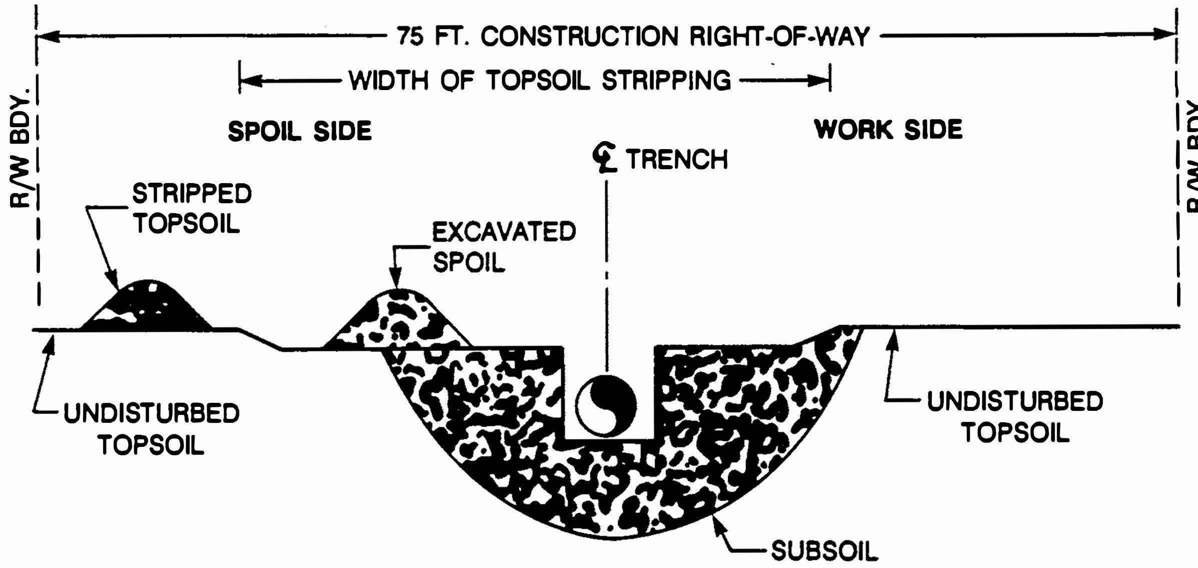
B. Right-of-way vegetation maintenance clearing shall not be done more frequently than every 3 years, and not before August 1 of any year.

C. Efforts to control ORV use, in cooperation with the landowner or appropriate land management agency, shall continue throughout the life of the project. Signs, gates, and vehicle trails shall be maintained as necessary.

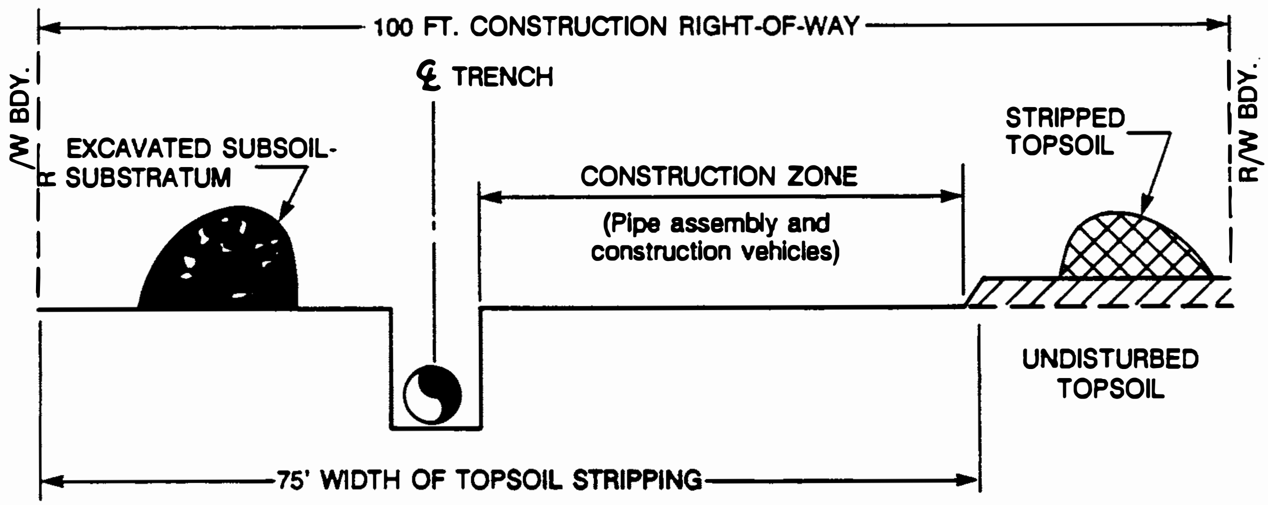
D. Monitor and correct drainage problems in active agricultural areas that have resulted from pipeline construction.

E. The applicants shall consult with the local county weed board, soil conservation authority, or land managing authorities to determine which areas are likely to present weed problems, and then develop specific procedures in coordination with the appropriate agency to prevent the invasion or spread of undesirable vegetation. Where noxious weeds potentially pose a serious problem such as in some irrigated areas or areas of high rainfall, seed disturbed soil as soon as possible after construction to reduce competition from the noxious weeds.

F. Successful revegetation will vary with the climate and soil type. In areas with high rainfall, revegetation will be determined to be successful if the desired perennial species established covers 70 percent of the right-of-way after one growing season. Percent cover is determined by random sampling of one square yard samples. Surrounding vegetative cover may be used as a guide to determine if the stand is successful. In the drier areas, such as in areas with 8 inches of average annual rainfall, one plant per square foot will be considered successful. The Environmental Inspector shall determine whether or not reseeding is required. If the Environmental Inspector determines that reseeding is necessary, the applicants will reseed at the beginning of the next planting season.



DITCH PLUS SPOIL SIDE TOPSOIL SEGREGATION



FULL RIGHT-OF-WAY TOPSOIL STRIPPING

FIGURE B-1

TOPSOIL STRIPPING CROSS-SECTION

NOT TO SCALE

Appendix B-2. Recommended Seed Mixes for the PGT Project

Appendix B-2

Recommended Seed Mixes for the PGT Project in Idaho, Oregon, and Washington According to Annual Precipitation

Annual Precipitation (inches)	Cultivar/Common Name	Pure Live Seed per Acre[a] (pounds)
	Idaho	
20	Latar orchardgrass	4
	Timothy	2
	Durar hard fescue	2
	Delar small burnet	1
	White dutch clover	1
	Lutana cicer mild vetch	1
	TOTAL	11
<20 (or droughty or sandy soils)	Luna pubescent wheatgrass	8
	Covar sheep fescue	2
	Yellow blossom sweet clover	1
	TOTAL	11
	Oregon and Washington	
8-12	P-27 Siberian wheatgrass	2.5
	Secar bluebunch wheatgrass	2.5
	Magnar basin wildrye	2.5
	Alkar or Jose tall wheatgrass	2.5
	TOTAL	10.0
12-18	Greenar or Oahe Intermediate wheatgrass	2.5
	Secar bluebunch wheatgrass	2.5
	Luna pubescent wheatgrass	2.5
	Paiute orchardgrass	2.5
	Yellow sweetclover	0.5
	Apar Lewis flax	0.25
	TOTAL	10.75
18-25	Greenar, Oahe or Amur Intermediate wheatgrass	4.0
	Birdsfoot trefoil	2.0
	Sherman big bluegrass	2.5
	Luna pubescent wheatgrass	3.5
	Covar sheep fescue	1.0
	Cicer milkvetch	0.5
	TOTAL	13.5

Appendix B-2 (continued)

Recommended Seed Mixes for the PGT Project in Idaho, Oregon, and Washington According to Annual Precipitation

Annual Precipitation (inches)	Cultivar/Common Name	Pure Live Seed per Acre (pounds)
	Oregon and Washington	
25+	Luna pubescent wheatgrass	6.0
	Latar orchardgrass	6.0
	Perennial ryegrass	2.0
	Creeping red fescue	5.0
	Big trefoil	1.0
	Alsike clover	2.0
	TOTAL	22.0

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[a] Seeding rates should be increased to 100 percent on critical areas.

Appendix B-3. Recommended Seed Mixes for the Altamont Project

Appendix B-3

Staff's Recommened Changes to Altamont's Proposed Seed Mixes

A. The following changes were made to all proposed seeding mixes:

1. The seeding rates have been recalculated and are listed at pounds of pure live seed (PLS) per acre for the drill rate. This amount must be doubled for broadcast seeding.

2. Blue grama (Bouteloua gracilis) has been removed from all mixes. Local authorities have been discouraging the use of this species.

3. The Pryor cultivar of slender wheatgrass should be used where it can be located. Otherwise the Revenue cultivar should be used.

4. If adjustments must be made to any mixes due to lack of availability, do not remove slender wheatgrass (Agropyron trachycaulum) from any mix since this is an important species for establishing a quick cover.

5. Sheep fescue (Festuca ovina) is generally recommended for only those areas above 5000 feet in Montana, and above 7500 feet in Wyoming. It may also be added to seed mixes beyond these limits where found along the right-of-way. Determine and use a native variety of sheep fescue where used.

6. The amount of Lewis flax (Linum lewisii) in each mix was reduced.

B. The following changes were made to the individual seed mixes:

1. Changes to the sandy site mixture: sand bluestem and prairie coneflower were removed.

2. Changes to the clay site mixtures: thickspike wheatgrass and birdsfoot trefoil were removed.

3. Changes to the high erosion potential site mixture:
   - o Switchgrass was removed.
   - o Annual ryegrass may be added to this mixture at 5 pounds PLS per acre.
   - o This critical area seed mix includes a higher than normal seeding rate.

4. Changes to the wet site mixture:
   - o Thickspike wheatgrass and reed canarygrass were removed.

5. Changes to the Alkaline/Sodic mixture:
   - o Crested wheatgrass was removed.
   - o Western wheatgrass, cultivar rosana, and alkali sacaton were added.

In Hill, Chouteau, Stillwater and Carbon Counties in Montana, Indian ricegrass may be added to the mixes. Indian ricegrass may also be used in other sandy areas. If the seed mixes presented in this appendix must be modified because of lack of species availability or quality, adjust pounds of PLS for each species to maintain a total of 10 to 12 pounds of PLS per acre on a drilled seed basis. This amount will be doubled when the seed is broadcast or applied to highly erodible soils.

Table B-3-1 Recommended Seed Mixes for the Altamont Project Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
	Sandy Soils	
Agropyron dasystachyum Thickspike wheatgrass	Critana	2.0
Agropyron spicatum Bluebunch wheatgrass	Secar	2.0
Agropyron trachycaulum Slender wheatgrass	Pryor	1.5
Calamovilfa longifolia Prairie sandreed	Goshen	0.50
Oryzopsis hymenoides Indian ricegrass	Nezpar	2.0
Stipa comata Needle-and-thread	--	2.0
Schizachrium scoparium Little bluestem	Aldous	2.0
Trifolium repens White Dutch clover	--	0.25
Achillea millefolium Yarrow	--	0.10
Linum lewisii Lewis flax	Appar	0.25
Petalostemon purpureum Purple prairie clover		0.25
	TOTAL	12.85

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
Loamy Soils		
Agropyron dasystachyum		
Thickspike wheatgrass	Critana	
OR		
Agropyron smithii		
Western wheatgrass	Rosanna	2.0
Agropyron spicatum		
Bluebunch wheatgrass	Secar	2.5
Agropyron trachycaulum		
Slender wheatgrass	Pryor	1.5
Festuca ovina		
Sheep fescue	Covar	0.25
Poa canbyi		
Canby bluegrass	Canbar	0.25
Stipa comata		
Needle-and-thread	--	2.0
Stipa viridula		
Green needlegrass	Lodorm	2.0
Trifolium repens		
White Dutch clover	--	0.25
Achillea millefolium		
Yarrow	--	0.10
Linum lewisii		
Lewis flax	Appar	0.25
Petalostemon purpureum		
Purple prairie clover	--	0.25
Ratibida columnifera		
Prairie Coneflower	--	0.10
	TOTAL	11.45

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
	Clayey Soils	
Agropyron smithii		
Western wheatgrass	Rosanna	2.5
Agropyron spicatum		
Bluebunch wheatgrass	Secar	2.0
Agropyron trachycaulum		
Slender wheatgrass	Pryor	2.0
Festuca ovina		
Sheep fescue	Covar	0.50
Oryzopsis hymenoides		
Indian ricegrass	Nezpar	2.0
Sporobolus airoides		
Alkali sacaton	--	0.25
Stipa viridula		
Green needlegrass	Lodorm	2.0
Achillea millefolium		
Yarrow	--	0.10
Linum lewisii		
Lewis flax	Appar	0.25
	TOTAL	11.65

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
Soils with High Erosion Potential		
Agropyron dasystachyum		
Thickspike wheatgrass	Critana	3.0
Agropyron smithii		
Western wheatgrass	Rosanna	3.0
Agropyron spicatum		
Bluebunch wheatgrass	Secar	3.0
Agropyron trachycaulum		
Slender wheatgrass	Pryor	2.0
Calamovilfa longifolia		
Prairie sandreed	Goshen	2.0
Poa compressa		
Canada bluegrass	Reubens	0.25
Distichlis stricta		
Inland saltgrass	--	1.0
Achillea millefolium		
Yarrow	--	0.1
Linum lewisii		
Lewis flax	Appar	1.0
Trifolium repens		
White Dutch clover	--	1.0
	TOTAL	16.35

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
	Mesic/Wet Soils	
Agropyron riparium Streambank wheatgrass	--	2.0
Agropyron smithii Western wheatgrass	Rosanna	2.0
Agropyron trachycaulum Slender wheatgrass	Pryor	2.0
Elymus triticoides Beardless wildrye	Shoshoni	2.0
Panicum virgatum Switchgrass	--	1.0
Sporobolus airoides Alkali sacaton	--	0.25
Lotus corniculatus Birdsfoot trefoil	--	1.0
Linum lewisii Lewis flax	--	0.5
	TOTAL	10.75
	Saline Soils	
Agropyron dasystachyum Thickspike wheatgrass	Critana	2.0
Agropyron trachycaulum Slender wheatgrass	Pryor	1.5
Elymus cinereus Basin wildrye	Magnar	2.0
Elymus triticoides Beardless wildrye	Shoshoni	3.0
Sporobolus airoides Alkali sacaton	--	0.50
Distichlis stricta Inland saltgrass	--	1.25
Linum lewisii Lewis flax	--	0.50
Trifolium fragiferum Strawberry clover	--	1.0
	TOTAL	11.75

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
Acidic Soils[1]		
Agropyron dasystachyum Thickspike wheatgrass	Critana	2.0
Agropyron trachycaulum Slender wheatgrass	Pryor	2.0
Agrotis alba Redtop	--	0.2
Alopecurus pratensis Meadow foxtail	--	1.0
Festuca ovina Sheep fescue	Covar	0.50
Panicum virgatum Switchgrass	--	1.0
Poa compressa Canada bluegrass	Reubens	0.25
Linum lewisii Lewis flax	--	0.50
Lotus corniculatus Birdsfoot trefoil	--	1.0
	TOTAL	8.45

[1] This mixture is included as a contingency measure. Acid sites are not likely to be found along the right-of-way.

Table B-3-1 (continued)
Recommended Seed Mixes for the Altamont Project
Based on Different Soil Types

Species/Common Name	Preferred Variety	Pure Live Seed per Acre (pounds)
Alkaline/Sodic Soils		
Agropyron smithii		
Western wheatgrass	Rosanna	2.0
Agropyron dasystachyum		
Thickspike wheatgrass	Critana	2.0
Agropyron trachycaulum		
Slender wheatgrass	Pryor	2.0
Elymus cinereus		
Basin wildrye	Magnar	2.0
Elymus triticoides		
Beardless wildrye	Shoshoni	2.5
Sporobolus airoides		
Alkali sacaton	Rosana	0.25
Distichlis stricta		
Inland saltgrass	--	1.5
Linum lewisii		
Lewis flax	--	0.50
Trifolium fragiferum		
Strawberry clover	--	1.0
	TOTAL	13.75

Appendix B-4. Methodology Used to Rate Soil Rehabilitation Potentials Along the Altamont Route

APPENDIX B-4

Methodology Used to Rate Soil Rehabilitation Potentials Along the Altamont Route

Rehabilitation potential is the potential of a soil to reestablish vegetation commensurate with predisturbance cover. Soils were rated as having either a poor, poor-to-fair, fair, fair-to-good, or good rehabilitation potential depending on the presence of certain restrictive features. Soils that rated poor and poor-to-fair were considered to have the potential to show significant impacts from construction disturbances. Otherwise, rehabilitation was not considered to be a problem with normal restoration practices.

A map unit or group of map units was rated poor if one or more of the following restrictive features were exhibited:

Electrical Conductivity (EC)	>8 mmhos/cm
Sodium Adsorption Ratio (SAR)	>8
Steep Slopes	>15 percent
High Clay Content	>85 percent
Excessive Surface Stoniness	>75 percent covered
Shallow Soil	<20 inches
Shallow Topsoil	<4 inches

Soils were rated poor-to-fair where poor and fair map units were intricately mixed and difficult to separate.

Soils were rated fair when a map unit or group of map units exhibited moderate levels of electrical conductivity (4 to 8 mmhos/cm) or sodicity (SAR between 4 and 8); had shallow soils (total soil depth between 20 and 40 inches); or if soils below the surface horizon exhibited high levels of electrical conductivity or sodicity, or had a high clay content.

Soils were rated fair-to-good where fair and good map units were intricately mixed and difficult to separate.

Soils were rated good where a map unit or group of map units was located on gentle slopes and consisted of deep, non-saline, non-sodic, loamy textured soils. These soils may exhibit wind and water erosion hazards, high water tables, or flooding hazards. However, these traits are physical constraints that can be addressed with proper management and are not necessarily detrimental to vegetation establishment.

Appendix B-5. Altamont's Construction and Rehabilitation Plan for the South Pass Area

FERC Staff's Introductory Notes
on Altamont's South Pass Plan

1. Altamont's Plan quotes the Draft Environmental Impact Statement (EIS), portions of which have been substantially revised. For instance, the quote at the bottom of page 1-1 indicates that poor rehabilitation potential soils occur "between MPs 526.4 and 526.9, and between MPs 527.8 and 531.5". These MPs have been revised in the Final EIS.

2. Altamont's Plan references "Preliminary Alignment Sheets in a map pocket" at various points in the text (beginning on page 1-2). These sheets are not included in this appendix, but may be viewed at the FERC's offices in Washington, DC, and at the BLM's offices in Lander, Rawlins, Rock Springs and Worland, Wyoming.

3. The BLM VRM Class designations discussed on pages 3-2 and 3-3 are in dispute.

4. A mainline valve location is incorrectly listed on page 5-23 as MP 537.2 (see paragraph 1). This valve is proposed to be located at MP 532.7, as is identified in paragraph 3 on the same page.

5. Inclusion of Altamont's Plan in this appendix does not imply our adoption of all of the Plan's elements. Where Altamont's Plan conflicts with our Erosion Control, Revegetation, and Maintenance Plan (Appendix B-1) or our Stream and Wetlands Construction and Mitigation Procedures (Appendix C-3), Altamont would be required to follow our requirements. The only exceptions are where the FERC environmental staff approves deviations on a site-specific basis prior to construction, or where our requirements conflict with those of the state or Federal land managing agency.

CONSTRUCTION AND

REHABILITATION PLAN

MP 511.0 TO MP 540.8

Altamont Gas Transmission Company
Houston, Texas
Calgary, Alberta

February, 1991

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PART 1 - INTRODUCTION

1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

In July 1989, Altamont Gas Transmission Company (Altamont) filed an Application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity to construct and operate a 620-mile, 30" diameter natural gas pipeline from Wild Horse, Montana to Opal, Wyoming. The proposed pipeline route crosses the Continental Divide at an approximate elevation of 7550' near South Pass, Wyoming. In support of its application, Altamont (1989a) filed Exhibit F-IV-Environmental Report which documented environmental conditions along the proposed route. Appended to the Environmental Report is a Preliminary Rehabilitation Plan which is designed to mitigate a number of potential environmental effects identified in the Environmental Report. The Preliminary Rehabilitation Plan specifically focused on controlling erosion and sedimentation as well as on revegetating disturbed areas. The Plan recognized that as routing and design are finalized, the Preliminary Plan would be refined to include site-specific, detailed measures suitable for inclusion in construction contracts, specifications and on alignments sheets.

On January 11, 1991, FERC issued a Draft Environmental Impact Statement (DEIS) for the Altamont pipeline and a competing project crossing the states of Idaho, Washington, Oregon and California (FERC, 1991). On page 4B-10, the DEIS states:

> "The South Pass area contains soils with poor rehabilitation potentials between MPs 526.4 and 526.9, and between MPs 527.8 and 531.5. These soils exhibit restrictive features such as wind and water erosion hazards, salinity and sodicity problems, steep slopes (over 15 percent), and shallow topsoils of between 0 and 4 inches. These restrictive features would limit successful regeneration of vegetation and may result in significant, long-term visual impact on the area.
>
> Because the South Pass area (MPs 520 to 540) has special cultural and historic significance and is visually sensitive, Altamont must take extreme care in restoring this area. In response to our request for the development of detailed mitigation, Altamont has commissioned a team of reclamation specialists to evaluate methods of mitigating visual impacts of pipeline construction in the South Pass area through right-of-way reclamation. In addition, we are considering the imposition of special construction measures to minimize the length of time that topsoil is disturbed. Our goal is to reestablish native and pre-existing floral species on all areas disturbed by construction in as rapid a time frame as is reasonably possible. The results

> of this ongoing analysis will be presented in the Final EIS, along with specific recommendations."

On page 6-40 of the DEIS, Mitigation Measure No. 66 states:

> "Altamont shall develop a detailed construction and restoration plan for its proposed route between mileposts 514 through 539 with the goal of limiting construction duration and disturbance, minimizing overall long-term visual impact, and reestablishing native and preexisting floral species as rapidly as possible. This plan shall be filed with the Commission for evaluation and inclusion in the Final EIS."

The purpose of this Construction and Rehabilitation Plan is to comply with the requirements of DEIS Mitigation Measure No. 66. The Plan is intended to be more specific than Altamont's Preliminary Rehabilitation Plan filed in 1989 but is less detailed than the Plan of Development (POD) to be filed by Altamont prior to construction for all federal lands in Montana and Wyoming as required under the terms of the right-of-way grant and use permit issued by the Bureau of Land Management (BLM). This Construction and Rehabilitation Plan primarily addresses visual impacts and rehabilitation issues whereas the POD will address all potential construction and operation/maintenance impacts. The POD will also incorporate the results of the Altamont route surveys to be conducted in 1991 and 1992 including identification of possible blasting locations, Class III cultural resource surveys, wildlife surveys and more detailed soils and vegetation studies. Accordingly, this Plan will be amended as required, however Altamont is prepared to implement the commitments contained in this Plan.

1.2 STUDY AREA

Based upon discussions with representatives of both FERC and the BLM, the study area was widened to include from MP 511.0 to MP 540.8 (refer to Preliminary Alignment Sheets in map pocket at back of this report plus Altamont Map 7 of 14 in the DEIS Map Volume). It should be noted that this segment of Altamont's proposed route includes the Continental Divide Realignment filed with FERC on November 28, 1990 to parallel the north side of Highway 28 from MP 529.0 to 538.6 rather than follow the original routing filed in July 1989 beside the AT&T cable right-of-way.

The study area is predominantly sagebrush steppe rangeland administered by the Bureau of Land Management with inclusions of privately owned sections (usually the river valleys) and state-owned sections. Streams crossed by the proposed route in this area include Rock Creek, Willow Creek, Slaughterhouse Gulch, Pine Creek, Fish Creek and the Sweetwater River (all part of the Atlantic Ocean watershed) and West Pacific Creek (part of the Pacific Ocean watershed). Additional descriptions of the study area can be found in the DEIS.

1.3 BRIEF PROJECT DESCRIPTION

A detailed project description can be found in Chapter 2 of the DEIS. In brief, the Altamont project involves the construction and operation of a 30" diameter buried natural gas pipeline.

Construction is planned for June to October 1993 with an in-service date of December, 1993. Standard right-of-way width is 100 feet consisting of a 52.5 foot wide permanent easement and a 47.5 foot wide temporary working strip. Additional right-of-way may be needed at crossings of roads, watercourses and steep hills. The pipe will be buried in a trench with 36" of cover in most locations and 24" in rocky areas. Outside of rocky areas, the trench will be a minimum of 42" wide and 66" deep although a wider and deeper trench will be required at some locations. The only locations where the pipeline itself will be visible are at the six compressor stations and one meter station; however there are no compressor or meter stations located within 8 miles of the study area. While the pipeline will be completely buried, there are various above-ground appurtenances required in accordance with federal law and for pipeline operation and maintenance. These above-ground facilities are identified on Table 1-1 and described in more detail below. Note that no new access roads or microwave towers are required.

A line marker is typically a small steel sign attached to a 4-5' high metal or wooden post directly over the pipeline installed to warn the public of the presence of a buried gas pipeline and to call a specific telephone number before digging (eg. ditch deepening, augering holes for fence posts). Alternatively, a sticker attached to a 5' high PVC pipe may be used. In order to comply with DOT regulations (49 CFR Part 192) regarding the marking of buried pipelines, Altamont is required as follows:

> "a line marker must be placed and maintained as close as practical over each buried main and transmission line:
>
> (1) At each crossing of a public road and railroad; and
> (2) Wherever necessary to identify the location of the transmission line or main to reduce the possibility of damage or interference."

A block valve assembly is typically a buried ball valve with blowdowns and valve operators extending above grade. A 6-7' high chain link security fence will be installed around the entire mainline valve assembly on a 20' x 30' area located directly over the pipeline. Maximum spacing of 20 miles as per DOT requirements.

A test lead is a small (3" x 4") metal box attached to a 2-5' high wooden post required to test cathodic protection on the pipeline. Test leads will be located adjacent to line markers as much as possible.

1.4 OUTLINE OF PLAN

The remainder of this Plan is divided into two parts. Part 2 identifies common Rehabilitation Units along the length of the study area composed of similar landtypes and visual characteristics. General visual mitigation objectives are proposed for each Rehabilitation Unit.

TABLE 1-1
ABOVE-GROUND FACILITIES - MP 511.0 TO MP 540.8

ITEM	DESCRIPTION	QUANTITY	MP/DESCRIPTION
1.	Line Marker	2	511.65
2.	Line Marker	2	512.80
3.	Line Marker	2	514.30 Rock Creek
4.	Line Marker	2	515.30 Lewiston Mine Road
5.	Block Valve Assembly	1	515.50
6.	Line Marker (1 c/w Test Lead)	2	515.55 Pick Axe Road
7.	Line Marker	2	517.80
8.	Line Marker	2	521.20
9.	Line Marker	2	522.80
10.	Line Marker	2	524.80
11.	Line Marker	2	525.40
12.	Line Marker	2	526.30
13.	Line Marker	2	527.05
14.	Line Marker	2	528.80 Oregon Buttes Road
15.	Line Marker (1 c/w Test Lead)	2	529.10 Highway 28
16.	Block Valve Assembly	1	532.70
17.	Line Marker	2	536.00
18.	Line Marker (1 c/w Test Lead)	2	538.60 Highway 28
19.	Line Marker	2	540.60

Part 3 presents the Construction and Rehabilitation Plan. General mitigation measures which apply to the entire study area are described. Next, a specific set of procedures are proposed for each Rehabilitation Unit. The Rehabilitation Units and main location names used in the text are identified on Preliminary Alignment Sheets in the back of this Plan.

Appendix A provides a review of previous experience and literature in reestablishing sagebrush on lands similar to the study area.

PART 2 - IDENTIFICATION OF REHABILITATION UNITS

2.0 LANDTYPES

Landtype units for the study area were developed based on 1) site factors that could influence revegetation and 2) existing dominant vegetation. Site factors important to revegetation include soil parameters (depth, coarse fragment content, texture and salinity) and slope. Recognition of existing dominant vegetation is important to develop seed mixes and revegetation techniques that minimize visual contrast. Information used to develop the landtype classification included:

- USDA Soil Conservation Service soil mapping for Fremont County;
- USDI Bureau of Land Management vegetation mapping and transect data;
- black and white stereoscopic aerial photographs (9" x 9") flown September 13, 1989 at a scale of 1:24,000;
- video coverage of the route flown June, 1990;
- USGS 7-1/2 minute topographic maps at a scale of 1:24,000;
- site visits during 1990 and February 1991;

Additional field investigations will be conducted prior to construction contract preparation to refine landtypes and corresponding rehabilitation units.

Six landtypes are identified between MP 511.0 and 540.8. Table 2-1 identifies landtypes by MP and lists soils, slope and general location.

2.1 UPLAND BIG SAGEBRUSH

The upland big sagebrush landtype dominates the route from approximately MP 521.0 to 540.8. It is less abundant east of MP 521.0 occurring in much smaller mapping units. Diagnostic features of the landtype include a relatively uniform cover of big sagebrush (Artemisia tridentata) approximately one to three feet tall, with an herbaceous understory varying from sparse to well vegetated. This landtype is associated primarily with soils derived from sedimentary parent materials, but also occurs on moderately deep to deep soils derived from metamorphic or igneous substrates. Major soil series include Ryark, Hoodle-Gelkie, Uhl-Gelkie, Almy and Sinkson.

TABLE 2-1
LANDTYPES - MP 511.0 - 540.8

FROM MP	TO MP	LANDTYPE	SOILS	SLOPE (percent)	LOCATION
511.0	512.1	Low Sagebrush	Handran-Midelight/Irigul-RO	<8-15	Rolling terrain west of Little Beaver Creek
512.1	512.4	Herbaceous Riparian/Wetland	Silas/Venapass	<8	Rolling terrain west of Little Beaver Creek
512.4	514.0	Low Sagebrush	Irigul-Midelight-RO	<8-30	Rolling terrain west of Little Beaver Creek
514.0	514.2	Approach Slope	Irigul-RO	30	East slope of Rock Creek
514.2	514.4	Woody Riparian/Wetland	Silas/Venapass	<8	Floodplain of Rock Creek (includes placer piles)
514.4	514.5	Approach Slope	Irigul-Midelight	8-25	West slope of Rock Creek
514.5	514.9	Low Sagebrush	Irigul-Midelight	<8-15	Rolling uplands west of Rock Creek
514.9	515.0	Herbaceous Riparian/Wetland	Uhl-Gelkie	<8	Ephemeral tributary of Rock Creek
515.0	515.1	Low Sagebrush	Irigul-Midelight	<15	Rolling uplands west of Rock Creek
515.1	515.3	Herbaceous Riparian/Wetland	Uhl-Gelkie	<8	Rolling uplands west of Rock Creek
515.3	515.7	Low Sagebrush	Hoodle-Gelkie/Lymanson	<15	Dissected slopes east of Willow Creek
515.7	516.2	Herbaceous Riparian/Wetland	Silas	<8	Ephemeral tributary to Willow Creek
516.2	516.4	Low Sagebrush	Lymanson-Conpeak	15-20	East slopes of Willow Creek
516.4	516.6	Woody Riparian/Wetland	Venapass/Silas	<8	Floodplain of Willow Creek
516.6	518.0	Low Sagebrush	Lymanson-Conpeak/Irigul	15-20	West slopes of Willow Creek
518.0	518.1	Herbaceous Riparian/Wetland	(Disturbed Soil)	<8	Ephemeral tributary of Willow Creek
518.1	518.2	Low Sagebrush	Irigul	<8	Rolling terrain west of Willow Creek
518.2	518.3	Herbaceous Riparian/Wetland	Silas	<8	Swale west of Willow Creek
518.3	518.7	Low Sagebrush	Midelight	<8	Rolling terrain west of Willow Creek
518.7	518.8	Herbaceous Riparian/Wetland	Silas	<8	Swale west of Willow Creek
518.8	519.9	Low Sagebrush	Irigul-Midelight	<8	Rolling uplands west of Willow Creek
519.9	520.0	Approach Slope	Irigul	25-50	Slopes east of Slaughterhouse Gulch
520.0	520.4	Low Sagebrush	Irigul-RO	<8-50	Upland east of Slaughterhouse Gulch

TABLE 2-1 Cont'd

FROM MP	TO MP	LANDTYPE	SOILS	SLOPE (percent)	LOCATION
520.4	520.5	Herbaceous Riparian/Wetland	Venapass	<8	Ephemeral tributary of Slaughterhouse Gulch
520.5	521.0	Low Sagebrush	Lymanson-Conpeak/Uhl-Gelkie	<8-25	Upland west of Slaughterhouse Gulch
521.0	521.6	Upland Big Sagebrush	Hoodle-Gelkie	<8	Upland bench east of Pine Creek
521.6	521.7	Herbaceous Riparian/Wetland	Silas	<8	Ephemeral tributary to Pine Creek
521.7	522.1	Upland Big Sagebrush	Hoodle-Gelkie/Uhl-Gelkie	<8-15	Uplands east of Pine Creek
522.1	522.2	Woody Riparian/Wetland	Venapass	<8	Floodplain of Pine Creek
522.2	525.5	Upland Big Sagebrush	Hoodle-Gelkie/Uhl-Gelkie/ Irigul	<8-20	West slopes of Pine Creek
525.5	525.6	Herbaceous Riparian/Wetland	Uhl	<8	Floodplain of Fish Creek
525.6	526.4	Upland Big Sagebrush	Hoodle-Gelkie	<8-15	Uplands west of Fish Creek
526.4	526.8	Herbaceous Riparian/Wetland	Venapass-Uhl-Absher	<8	Floodplain of Sweetwater River
526.8	526.9	Woody Riparian/Wetland	Silas	<8	Floodplain of Sweetwater River
526.9	528.6	Low Sagebrush	Hoodle-Gelkie	<8-15	Slopes west of Sweetwater River
528.6	531.3	Upland Big Sagebrush	Hoodle-Gelkie	<8-15	Rolling terrain west of Sweetwater River
531.3	531.9	Low Sagebrush	Blackhall-Carmody	15-25	Rolling upland north of Highway 28
531.9	532.4	Upland Big Sagebrush	Ryark/Almy/Sinkson	<8-15	Rolling upland north of Highway 28
532.4	532.5	Herbaceous Riparian/Wetland	Havre-Absher-Forelle	<8	Floodplain of West Pacific Creek
532.5	533.2	Upland Big Sagebrush	Almy/Sinkson/Thermopolis	<8-15	Terrace and toeslopes west of West Pacific Creek
533.2	533.4	Badlands	Badlands	<8->50	Broken terrain west of West Pacific Creek
533.4	540.8	Upland Big Sagebrush	Ryark/Bluerim-Onason	<8-25	Rolling and dissected uplands north of Highway 28

Note: Most woody and herbaceous riparian/wetland landtypes are narrow corridors frequently less than 100 feet wide. Using MPs to the nearest 0.1 mile substantially overestimates these areas. Although herbaceous riparian/wetland is identified for MP 515.7 to 516.2, this area consists of narrow herbaceous corridors with intervening low sagebrush uplands.

In addition to big sagebrush, conspicuous shrubs in the landtype include rubber rabbitbrush (Chrysothamnus nauseosus) on disturbed areas, shadscale saltbush (Atriplex confertifolia) on saline sites and spiny phlox (Leptodactylon pungens) on sandier soils. Common herbaceous species include muttongrass (Poa fendleriana), bluebunch wheatgrass (Agropyron spicatum), bottlebrush squirreltail (Sitanion hystrix), western wheatgrass (Agropyron smithii), Hood's phlox (Phlox hoodii) and silky lupine (Lupinus sericeus).

The upland big sagebrush landtype is found on gentle to moderately steep slopes of variable aspect. Minor inclusions within the upland big sagebrush landtype occur in shallow swales and benches with deeper soil accumulation and increased snow retention, resulting in higher herbaceous production than is typical of this landtype.2.2UPLAND LOW-GROWING SAGEBRUSH

The upland low-growing sagebrush landtype is abundant on the eastern portion of the route, primarily east of MP 521.0. Diagnostic features of the landtype are short-statured (<1 foot tall) sagebrush growing on shallow, rocky soils. The landtype is associated primarily with soils derived from metamorphic and igneous parent materials. These soils are frequently shallow with a high percentage of surface stones. Dominant soil series include Irigul, Midelight, Handran, Lymanson and Conpeak.

The landtype is dominated by black sagebrush (Artemisia nova) and stunted big sagebrush. Understory cover is generally sparse, including bluebunch wheatgrass, native bluegrass (Poa secunda), Indian ricegrass (Oryzopsis hymenoides), Hood's phlox, fringed sagewort (Artemisia frigida), pussytoes (Antennaria spp.) and goldenweed (Haplopappus spp.).

The upland low-growing sagebrush landtype is found primarily on gentle to moderately steep slopes and rounded ridges. Frequent, strong winds on these exposed sites, in conjunction with shallow soils, contributes to low annual production.

Rock outcrops and herbaceous dominated sites are minor inclusions within this landtype. The herbaceous types have similar species composition, however, sagebrush is less abundant. On the rockiest ridges exposed to high winds, the community has fewer grasses and is dominated by "cushion plant" forbs.

2.3 APPROACH SLOPES

The approach slopes landtype is restricted to steep (>25 percent) slopes adjacent to major drainages such as the east slope above Rock Creek. Soils are generally shallow, although soils on approach slopes to the west of drainages may be moderately deep to deep due to wind deposition of soil. The Irigul soil is most frequently encountered in this landtype. Vegetation on approach slopes is compositionally similar to the upland low-growing sagebrush landtype except that sagebrush is generally less abundant. On deeper soils, big sagebrush dominates.

2.4 BADLANDS

Badlands are uncommon in the study area, restricted to a small segment from MP 533.2 to 533.4. Soils are poorly developed and reflect the geologic parent material exposed by erosion.

Soils are in the badland mapping unit. Vegetation is very sparse with dominant species including big sagebrush, rubber rabbitbrush, shadscale saltbush, Indian ricegrass, bluebunch wheatgrass and numerous low growing forbs. Diagnostic features of the badlands are very sparse vegetation, high percentage of exposed soil, and variable colors of exposed strata. Slope varies from gentle to very steep. Gentle slopes adjacent to an ephemerally flowing drainage have high percent cover of gravel. Portions of the unit have exposed, indurate sandstone.

2.5 WOODY RIPARIAN/WETLAND[1]

The woody riparian/wetland landtype is narrowly restricted to the bottoms of major drainages including Rock Creek, Willow Creek, Pine Creek and the Sweetwater River. Diagnostic features of the landtype include generally dense shrubs or, less frequently, trees on floodplains receiving supplemental moisture for a large part of the growing season from flooding or subirrigation.

Alluvial soils are generally deep and are derived from various parent materials. Soil series in this landtype include Venapass and Silas. Most drainages support species of willow (Salix spp.), with quaking aspen (Populus tremuloides) present on slightly drier sites at some drainage crossings, e.g. west side of Rock Creek. Understory species are typical of wetter sites and include sedges (Carex spp.), rushes (Juncus spp.), horsetails (Equisetum spp.) and numerous wet site forbs and grasses.

The woody riparian/wetland landtype occurs primarily on gently sloping floodplains and terraces. Included within this landtype are placer gravel/rock piles along Rock Creek. These placer piles are poorly to well vegetated depending on size of rock, slope of the pile and proximity to water. Willows have reestablished on the more moist piles and swales between piles, while big sagebrush and rabbitbrush have become established on the drier piles. Areas between the piles are frequently well vegetated by herbaceous species.

2.6 HERBACEOUS RIPARIAN/WETLAND[2]

The herbaceous riparian/wetland landtype is relatively common but most occurrences are very narrow so that total distance crossed by the route is small relative to upland landtypes. This landtype is more common east of the Continental Divide, with only one site identified west of the Divide (West Pacific Creek). Diagnostic features of the landtype include dense stands of herbaceous species in concave, gently sloping tributary drainages or floodplains of larger drainages. These sites normally have increased moisture from snow accumulation,

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[1] An inventory for jurisdictional wetlands has not yet been conducted and landtype designation in this report may not represent ultimate jurisdictional wetland delineation.

[2] An inventory for jurisdictional wetlands has not yet been conducted and landtype designation in this report may not represent ultimate jurisdictional wetland delineation.

overland flow or alluvial flow. Soils are moderately deep to deep and include the Silas, Venapass and Havre-Absher-Forelle series.

Vegetation cover is typically high with little exposed bare ground. Relatively high production and lack of sagebrush results in heavy livestock use of this landtype. Dominant species include Nebraska sedge (Carex nebrascensis), other sedges, tufted hairgrass (Deschampsia cespitosa), mat muhly (Muhlenbergia richardsonis), Baltic rush (Juncus balticus) and western aster (Aster occidentalis). On saline sites such as West Pacific Creek, inland saltgrass (Distichlis stricta) and foxtail barley (Hordeum jubatum) may be more common.

3.0 VISUAL RESOURCES

3.1 BACKGROUND

3.1.1 Project Setting

The study area has special cultural and historic significance and is visually sensitive (DEIS, p. 4B-10). The visual sensitivity is associated with expansive views within the context of the historic values of the region. The landscape appears generally homogeneous, characterized by sagebrush uplands and intervening drainages covered in willows and other shrubs. Historical values of the region include the presence of National Historic Trails (the Oregon Trail and Mormon Trail) and an abandoned gold mining district near South Pass City located several miles north of the proposed route. The proposed route will cross the Oregon-Mormon Trail at MP 538.6. Several other historical trails crossed are eligible for the National Register of Historic Places (NRHP), although the current condition of the trail segments to be crossed by the pipeline will not be fully determined until after Altamont's Class III inventory is completed. Eligible trails include the Point of Rocks to South Pass City Stage Route (currently an improved gravel road known as Pick Axe Road), the Green River to South Pass City Stage Route and the Lander Cutoff of the Oregon Trail. The current condition of each segment to be crossed will be a factor in determining whether that segment of the trail contributes to the overall eligibility of the trail system, and thus will determine the treatment of the trail crossing to a large extent. Local interpretive exhibits along Highway 28 are provided at the South Pass Rest Area north-east of the Sweetwater River, the overlook near the South Pass National Historic Landmark and the Parting-of-the-Ways Historic Marker (see Preliminary Alignment Sheets for locations). In addition, the State of Wyoming operates the South Pass City State Historic Site several miles north of the proposed pipeline route.

The area is not without visual intrusions:

> "Field observation revealed that the area where the Oregon-Mormon Trail crosses the Continental Divide is presently riddled with unimproved two-track roads, a two-pole overhead electrical powerline, a buried AT&T cable right-of-way (marked by large metal poles at intervals of about 1,000 feet), an abandoned (although still quite prominent) railroad grade, and SR 28. It is against this background that the visual impact of the proposed project should be considered." (DEIS, p. 6-28)

Nevertheless, an objective of this Construction and Rehabilitation Plan is to ensure that the long-term visual appearance of the pipeline right-of-way will minimize ground contrast with the form, line, color and texture of adjacent landtypes.

3.1.2 Status of BLM VRM Inventories

The BLM's Visual Resource Management System (VRM) provides an opportunity to address the scenic quality and visual sensitivity of the landscape, and visual resource management objectives. BLM Manual 8400 (USDI 1984) provides the current direction and methods for the VRM system.

Visual resource inventory classes are assigned through the inventory process. Class I is assigned to those areas where a management decision has been made to maintain a natural landscape. This includes areas such as National Wilderness Areas, the Wild section of National Wild and Scenic Rivers, National Historic Trails and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Classes II, III and IV are assigned based on a combination of scenic quality, sensitivity level and distance zones (see DEIS p. 3L-3 for a description of VRM classes). This is accomplished by combining the three overlays for scenic quality, sensitivity levels and distance zones.

The study area is within the Lander Resource Area (RA) of BLM's Rawlins District and the Green River RA of the Rock Springs District. VRM information available for Lander RA between MP 511.0 and 522.3 includes inventory of scenic quality and visual resource management classes. This information has been incorporated into the Lander Resource Management Plan (USDI 1986a). Visual sensitivity and distance zone information is not included in the VRM inventory for this RA. The pipeline route crosses VRM Class IV through Lander RA. It should be noted that the DEIS is incorrect when it describes in Section 4-L that this area is classified as VRM II.

The VRM inventory for the Green River RA (MP 522.3 to 540.8) is currently being prepared as part of BLM's plans to publish a Resource Management Plan for the RA in the next one to two years (McMahan, pers. comm.; Storbo, pers. comm.). This area was previously the Big Sandy RMP area, which was inventoried for scenic quality in April of 1980, but was not carried through to the VRM classification stage. A complete VRM inventory is required for this area (USDI 1990; Storbo pers. comm.). It is understood that the Green River RMP may classify all of Fremont County as VRM Class II. The Oregon Trail/Highway 28 corridor is under consideration for Class II within 1/4 mile, or to the visual horizon, from the Fremont county line west (McMahan, pers. comm.).

Since available BLM VRM mapping is not complete across the entire study area, a study approach has been developed to address the visual resource concerns that reflects the intent of the VRM inventory and establishes the basis for visual mitigation objectives. The study approach is described in the following section.

3.2 STUDY APPROACH

The purpose of the visual resource component of the Construction and Rehabilitation Plan is to identify visually sensitive areas along the Altamont pipeline from MP 511.0 to 540.8, and establish mitigation objectives. The study approach involved the following steps:

1. <u>Gather Available VRM Data</u>

   Discussions and meetings were held with appropriate BLM personnel in Lander, Rock Springs and Kemmerer. Available VRM data was gathered for the Lander and Green River RAs. The application of this information has been most useful in identifying visual resource issues. This includes the identification of key viewpoints and the relative sensitivity of landscape types.

2. Identify Key Viewpoints

Key viewpoints are identified as follows:

- National Historic Trails, historic trails eligible for or potentially eligible for the National Register of Historic Places, interpretive viewpoints and overlooks and dispersed recreation roads and trails ("two-tracks").

3. Review Pipeline Corridor from Key Viewpoints

Accessible historic trails and interpretative viewpoints were visited and photographed to assist in the assessment of the visibility of the pipeline.

4. Develop Landtype Classification

A landtype classification was established in order to coordinate the visual assessment with the development of the Construction and Rehabilitation Plan. The following describes the characteristic vegetation, color and landforms associated with the six landtypes identified for the study area (see Section 2.0). These landtypes contribute to the formulation of the visual mitigation objectives established for each segment.

The landtypes have been combined into three groups which correspond to the general visual character of the pipeline route. These include: Sagebrush, Badlands and Riparian/Wetland.

Sagebrush

This group includes landtypes: 1 - upland big sagebrush, 2 - upland low-growing sagebrush and 3 - approach slopes.

Landform: The terrain is characterized by gentle to moderately steep slope undulating upland areas, to steep slopes (>25%) adjacent to major drainages.

Color: The sagebrush color that best blends in with 90% of the landscape in the study area is Standard Environmental Color Carlsbad Canyon - Munsell Color No. 2.5Y 6/2 (USDI 1986a).

Badlands

Landform: The terrain is characterized by a sparsely vegetated landscape with a high percentage of exposed soil and variable colors of exposed strata. The terrain rises steeply from a gentle drainage bottom to the adjacent sagebrush landtype.

Color: The predominant color of the badlands is light, red-orange, blended with more minimal tones from horizontal, linear, gray-green strata.

Riparian/Wetland

This group include landtypes: 5 - woody riparian/wetland and 6 - herbaceous riparian/wetland.

Landform: The terrain is characterized by flat to gently slopes (1-3%) tributary drainages and floodplains, to gentle slopes (3-7%) associated with the floodplains and terraces of the major drainages (ie. Rock Creek, Willow Creek, Pine Creek, Sweetwater River). Vegetation cover is typically dense.

Color: Willow is associated with vegetation characteristics of the woody riparian/wetland type, which is dark green during the spring and summer. The winter color is dark brown.

The grasses of the herbaceous riparian/wetland type portray a dark green with blue cast through spring, summer and fall. During winter, snow covers most of the land and the grasses show lighter green with a yellow cast.

5. Develop Visual Sensitivity Classification

By combining the information collected in Steps 1 to 4, the visual concerns along the pipeline route have been classified into the following order of sensitivity, ranging from most to least:

A. Foreground views from National Historic Trails or historic trails potentially eligible for the National Register of Historic places (within approximately 1/4 mile).

B. Middleground views (up to 3 miles) from Pick Axe Road, an upgraded county road south of Atlantic City, which was formerly an historic trail.

C. Foreground views from Highway 28 (within approximately 1/4 mile).

D. Foreground views (within approximately 1/4 mile) from numerous two-tracks as well as dispersed recreation use on public lands.

6. Classify Visually Sensitive Areas Along Pipeline Right-of-Way Segments

A study corridor 1/2 mile wide along the pipeline route was divided into 13 segments which address the visual issues as discussed with representatives of FERC, the BLM, the State of Wyoming, the Oregon-California Trail Association as well as several informed citizens from the Lander-South Pass area. The boundaries for these segments were determined by a combination of field reconnaissance, aerial photo and topographic map reviews.

7. Develop Visual Mitigation Objectives

Visual mitigation objective codes (VMOC) have been established for each segment based on a combination of the visual sensitivity of the segment and the landscape setting.

The visual sensitivity ratings have been described in point 5 and are primarily a function of the level of significance (national, state or local) of the historic property and its physical integrity (the degree to which it retains its historic character). For example the Oregon Trail and the Mormon Trail are given the highest sensitivity rating because they have national significance. The landscape settings previously described in point 4 are a combination of topographic and vegetative attributes. These are critical variables because the topographic conformation of the setting establishes the form and line of the viewshed/landscape and the vegetative communities are primary determinants of texture and color of the viewshed/landscape. Form, line, color and texture are the major variables used in characterizing, evaluating and managing landscapes.

The goal of visual mitigation is to minimize the long-term contrast of the pipeline right-of-way with the adjacent landscape. This can be accomplished through blending the pipeline right-of-way into its surroundings. Blending is accomplished by manipulating the landscape attributes of line, form, texture and color through recontouring and various revegetation strategies. Landscape blending is planned to mitigate potential visual impacts in several areas along the right-of-way. In areas containing stream and historic ditch crossing (VMOC-1), blending will be accomplished by restoring modified landforms to original contours and replanting native vegetation, e.g., native woody species on stream banks. Where the pipeline is adjacent to Highway 28 (VMOC-5) and in areas where two-tracks are used for informal dispersed recreation (VMOC-2), the long-term surface contrast to foreground views can be significantly reduced by minimizing the vegetative contrast along the right-of-way. Commonly, this involves revegetating with native species.

Minimizing visual impacts to historic trails (VMOC-3&4) will be accomplished by avoiding impacts to trails by boring underneath using revegetation strategies which maximize in terms of creating a homogeneous viewshed (matching the form, line, color and texture of the extant surrounding vegetation) in both the foreground (0.25 mi) and middleground (3.0 mi).

The results of the Visual Assessment of the study area are provided on Table 3-1, which displays the MP and length of each segment, the landtypes, sensitivity level, a description of the setting and visual concerns, and the mitigation objectives for each segment.

TABLE 3-1
VISUAL ASSESSMENT - MP 511.0 - 540.8

Segment	From MP	To MP	Length (miles)	Landtype	Sensitivity	Setting/Visual Concerns	Mitigation Objectives
1	511.0	515.0	4.0	2,3,5,6	D	- Crosses Rock Creek. - Crosses Granier Ditch (historic). - Crosses five two-tracks. - Adjacent to two abandoned ranches. CONCERN: Recreation-related views from two-tracks.	1,2
2	515.0	515.9	0.9	2,6	A	- Crosses Pick Axe Road and Lewiston Mines Road. CONCERN: Foreground view from historic and recreation trails.	3
3	515.9	517.1	1.2	2,5,6	D	- Crosses Willow Creek. - Crosses two two-tracks. CONCERN: Recreation-related views from two-tracks.	1,2
4	517.1	518.5	1.4	2,6	B	- Crosses one two-track. CONCERN: 1. Recreation-related views from two-track. 2. Middleground views from Pick Axe Road.	2,4
5	518.5	520.8	2.3	2,3,6	D	- Crosses Slaughterhouse Gulch and unnamed tributary. CONCERN: Recreation-related views.	1,2
6	520.8	521.4	0.6	1,2,6	A	- Crosses Lander Cutoff of the Oregon Trail. CONCERN: Foreground views from historic trail.	3
7	521.4	527.9	6.5	1,2,5,6	D	- Crosses Pine Creek, Fish Creek, Sweetwater River and one intermittent drainage. - Crosses several two-tracks. CONCERN: Recreation-related views from two-tracks.	1,2
8	527.9	529.3	1.4	1,2	C	- Crosses the Continental Divide. - Crosses Oregon Buttes Road. - Crosses and parallels northside of Hwy. 28 (scenic corridor). - Crosses one two-track. CONCERN: Foreground views from Hwy. 28 and South Pass Rest Area	5,6
9	529.3	531.3	2.0	1	C	- Hwy. 28 paralleled. - Crosses Green River Fort Washakie Rd. (historic trail). - Crosses one two-track. CONCERN: Foreground views from Hwy 28.	2,5
10	531.3	535.0	3.7	1,2,4,6	C	- Crosses three intermittent drainages. - Crosses three two-tracks. - Parallels within 1/4 mile of Hwy. 28. CONCERN: Foreground views from Hwy. 28 and South Pass overlook.	1,2,5,6
11	535.0	538.2	3.2	1	C	- Crosses five intermittent drainages. - Crosses four two-tracks. - Parallel of Hwy. 28. CONCERN: Foreground views from Hwy. 28.	1,2,5
12	538.2	538.9	0.7	1	A	- Crosses one intermittent drainage. - Crosses one two-track. - Crosses Hwy 28 and Oregon-Mormon Trail. CONCERN: Foreground views from Hwy. 28 and Oregon-Mormon Trail.	1,2,3,5,6
13	538.9	540.8	1.9	1	D	- Crosses four intermittent drainages. - Crosses one two-track. - Parallels AT&T corridor. - Parallels Hwy. 28 1/4 mile to the south. CONCERN: Foreground views from Hwy. 28	1,2,5

TABLE 3-1 Cont'd

Notes:

Landtype Codes

1. Upland Big Sagebrush
2. Upland Low-Growing Sagebrush
3. Approach Slopes
4. Badlands
5. Woody Riparian/Wetland
6. Herbaceous Riparian/Wetland

Visual Sensitivity Categories

A. Foreground views from National Historic Trails or historic trails potentially eligible for the National Register of Historic Places (within approximately 1/4 mile).

B. Middleground views (up to 3 miles) from Pick Axe Road, an upgraded county road south of Atlantic City, which was formerly an historic trail.

C. Foreground views from Highway 28 (within approximately 1/4 mile).

D. Foreground views (within approximately 1/4 mile) from numerous two-tracks as well as dispersed recreation use on public lands.

Visual Mitigation Objective Codes (VMOC)

1. **Streams and Historic Ditch Crossings**

   Restore earthforms and minimize disturbance to vegetation at stream crossings and approach slopes to reduce long-term landform and vegetation contrast. Replant native woody species on stream banks.

2. **Two-Tracks**

   Reduce long-term surface contrast to foreground views primarily by minimizing visual contrast along the right-of-way as seen from two-tracks which are used for dispersed recreation.

3. **Historic Trails (Foreground Views - 1/4 mile)**

   Retain the historic appearance of the landscape by avoiding impacts to trails through boring. Avoid long-term visual contrast that will attract attention to the view by blending the form, line, color and texture of right-of-way with adjacent terrain and vegetation cover. Note this objective may be applied at additional trails which are determined to be eligible for the NRHP.

4. **Historic and Recreation Trails (Middleground views - up to 3 miles)**

   Retain the historic appearance of the landscape by minimizing long-term visual contrast of the right-of-way to the historic trail.

5. **Highway Views (Highway 28 Foreground - 1/4 mile)**

   Where the pipeline is parallel to Highway 28, reduce surface contrast with adjacent landtypes, so that the route does not attract attention. Avoid color and line contrast with adjacent natural vegetation and terrain.

6. **South Pass Interpretative Sites and Vistas**

   Avoid visual contrast from historic interpretation sites by locating the pipeline route out of foreground and middleground views. (This objective was accomplished with the Continental Divide realignment filed by Altamont on November 28, 1990).

4.0 REHABILITATION UNITS

Rehabilitation units developed for the study area combine landtypes (Section 2.0), visual sensitivity categories and visual mitigation objectives (Section 3.0) to reflect that mitigation measures must vary within a landtype to address visual sensitivity. Table 4-1 identifies 14 rehabilitation units between MPs 511.0 and 540.8. Sections 5.0 and 6.0 identify general and specific measures to achieve visual mitigation objectives.

A separate Rehabilitation Unit(x) addresses crossings of Highway 28, the Oregon-Mormon Trail, and trails eligible for or potentially eligible for the NRHP.

MP	Road/Trail
515.5	Pick Axe Road
521.2	Lander Cutoff of the Oregon Trail
529.0	Highway 28
530.0	Green River to South Pass City Stage Route
538.6	Highway 28
538.6	Oregon-Mormon Trail

Stream crossings (i.e. the beds and banks) are treated as specific locations within the appropriate Rehabilitation Unit.

TABLE 4-1
REHABILITATION UNITS - MP 511.0 - 540.8

FROM MP	TO MP	LANDTYPE (see Section 2.0)	VISUAL SENSITIVITY CATEGORY[1] (see Section 3.0)	VISUAL MITIGATION OBJECTIVES[2] (see Section 3.0)	REHABILITATION CODE (see Section 6.0)
511.0	512.1	Low Sagebrush	D	2	2D
512.1	512.4	Herbaceous Riparian/Wetland	D	2	6D
512.4	514.0	Low Sagebrush	D	2	2D
514.0	514.2	Approach Slope	D	1	3D
514.2	514.4	Woody Riparian/Wetland	D	1	5D
514.4	514.5	Approach Slope	D	1	3D
514.5	514.9	Low Sagebrush	D	2	2D
514.9	515.0	Herbaceous Riparian/Wetland	D	2	6D
515.0	515.1	Low Sagebrush	A	3	2A
515.1	515.3	Herbaceous Riparian/Wetland	A	3	6A
515.3	515.7	Low Sagebrush	A	3	2A
515.7	515.9	Herbaceous Riparian/Wetland	A	3	6A
515.9	516.2	Herbaceous Riparian/Wetland	D	1	6D
516.2	516.4	Low Sagebrush	D	2	2D
516.4	516.6	Woody Riparian/Wetland	D	1	5D
516.6	517.1	Low Sagebrush	D	2	2D
517.1	518.0	Low Sagebrush	B	2,4	2B
518.0	518.1	Herbaceous Riparian/Wetland	B	2,4	6B
518.1	518.2	Low Sagebrush	B	2,4	2B
518.2	518.3	Herbaceous Riparian/Wetland	B	2,4	6B
518.3	518.5	Low Sagebrush	B	2,4	2B
518.5	518.7	Low Sagebrush	D	2	2D
518.7	518.8	Herbaceous Riparian/Wetland	D	1	6D
518.8	519.9	Low Sagebrush	D	2	2D
519.9	520.0	Approach Slope	D	1	3D

TABLE 4-1 Cont'd

FROM MP	TO MP	LANDTYPE (see Section 2.0)	VISUAL SENSITIVITY CATEGORY[1] (see Section 3.0)	VISUAL MITIGATION OBJECTIVES[2] (see Section 3.0)	REHABILITATION CODE (see Section 6.0)
520.0	520.4	Low Sagebrush	D	2	2D
520.4	520.5	Herbaceous Riparian/Wetland	D	1	6D
520.5	520.8	Low Sagebrush	D	2	2D
520.8	521.0	Low Sagebrush	A	3	2A
521.0	521.4	Upland Big Sagebrush	A	3	1A
521.4	521.6	Upland Big Sagebrush	D	2	1D
521.6	521.7	Herbaceous Riparian/Wetland	D	1	6D
521.7	522.1	Upland Big Sagebrush	D	2	1D
522.1	522.2	Woody Riparian/Wetland	D	1	5D
522.2	525.5	Upland Big Sagebrush	D	2	1D
525.5	525.6	Herbaceous Riparian/Wetland	D	1	6D
525.6	526.4	Upland Big Sagebrush	D	2	1D
526.4	526.8	Herbaceous Riparian/Wetland	D	1	6D
526.8	526.9	Woody Riparian/Wetland	D	1	5D
526.9	527.9	Low Sagebrush	D	2	2D
527.9	528.6	Low Sagebrush	C	5,6	2C
528.6	531.3	Upland Big Sagebrush	C	2,5,6	1C
531.3	531.9	Low Sagebrush	C	2,5	2C
531.9	532.4	Upland Big Sagebrush	C	2,5,6	1C
532.4	532.5	Herbaceous Riparian/Wetland	C	1,5,6	6C
532.5	533.2	Upland Big Sagebrush	C	2,5,6	1C
533.2	533.4	Badlands	D	2	4D
533.4	538.2	Upland Big Sagebrush	C	5,6	1C
538.2	538.9	Upland Big Sagebrush	A	3,5,6	1A
538.9	540.8	Upland Big Sagebrush	D	5	1D

TABLE 4-1 Cont'd

Footnotes:

[1] VISUAL SENSITIVITY CATEGORIES:

A. Foreground views from National Historic Trails or historic trails potentially eligible for the National Register of Historic places (within approximately 1/4 mile).

B. Middleground views (up to 3 miles) from Pick Axe Road, an upgraded county road south of Atlantic City, which was formerly an historic trail.

C. Foreground views from Highway 28 (within approximately 1/4 mile).

D. Foreground views (within approximately 1/4 mile) from numerous two-tracks as well as dispersed recreation use on public lands.

[2] VISUAL MITIGATION OBJECTIVE CODES:

1. Streams and Historic Ditch Crossings

   Restore earthforms and minimize disturbance to vegetation at stream crossings and approach slopes to reduce long-term landform and vegetation contrast. Replant native woody species on stream banks.

2. Two-Tracks

   Reduce long-term surface contrast to foreground views primarily by minimizing visual contrast along the right-of-way as seen from two-tracks which are used for dispersed recreation.

3. Historic Trails (Foreground Views - 1/4 mile)

   Retain the historic appearance of the landscape by avoiding impacts to trails through boring. Avoid long-term visual contrast that will attract attention to the view by blending the form, line, color and texture of right-of-way with adjacent terrain and vegetation cover. Note this objective may be applied at additional trails which are determined to be eligible for the NRHP.

4. Historic and Recreation Trails (Middleground views - up to 3 miles)

   Retain the historic appearance of the landscape by minimizing long-term visual contrast of the right-of-way to the historic trail.

5. Highway Views (Highway 28 Foreground - 1/4 mile)

   Where the pipeline is parallel to Highway 28, reduce surface contrast with adjacent landtypes, so that the route does not attract attention. Avoid color and line contrast with adjacent natural vegetation and terrain.

6. South Pass Interpretative Sites and Vistas

   Avoid visual contrast from historic interpretation sites by locating the pipeline route out of foreground and middleground views. (This objective was accomplished with the Continental Divide realignment filed by Altamont on November 28, 1990).

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PART 3 - CONSTRUCTION AND REHABILITATION PLAN

5.0 GENERAL MITIGATION MEASURES

Mitigation of the environmental effects of pipeline construction in the study area is primarily focused on controlling erosion and sedimentation and revegetating disturbed areas to minimize visual contrast. Construction and rehabilitation practices are discussed in general in this section; specific measures for each Rehabilitation Unit are presented in Section 6.0.

Short-term objectives of rehabilitation are to control erosion and sedimentation, and to minimize impacts on existing land uses. Long-term objectives also include erosion and sedimentation control, the minimization of visual contrast and restoration of topography, water resources, soils and vegetation to complement pre-disturbance conditions. Construction practices, scheduling, and implementation of construction and rehabilitation measures discussed below will mitigate short-term and long-term impacts. Environmental inspection during the construction phase and monitoring during the operational phase will ensure that these objectives are met.

Specific objectives addressed in this section include:

- Minimize grade changes;
- Restore original contours unless otherwise directed by a geotechnical engineer;
- Salvage, protect and utilize the highest quality soil for revegetation;
- Provide erosion and sediment control as required;
- Discourage non-noxious weed competition and control noxious weeds;
- Utilize adapted native species for revegetation to reduce the visual effect of the right-of-way and provide a self-perpetuating cover compatible with post-construction land use and adjacent vegetation;
- Minimize above-ground facilities and camouflage those facilities that are not required to be visible;
- Protect wetlands;
- Discourage the unauthorized use of the right-of-way by off-road vehicles; and,
- Monitor and maintain revegetation and erosion and sediment control structures and practices.

Elements of this Construction and Rehabilitation Plan were discussed with personnel from the BLM Worland, Lander and Rock Springs offices in February, 1991. Many of the proposed mitigation techniques reflect these discussions.

A number of construction and rehabilitation mitigation measures apply equally to all Rehabilitation Units. These are described in more detail below, prior to the presentation of specific mitigation measures for each Rehabilitation Unit in Section 6.0.

5.1 CONSTRUCTION

General mitigation measures for pipeline construction are contained in Section 3.0 of Altamont's Environmental Report and Chapter 2 of the DEIS and will not be repeated here. Important aspects specific to the study area appear below.

5.1.1 Construction Spread

In order to accommodate the special requirements through this particular area of Wyoming, Altamont proposes to revise its original construction plan by adding another construction spread. Spread 5A will consist of a smaller specialized pipeline spread which will construct the segment from MP 493.6 (the old highway south of Highway 287) to MP 540.6 (a point south of Highway 28 adjacent to the existing AT&T right-of-way). The length of pipeline to be installed by this spread totals 49 miles and includes the segment discussed in this Plan plus the Continental Divide and Beaver Creek route realignments.

It is presently anticipated that Spread 5A will be tendered in conjunction with the revised Spread 5 (MP 420.0 to MP 493.6) with the stipulation that it will function as a separate, specialized spread (generally less than 200 workers with a corresponding reduction in construction equipment) in accordance with the requirements as outlined in the Construction and Rehabilitation Plan. It will be permissible for the contractor to utilize workers and equipment from Spread 5, if feasible, and to share field office responsibilities in order to minimize supervision, maintenance and overhead costs.

By utilizing a smaller specialized pipeline spread and a separate experienced revegetation contractor (see Section 5.2.2) in this area, Altamont is attempting to minimize surface disruption while maximizing rehabilitation. A trade-off is that construction will not proceed as rapidly as it would with a mainline spread. Construction productivities should exceed one half mile per day allowing the entire 49 miles to be installed in approximately three months. The reduced manpower and equipment requirements will result in less right-of-way traffic and less surface disturbance. In critical areas, pipe may be strung utilizing low ground pressure equipment such as "athey wagons" or reduced loads on conventional pole trailers.

Stretches of narrow right-of-way will require turnouts to permit vehicles and equipment to pass and will also provide the beneficial effect of a feathered edge. In addition, Altamont proposes to install slight deflections in the pipeline alignment near selected public road and trail crossings to restrict line of sight down the pipeline right-of-way. Altamont is also proposing to reduce the standard right-of-way width from 100' to 75' for distances of up to 1/4 mile at selected locations. This procedure, however, can only be implemented if Altamont is permitted to open-cut, rather than bore, the public road or trail crossings at these locations.

5.1.2 Construction Access

Only the pipeline right-of-way and existing access roads will be utilized by the contractor in this area, provided that the contractor is permitted to use all such access that is normally used by the general public.

Altamont surveyors will stake both right-of-way boundaries at frequent intervals. An integral part of the construction specifications for Spread 5A will be the requirement for the contractor to restrict personnel and equipment to the flagged right-of-way and approved access roads. Failure to adhere to this restriction may result in termination of employment. To further restrict the possibility of off right-of-way damage and to reduce traffic to and from the work site, all contractor personnel who are not required to operate a vehicle will be bused from the contractor's construction yard and back each day.

5.1.3 Right-of-Way Preparation

The removal of obstacles (e.g. shrubs and large rocks) from the permanent and temporary right-of-way as well as the partial levelling and smoothing of abrupt changes in ground contours will be conducted to permit construction activities and to allow the temporary storage of topsoil and spoil. To the extent practicable, the work space will be limited to the minimum area necessary for these activities.

To prevent wind erosion and facilitate vegetative reestablishment, the roots of existing plants will be left in place to the extent practicable through the use of brush beaters or similar equipment. Low shrubs, smaller woody debris and herbaceous plants will be salvaged with topsoil, then reapplied during rehabilitation to create organic matter and a plant material source and to decrease the potential for wind and water erosion.

The following additional measures will be implemented to reduce the effects of clearing and grading:

- Construction equipment which will minimize surface disturbance, soil compaction, and loss of topsoil will be utilized. Such equipment includes low ground pressure tracks or tires, blade shoes, and brush rake attachments.

- Suitable vehicle water crossing structures such as temporary bridges will be installed as required.

- Only the area between flagged right-of-way boundaries will be cleared.

- Steep, erodible slopes will not be pre-cleared unless construction is scheduled to commence immediately following clearing.

- Erodible slopes which do not require grading and willow bottomlands will be hand cleared. Debris or soil inadvertently deposited within the high water marks of watercourses will be removed in a manner that minimizes disturbance of the bed and banks.

5.1.4 Topsoil Salvage and Storage

A minimum of 4 inches of topsoil or available surficial material will be salvaged unless otherwise prevented by rock outcrops. A maximum of 12 inches of topsoil will be salvaged. Actual stripping depths will be determined by Altamont in the field prior to pipeline construction.

Topsoil will be stripped one dozer blade width over the trench (12-14') and stored on the working side of the right-of-way away from the spoil pile if 4-8" of soil is salvaged. If 8-12" of soil is salvaged, it will be stored in a separate windrow on the far side of the spoil pile with a minimum two-foot separation (applies to 100' wide right-of-way only). Topsoil will be stripped wherever grading occurs, i.e., wherever the surface is bladed, and stockpiled along one or both edges of the right-of-way. Locations requiring grading will be determined by Altamont engineers during field investigations to be conducted prior to easement negotiations and the preparation of construction specifications.

Additional soil salvage measures which will be undertaken to protect the soil resource include:

- Gaps will be left in topsoil piles where drainages occur.
- Topsoil stripping activities will cease during excessively wet and/or inordinately windy weather.
- Topsoil will not be used as padding in the trench or to fill sacks for trench breakers.
- Surface disturbances will be minimized.
- Wherever feasible, steep slopes will not be cleared until trenching and pipe installation is scheduled. A temporary uncleared buffer zone will be retained extending back from the crest of the hill.
- The presence of saline and/or sodic soils will be determined in the field prior to construction. Special handling techniques will be utilized if an organic horizon over these types of soils is present, as indicated by vegetative cover. If saline or sodic soils are present on the surface, they will be mixed with underlying horizons.
- No drains or ditches will be blocked by soil stockpiles.

5.1.5 Pipe Bedding/Padding

Select bedding/padding material or rock jacket are intended to protect the pipe as well as the coating from damage. During the detailed design phase of the project, Altamont engineers will be evaluating the use of these two methods of pipe protection. All potentially available borrow sites will be identified. Definitive quantity estimates will be calculated and cost estimates completed and compared to the cost of rock jacket. Altamont has determined that a "pipeline padder" machine will not be utilized in the study area.

If rock jacket is selected it will be applied to the pipe off-site at an approved location, preferably adjacent to a railhead. The results of this pipe protection analysis may suggest that, dependent upon site specific conditions, a combination of select bedding/padding material and rock jacket is preferable.

Based upon numerous site visits conducted by Altamont personnel, it has been determined that approximately one-half of this area will require these measures for pipe protection. Assuming a conservative 0.3 cubic yard per lineal foot of ditch for bedding/padding material for a total length of 15 miles would amount to less than 25,000 yd^3 in total. More isolated areas along the pipeline will be considered for rock jacket in order to reduce the amount of travel along the right-of-way. Fly rock resulting from rock ditch blasting operations will be controlled with the use of blasting mats. All extraneous rock material not required for trench backfilling operations or for redistribution on the right-of-way will be hauled off to a pre-approved disposal site.

A combination of mechanical and manual rock pickers will be utilized during the clean up operation to ensure that the end result resembles the surrounding terrain as closely as practicable.

5.1.6 Water Crossings

River and creek crossings in this area will be constructed utilizing the open cut method. However, to minimize impact, additional measures will be taken which may include the dam and pump-around method or the dam and flume method on streams with cold water fish species present. Further mitigation measures will include the temporary installation of "bailey" bridges (or suitable equivalent) to permit construction equipment and vehicles to cross the creek without disruption to the stream flow or increase in downstream sedimentation. During the clean-up operations all temporary structures and earthworks will be removed from the site and the entire right-of-way rehabilitated as further outlined in this Plan. Additional details on water crossings are provided in Section 6.0.

5.1.7 Environmental Inspection

Prior to construction, all relevant inspection and contractor personnel will attend an environmental training seminar which will highlight specific environmental concerns on this project and outlines appropriate action. Environmental Inspectors will be on the construction site at all times during construction. The number of inspectors will be sufficient to provide complete inspection of all phases of pipeline construction that could potentially impact the environment.

Environmental Inspectors will be fully qualified and trained to ensure that the terms and conditions of the environmental protection plans are followed and that disturbance to the environment is minimized.

The responsibilities of the Environmental Inspector will include, but not be limited to, the following items:

- compliance with requirements of erosion and sedimentation control plans; stream and wetland construction and mitigation procedures; applicable conditions of the FERC certificate; and other environmental permits and approvals;
- marking of surface and subsurface drainage system locations identified by landowners and/or soil conservation authorities;
- identification of stabilization needs in all areas;
- performance of appropriate tests of subsoil and topsoil to determine the extent of compaction across the project right-of-way;
- restoration of soil profile as requested or required;
- approval of imported soils used as fill and/or additional cover material;
- documentation of the revegetation programs.

5.2 REHABILITATION

General mitigation measures for rehabilitating the pipeline right-of-way are presented in Appendix B of Altamont's Environmental Report and the DEIS. Elements specific to the study area are presented below.

5.2.1 Topsoil Replacement

After the trench has been backfilled and the work areas ripped to relieve compaction, topsoil will be evenly replaced over those areas that required topsoil stripping. Topsoil will not be handled during excessively wet or inordinately windy weather. Redistribution depths will vary between 4 and 12 inches depending upon stripping depths. Salvaged soil will not be mixed with spoil material before or during redistribution and only the topsoil that was salvaged will be spread. Topsoil from unstripped areas will not be used to cover adjacent disturbances.

The following methods will be employed to promote successful rehabilitation:

- Backfilling will commence immediately after lowering-in. Backfill material will not be mixed with salvaged or unstripped topsoil.
- Replaced topsoil will be worked with a chisel plow, flexible cultipacker or similar implement to reduce compaction or crusting before seeding, if necessary.

- Replaced soil will be left in as roughened a condition as possible (clods) until it is seeded and stabilized to discourage wind erosion. Additional stabilization may be required on slopes and in drainages.

5.2.2 Revegetation

Revegetation will be undertaken on the right-of-way to provide stabilization through erosion and sedimentation control. Altamont will attempt to reestablish a vegetative cover that is similar in structure and composition to pre-construction conditions and restore wildlife and livestock productivity.

Rehabilitation of sensitive areas requires a high degree of expertise and specialized equipment. A contract will be tendered that deals specifically and solely with the revegetation aspects of the pipeline project. The contract will be awarded to a firm technically competent in reclamation procedures set forth in the tender documents.

5.2.2.1 Species Selection

Selection of plant species for revegetation is based on evaluation of existing species occurrence, establishment potential, growth characteristics, soil stabilizing qualities, palatability to wildlife and livestock, commercial availability, post-construction land use objectives and discussions with BLM personnel in Lander, Wyoming on February 5, 1991. Redistributed soil and substrate properties (texture and restrictive features such as wind and water erosion hazard, salinity, acidity, alkalinity, sodicity and drainage) have also been considered.

Seed will be obtained from within the same geographical area that is being revegetated (300 miles south and north and 500 miles east and west of the site). Efforts will be made to obtain seed originating from as close as possible to the study area. This measure will enhance revegetation success by using seed adapted to local conditions.

All seed and live plant material will be acquired by Altamont and supplied to the contractor. Specialized rehabilitation products such as tublings, native seed mixtures, and erosion control products often require considerable lead time to acquire. In addition, deterioration of quality control and product substitution sometimes occurs under tight time frames. Acquisition of rehabilitation products by Altamont will ensure timely order placement, adequate supplies, and where supplies are not available, redesign to adequate standards.

5.2.2.2 Seed Mixtures and Rates

Altamont proposes to use two revegetation mixtures which include species present in upland and bottomland vegetation communities of the area. The use of native species has been stressed. Proposed seed mixtures are presented in Tables 5-1 and 5-2. Seeding rates have been designed to total approximately 100 pure live seeds (PLS) per square foot for broadcast seeding.

Forbs, shrubs and trees will not be reestablished with the following exceptions:

TABLE 5-1
UPLAND REVEGETATION MIXTURE

Species/Common Name	Preferred Variety	Broadcast Seeding Rate lbs/acre	PLS/sq.ft.
Agropyron dasystachyum Thickspike wheatgrass	Critana	4.0	14
Agropyron spicatum Bluebunch wheatgrass	Secar	5.0	16
Agropyron trachycaulum Slender wheatgrass	Pryor, Revenue	2.0	7
Oryzopsis hymenoides Indian ricegrass	Nezpar	5.0	16
Poa sandbergii Sandberg bluegrass	-	1.0	21
Stipa comata Needle-and-thread	-	4.0	10
Stipa viridula Green needlegrass	Lodorm	3.0	13
	TOTAL	24.0	97

NOTE: Artemisia frigida (fringed sagewort) may be included on shallow soils on windy ridges at a rate of 0.1 lbs/acre (10 PLS/sq.ft.)

TABLE 5-2
BOTTOMLAND REVEGETATION MIXTURE

Species/Common Name	Preferred Variety	Broadcast Seeding Rate lbs/acre	PLS/sq.ft.
Agropyron trachycaulum Slender wheatgrass	Pryor, Revenue	3.0	11
Agrostis alba Redtop	-	0.25	28
Alopecurus arundinaceus Creeping foxtail	Garrison	1.0	21
Deschempsia cespitosa Tufted hairgrass	-	0.5	29
Elymus canadensis Canada wildrye	-	4.0	10
	TOTAL	8.75	99

- Fringed sagewort may be included on shallow soils on wind-swept ridges;
- Sagebrush will be planted on a localized basis to shorten the time for sagebrush reestablishment in the most visually sensitive areas. Sagebrush is expected to reinvade the right-of-way naturally within several years.
- Willow will be reestablished by hand planting along drainages currently supporting willows. This effort will be coordinated with landowners on private property. Specific exceptions are discussed by rehabilitation unit in Section 6.0.

All seed will meet the requirements of the Federal Seed Act (7 U.S.C., Section 1551-1610, inc.). Seed used will be:

- Purchased in accordance with Pure Live Seed (PLS) specifications for mixes;
- Of the specified variety where indicated;
- Free of noxious weeds;
- Harvested within 12 months of the date of planting;
- Clearly labelled to disclose purity and germination data;
- Harvested from ecotypically similar plants, growing under similar climatic and edaphic conditions;
- Delivered to the site in sealed containers with dealer's guaranteed analysis.

Seed mixtures may be modified based on limited species availability, poor seed quality or site differences. Seed mixtures may also be modified to protect seeded areas from grazing. In open areas where seedings cannot be otherwise protected, it may be necessary to substitute species with low palatabilities or greater resistance to grazing. Modifications will be undertaken only with the concurrence of appropriate regulatory authorities or the landowner.

If seeding is delayed more than 30 days from backfilling, it may be necessary to conduct a temporary seeding. An interim revegetation mixture composed of native species will be developed in consultation with the BLM.

5.2.2.3 Seedbed Preparation

Seedbed preparation will be accomplished immediately after backfilling and topsoil replacement. Where compaction is determined to be a problem, the working side will be ripped to a sufficient depth, utilizing a conventional bulldozer with multi ripper shanks. Where compaction is minimal, a chisel plow may be used to break up the surface. A flexible cultipacker will be used to create a final seedbed for broadcast seeding. The flexible cultipacker will consist of variable-depth spikes in an uneven placement on drums placed together along a horizontal shaft or tube. The individual drums can follow uneven ground and roll over rocks without changing the frame alignment. The drums can be filed with water for more weight and better performance. Cultipacking will break up large clods from ripping, firm the seedbed, improve seed: soil contact and avoid the unsightly visual effects of drill rows. The soil surface will be left in a roughened condition to create an irregular seedbed which will trap seed and snow, provide microsites for seed germination, reduce the effects of wind and reduce soil movement on steeper slopes.

Sites that exhibit minimal construction damage (i.e. the original vegetation has survived generally intact) will not require revegetation. Small areas may be required to be worked by hand and seeded as required.

5.2.2.4 Seeding Method

Lands disturbed by pipeline construction will be broadcast seeded to minimize the visual impact of drill rows. Seed will be evenly broadcast using manually operated cyclone-type bucket spreaders, mechanical seed blowers, dribble-type seeders or hydroseeders. Seed will be mixed frequently to discourage settling. Where possible, broadcast seeded areas will be chained, harrowed, or cultipacked to cover the seed. On steeper slopes where conditions allow, broadcast seeded areas will be dozer-tracked perpendicular to the fall-line to provide microsites for seed germination. On small or inaccessible sites, hand raking will be used to cover seed.

5.2.2.5 Mulching

Mulching aids in erosion control, soil moisture retention, temperature moderation and provides supplemental organic material. Hydromulch will be used on the more visually sensitive areas (visual sensitivity categories A, B and C) to avoid the effect of straw mulch crimp rows. Hydromulch will be applied at a rate of 1.0-2.0 tons/acre, depending on slope, soil texture and wind conditions. Hydromulch will be sprayed from two directions to provide complete coverage. Applicators will attempt to maximize the velocity of the slurry as it meets the ground surface by positioning the nozzle to promote the mixing of soil particles with the mulch.

If used, noxious weed-free straw mulch will be evenly spread over seeded areas so that at least 75 percent of the ground surface is covered. Straw mulch may be used on visual sensitivity category D areas. Straw mulch will be applied at a rate of 0.5-1.0 ton/acre on relatively level surfaces and 1.0-1.5 tons/acre on steeper slopes and dry, sandy sites. Mulch will be anchored into the seedbed using a mulch crimper and/or liquid mulch binder applied at the manufacturer's recommended rates.

Regardless of mulch type used, it will be applied immediately after seeding. If revegetation is delayed more than 30 days following backfill, hydromulch will be applied at a rate of 1.0-2.0 tons/acre on slopes exceeding 10 percent; if used, straw mulch will be applied at a rate of 2.0 tons/acre and anchored. A liquid mulch binder will be utilized at the manufacturer's recommended rate for both techniques.

Soil stabilization products such as jute matting, geotextile mats, excelsior blankets, or similar products will be used on unstable sites which require more aggressive erosion control treatments. If revegetation lags completion of construction on areas adjacent to stream crossings by more than 30 days, these sites will be protected with jute matting or similar product for a minimum of 100 feet on either side of the waterway. Netting products will be used with caution to avoid livestock and wildlife entanglement.

On extremely windy sites, the Environmental Inspector will determine whether water, mulches, or barriers (straw bales, snow fences, etc.) should be used.

5.2.3 Fertilization

Fertilizer will not be applied because of the short duration of soil stockpiling and because fertilizer enhances growth and development of weedy species. If, during revegetation monitoring, nutrient deficiencies appear to be affecting revegetation success, macro- and micro-nutrient testing will be conducted and a fertilizer plan developed.

5.2.4 Stream and Wetland Mitigation

Bank stabilization and revegetation of streambanks and wetlands are discussed in Appendix C-3 of the DEIS ("Stream and Wetland Construction and Mitigation Procedures"). Rehabilitation measures itemized in this document include:

- All riprap activities must comply with nationwide Section 404 permit No. 13 conditions at a minimum.

- Limit use of riprap to areas where flow conditions preempt vegetative stabilization, unless otherwise specifically required by state permit.

- Restore topsoil to original horizon and revegetate with native herbaceous species or temporarily revegetate disturbances with annual ryegrass at a rate of 25-30 pounds per acre, unless standing water is present.

- Allow 10-foot-wide riparian strip above streambank to permanently revegetate with native woody plant species across the entire ROW.

- Maintain sediment filter devices at base of all slopes located adjacent to streams until ROW revegetation is complete.

- Install permanent slope breakers at base of all slopes adjacent to streams.

- Do not use fertilizer or lime, unless required by appropriate state permitting agency.

- Develop specific procedures, in coordination with the appropriate state agency, to prevent the invasion or spread of undesirable exotic vegetation.

- Cribwall overhanging banks where present on streams with cold water fish.

- Plant native willow cuttings on streambanks where willows presently occur.

Site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this Plan.

5.2.5 Schedule

Rehabilitation activities will be determined by construction schedules and seasonal climatic variations. Seeding will be coordinated with other reclamation activities to occur as soon after seedbed preparation as possible (preferably within six days, weather permitting). Slopes steeper than 3:1 will be seeded immediately following final grading, weather permitting. Based on the current construction schedule, revegetation will be conducted during the fall (after September 15), depending on weather conditions. Revegetation will not occur if snow cover is in excess of two inches. If revegetation cannot be conducted immediately, temporary erosion control measures (e.g. mulching) will be used. Permanent revegetation will occur at the beginning of the next appropriate season.

5.2.6 Management

5.2.6.1 Weed Control

Prior to construction, the Fremont and Sublette county weed control boards and the BLM will be contacted to obtain recommended weed control measures for the pipeline right-of-way and above ground facilities. Recommended weed control measures will be implemented as specified by the county weed control boards and the BLM.

During and following construction of the pipeline, areas disturbed on the right-of-way will be monitored for the presence of noxious weed infestations. Areas with existing noxious weed problems that will be traversed by the pipeline will be intensively monitored and treated to prevent the spread of weeds to currently uninfested areas. Contractors will be required to have equipment arrive at construction sites in a clean condition, free of weeds. During the operational stage of the project, weeds will be controlled in a manner approved by the landowner and authorities having jurisdiction.

The primary method of weed control will be rapid revegetation of disturbed sites. Noxious weeds invade disturbed sites; however, the spread of weeds is slowed if adequate cover of desirable plants is established.

It is not anticipated that noxious weeds will be a problem in the study area. If necessary, and as directed by the BLM and County Weed Board, spot spraying with herbicides will be conducted to control noxious weeds. Herbicides likely to be used include picloram (Tordon), 2,4-D, and dicamba (Banvel). These herbicides selectively kill broadleaf plants and generally do not harm grasses when applied at recommended rates. Herbicide will be carried either in tanks mounted on vehicles or in backpack tanks depending on accessibility. Herbicide spray will be applied only when wind velocity is less than 8 miles per hour in order to prevent wind drift. No herbicides will be applied within 25 feet of waterbodies. All herbicide application will be:

- In compliance with all pertinent federal, state, and local regulations.

- With only those herbicides registered and approved by the Environmental Protection Agency (EPA).
- In strict compliance with application rates and application techniques specified on EPA-approved label instructions.
- Applied only by licensed applicators or licensed supervisors.
- In strict observance of all laws and regulations governing herbicide handling, storage, disposal, and spill cleanup.
- Made avoiding the use of oil carriers with the herbicide.

5.2.6.2 Fencing

Temporary fencing will be used on a limited basis to keep livestock away from construction activities and reclaimed portions of the right-of-way. Proposed fencing is discussed for specific rehabilitation units in Section 6.0. To allow vegetation to reestablish on disturbed sites, Altamont may negotiate with the BLM/landowner or tenant to defer grazing the right-of-way until plants have become well established; it may be possible to work deferment into the grazing rotation system in some allotments.

If new fence is constructed, gates and fenced passages along and across the right-of-way will be installed to allow for vehicle, livestock and wildlife crossings at existing trails and other locations designated in cooperation with area ranchers and grazing managers. All damaged fences will be repaired or replaced. Final repair will take place after rehabilitation work is completed. Gates will be kept closed by all personnel travelling to and from the pipeline right-of-way. Fences, gates and brace panels will be reconstructed to appropriate standards using designs from the Missoula Technology and Development Center (1988) or equivalent.

Wind fences will be constructed if wind scouring is evidenced during the first monitoring period.

5.2.6.3 Special Treatments

It is not anticipated that any special post-construction treatments will be necessary to achieve rehabilitation objectives. No supplemental irrigation, interseeding or other treatment is proposed. Following construction and successful rehabilitation, management will revert to appropriate landowners or surface management agencies.

If rills or gullies form in graded and soiled areas, they will be filled, graded or otherwise stabilized and the area will be reseeded.

5.2.7 Operational and Post-operational Monitoring

Operational monitoring will be conducted in cooperation with the BLM to ensure that erosion and sediment control practices, topsoil handling, revegetation and other rehabilitation measures are effective. Following construction, site-cleanup and rehabilitation, qualified specialists will evaluate disturbed areas to ascertain the effectiveness of control measures. Inspections of the pipeline right-of-way across the entire study area will be performed during the first and second growing seasons. Thereafter, inspections will be routinely made with other pipeline inspections with specific attention to potential problem areas. In addition, the right-of-way will be patrolled from the air on a regular basis. Remedial measures will be taken as soon as practicable at any identified problem area. Erosion control standards are discussed in the Rehabilitation Standards section.

Revegetated areas will be evaluated by field reconnaissance during the first and second growing seasons following seeding to determine revegetation success. Monitoring will be conducted to evaluate criteria described in the Rehabilitation Standards section. Areas with poor germination and/or growth will be evaluated to determine causes of unsuccessful revegetation. Altamont will consult with affected landowners or surface management agencies to determine the scope of evaluation. Reclamation techniques will be modified as necessary to address any identified problems, and remedial measures taken to revegetate problem areas. If necessary, reseeding will be conducted after the second growing season, since it is difficult to predict revegetation success based on the results of one growing season. The right-of-way will also be inspected for the presence of weeds and evidence of erosion as well as adequacy of erosion control procedures.

5.2.8 Rehabilitation Standards

Rehabilitation standards will be developed in cooperation with the Bureau of Land Management in consideration of the Proposed Policy on Reclamation (Feb. 2, 1990) and will be detailed in the Plan of Development (POD) to be filed prior to construction as required under other terms of the right-of-way grant and use permit for federal lands.

5.2.8.1 Erosion Control Standards

The rehabilitated area will be considered stable when none of the following characteristics are exhibited:

- Large rills or gullies (>3 inches wide or deep);
- Observable soil movement or head cutting in drainages;
- Slope instability on or adjacent to the right-of-way.

Soil conservation will be ensured by surface manipulations and water management techniques stated previously in this plan e.g., leaving a roughened surface, mulch application, etc.

Sites that do not meet erosion control standards will be stabilized with an appropriate procedure and revegetated.

5.2.8.2 Revegetation Standards

The following revegetation standards are recommended:

- Vegetation will stabilize surface soils and establish a self-perpetuating plant community capable of supporting post disturbance land uses;
- Species included in the revegetation mixtures or other desirable species will be successfully established;
- Post disturbance cover will approximate the surrounding undisturbed area cover;
- Post disturbance production will approximate the surrounding undisturbed area production;
- Post disturbance species diversity will approximate the surrounding undisturbed area diversity;
- Species composition and species density will be capable of supporting the post disturbance land uses;
- The area will sustain grazing pressure at least equal to pre disturbance levels;
- There is evidence of reproduction (vegetative or seed) from reestablished plants.

When these standards are attained for two consecutive years, rehabilitation will be considered successful.

Sites that do not meet revegetation standards will be reseeded after the second growing season. Remedial revegetation efforts will be repeated every two to three years, if necessary, until the standards are met.

5.3 ABOVE-GROUND FACILITIES PLAN

The design, construction, operation and maintenance of a natural gas transmission system requires the installation of various above-ground facilities and appurtenances. These include compressor stations, meter stations, scraper traps, sectionalizing block valves with above grade operators and blowdowns, aerial patrol markers, line markers, test lead posts and associated cathodic protection equipment. The pipeline itself will be completely buried.

No compressor stations are proposed in the study area. Compressor Station #5 will be located 65 miles to the northeast of MP 511.0 and Compressor Station #6 will be located 9 miles to the southwest of MP 540.8 towards Farson. There will be no requirement to construct new permanent access roads in the study area.

There will not be a requirement to construct any type of permanent communications facilities in the area. If Altamont elects to utilize a microwave system (although a satellite system is currently being evaluated) it is anticipated that suitable lease arrangements could be made since numerous microwave towers are located throughout the South Pass area.

Aerial pipeline markers will generally be installed at sufficient intervals along the entire length of the pipeline route to assist with regularly scheduled line patrols. Between MP 511.0 and MP 540.8, however, Altamont is not proposing to install aerial pipeline markers. It is felt that existing landmarks along this segment of the pipeline (such as Highway 28) will allow the pilot to stay on course and provide a reference for recording and reporting any unusual conditions to Altamont's operations and maintenance personnel.

In order to comply with DOT regulations (49 CFR, Part 192) regarding the marking of buried pipelines, Altamont is required as follows:

> "a line marker must be placed and maintained as close as practical over each buried main and transmission line
>
> (1) At each crossing of a public road and railroad; and
>
> (2) Wherever necessary to identify the location of the transmission line or main to reduce the possibility of damage or interference."

It is also a DOT requirement that Altamont install and maintain mainline sectionalizing valves at a maximum spacing of 20 miles along the entire length of its pipeline. Present plans call for the installation of a buried block valve at MP 515.5 and a second one at MP 537.2. All of Altamont's standard sectionalizing valves will be buried with only the blowdowns and valve operators extending above grade. A 6-7' high chain link security fence will also be installed around the entire mainline valve assembly.

To reduce the visual impact of the block valve required at MP 515.5 immediately adjacent to the east side of Pick Axe Road, Altamont proposes to design and install an underground concrete vault with a hinged metal security cover painted Munsell Color No. 2.5Y 6/2 to blend with the surrounding ground cover. The vault will not extend more than 8" above grade and, once properly located and installed, will be barely visible to travellers driving along Pick Axe Road or the Lewiston Mine Road. It is anticipated that portable blowdown piping will be stored at CS #6 east of Farson and can be transported to the site, flanged up and utilized readily should it become necessary. The site specific design will ensure that valve operators (manual or hydraulic) will be safely locked thus eliminating the need for chain link fencing at this location.

The block valve required at MP 532.7 will be located near some corrals along the base of a badland setting approximately 600' north of Highway 28 where there is an opportunity for the background topography to visually absorb the facilities as seen from the Highway. The aboveground blowdowns, operators and chain link fences will be painted earth tone colors to blend in with the surrounding.

It is also required by federal law that test leads be installed at adequate intervals to test the cathodic protection on the pipeline. Test leads are visually innocuous and no special visual mitigation is required. During the detailed design phase of the project the cathodic protection system will be finalized and any additional facilities required will be identified at that time.

5.4 ORV MANAGEMENT PLAN

Altamont will not require an access trail along the length of its pipeline right-of-way during the operation phase of the project. All above-ground facilities in the study area (see Table 1-1 and Section 5.3) have been located adjacent to existing roads or trails so that no new permanent access is required. The line will be patrolled on a regular basis by aircraft and on a periodic basis by foot. Access for emergency response will be initially by helicopter or by pedestrian traffic and subsequently by heavy construction equipment travelling along the right-of-way from the nearest public access point.

5.4.1 Federal/State Lands

Altamont wishes to prevent off-road vehicle (ORV) use along its right-of-way to the maximum extent allowed on federal and state lands because ORV traffic can damage revegetation efforts and potentially increase vandalism. The qualifying statement "maximum extent allowed" recognizes that ORV users may have legitimate rights to access the right-of-way under existing BLM and Bureau of Reclamation and Wyoming State Lands policies and that there are potential liability problems to the government and pipeline company should an ORV user become injured or killed as a result of placement of obstacles to prevent access. In spite of this, Altamont is prepared to take the following measures after construction.

- Remove temporary construction access and rehabilitate to appropriate standards.
- Restore original contours unless otherwise directed by a geotechnical engineer.
- Replace topsoil and seed the right-of-way as soon as practicable (see Section 5.2).
- Install berms and cross ditches at steep slopes to direct runoff away from the right-of-way.
- Replace temporary gates with permanent fences built of like or better quality materials than the original fence.
- Replace large surface rocks in locations where such rocks currently discourage ORV use.
- Post signs at all points of access along the right-of-way saying, "This Area Seeded for Wildlife Benefits and Erosion Control".
- Regularly patrol the right-of-way by aerial overflights. Observe pipeline at existing ground access points. (Note: a "two-track" along the right-of-way is not required for Altamont operations staff).

5.4.2 Private Lands

Altamont will propose identical measures to landowners as those presented above except that the landowner may wish to be responsible for seeding. If the landowner favors ORV use, it is unlikely Altamont would be able to prevent it.

5.4.3 Effectiveness of ORV Control Measures

From MP 529.0 to 540.8, the pipeline parallels Highway 28 and will not "open up" new access to ORV use. From MP 511.0 to 529.0 (i.e. non-highway parallel), the land ownership pattern is such that the pipeline right-of-way does not cross more than 2-3 miles of federal land at a stretch. Private and/or state lands occur at Jones Gulch, Rock Creek, Willow Creek, Slaughterhouse Gulch, Pine Creek, Fish Creek and Sweetwater River. These lands are currently fenced for cattle and will continue to be fenced without gates following pipeline construction. Accordingly, it is unlikely that the pipeline right-of-way will open up vast areas of new terrain to ORV use. If federal or state agencies are aware of any particular location where new access may be a problem, Altamont is willing to work cooperatively to explore alternative solutions to control any problems.

5.5 VEGETATION MANAGEMENT PLAN

It will generally be unnecessary for Altamont to conduct periodic vegetation clearing along the pipeline right-of-way to facilitate aerial and ground surveillance to detect the occurrence of leaks, surface erosion and slope failure. The possible exception is regrowth of tree species such as aspen directly over the pipeline trench. In locations such as these, a tree-free zone 20' in width centered over the pipeline will be maintained by hand-clearing (chain saws, etc.). It is presently anticipated that the first hand-clearing of trees may not occur until 10 years following construction and periodically at 5 year intervals afterwards. It will not be necessary to conduct any periodic clearing of shrub species such as sagebrush and willows growing on the pipeline right-of-way.

Additional details on weed control, fencing and special treatments were provided earlier in Section 5.2.6.

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6.0 SPECIFIC MITIGATION MEASURES

The following Rehabilitation Unit specifications discuss construction and revegetation practices for each unit. In all cases general mitigation measures (Section 5.0) are applicable unless modified by the specifications. In general, more intensive mitigation is proposed for the more visually sensitive areas. Mitigation measures are designed to meet visual quality objectives from MP 511.0 to 540.8 as defined in Section 3.0 and may not be appropriate outside of this area.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	1A
UNIT DESCRIPTION:	Upland big sagebrush on moderately deep to deep soils - foreground view from historic trails.
UNIT LOCATION (MP):	521.0-521.4, 538.2-538.9
MITIGATION OBJECTIVES:	Restore natural landscape appearance by reestablishing sagebrush to blend form, line, color and texture with adjacent terrain and vegetation.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75')
ROW PREPARATION:	Salvage and store cleared sagebrush for respreading on ROW.
TOPSOIL SALVAGE: Depth:	Uhl 5-12" Gelkie 5-12" Hoodle 4-10" Bluerim 6-12" Onason 6-12"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to all stockpiled topsoil to prevent wind erosion. Water working side of ROW if water is available to reduce dust and wind erosion.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at one-half standard rate to reduce competition with planted shrubs.
PLANTING:	Plant containerized big sagebrush (tublings) at densities consistent with adjacent stands. Protect with big game repellant and/or Vexar netting as necessary. Utilize dead shade (respread sagebrush) and/or shade cards to reduce wind effects and trap blowing snow.
MULCHING:	Hydromulch at 1.5 tons/acre with tackifier at 40 lb/acre.
PROTECTION:	Fence perimeter of planted area with three or four-strand wire fence. Remove fence after revegetation is successful.
ADDITIONAL PRACTICES:	Respread salvaged sagebrush to provide shade for planted stock and for erosion control and wind barriers. Anchor respread brush with rocks (if available) or with wooden stakes.

REHABILITATION UNIT SPECIFICATIONS		
REHABILITATION UNIT CODE:	1C	
UNIT DESCRIPTION:	Upland big sagebrush on moderately deep to deep soils - foreground views from Highway 28.	
UNIT LOCATION (MPS):	528.6-531.3, 531.9-532.4, 532.5-533.2, 533.4-538.2	
MITIGATION OBJECTIVES:	Reduce color and line contrast with adjacent landscapes through revegetation to simulate short-term highway ROW vegetation while reestablishing conditions to allow sagebrush reinvasion for long-term visual mitigation.	
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.	
CONSTRUCTION		
ROW WIDTH:	Standard (100')	
ROW PREPARATION:	Salvage sagebrush with topsoil. Feather north ROW edge.	
TOPSOIL SALVAGE:	Hoodle	4-10"
	Gelkie	5-12"
Depth:	Ryark	5-12"
	Havre	6-12"
	Absher	0-6"
	Forelle	6-12"
	Thermopolis	0-6"
	Almy	4-10"
	Sinkson	4-10"
	Bluerim	6-12"
	Onason	6-12"
	Rallod	0-6"
	Seaverson	0-6"
	Glendive	6-12"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to Hoodle, Ryark, Bluerim and Onason stockpiled soils to prevent wind erosion. Water working side of ROW to reduce dust and wind erosion.	
DITCHING:	Rip rock wherever possible to minimize blasting effects.	
REVEGETATION		
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rate.	
PLANTING:	None	
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.	
PROTECTION:	Fence ROW with three or four-strand wire fence where right-of-way is immediately adjacent to highway fence. Remove fence after revegetation is successful.	

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	1D
UNIT DESCRIPTION:	Upland big sagebrush on moderately deep to deep soils - dispersed recreation views.
UNIT LOCATION (MPS):	521.4-521.6, 521.7-522.1, 522.2-525.5, 525.6-526.4, 538.9-540.8
MITIGATION OBJECTIVES:	Reduce long-term visual contrast through revegetation and reestablishing site conditions suitable for sagebrush reinvasion.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100')
ROW PREPARATION:	Salvage sagebrush with topsoil. Feather ROW edges.
TOPSOIL SALVAGE: Depth:	Hoodle 4-10" Gelkie 5-12" Uhl 5-12" Irigul 0-6" Ryark 5-12" Bluerim 6-12" Onason 6-12"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to stockpiles of Hoodle, Ryark, Bluerim and Onason soils to prevent wind erosion. Water working side of ROW if water is available to reduce dust and wind erosion.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rate.
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre or straw mulch at 1 ton/acre and crimp.
PROTECTION:	Standard procedures.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	2A
UNIT DESCRIPTION:	Upland low-growing sagebrush generally on shallow, rocky soils - foreground views from historic trails.
UNIT LOCATION (MPS):	515.0-515.1, 515.3-515.7, 520.8-521.0
MITIGATION OBJECTIVES:	Restore natural landscape appearance by reestablishing sagebrush to blend form, line, color and texture with adjacent terrain and vegetation.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75'). Deflect pipeline alignment east of Pick Axe Road (MP 515.5) to restrict line of sight.
ROW PREPARATION:	Salvage sagebrush with topsoil.
TOPSOIL SALVAGE: Depth:	Midelight 0-6" Irigul 0-6" Hoodle 4-10" Gelkie 5-12" Lymanson 0-6"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to all stockpiled topsoil.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at one-half standard rate to reduce competition with planted shrubs. Add fringed sagewort to mix at 10 PLS/sq.ft.
PLANTING:	Plant containerized big sagebrush (tublings) or black sagebrush depending on adjacent vegetation at densities consistent with adjacent stands. Protect with big game repellant and/or Vexar netting as necessary. Use shade cards to reduce wind effects and trap blowing snow.
MULCHING:	Hydromulch at 1.5 tons/acre with tackifier at 40 lb/acre.
PROTECTION:	Fence perimeter of planted area with three or four-strand wire fence. Remove fence after revegetation is successful.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	2B
UNIT DESCRIPTION:	Upland low-growing sagebrush generally on shallow, rocky soils - selected middleground view from historic trail.
UNIT LOCATION (MPS):	517.1-518.0, 518.1-518.2, 518.3-518.5
MITIGATION OBJECTIVES:	Retain natural landscape appearance by minimizing long-term visual contrast through reestablishment of vegetation and site conditions suitable for sagebrush growth.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100')
ROW PREPARATION:	Salvage sagebrush with topsoil.
TOPSOIL SALVAGE: Depth:	Lymanson 0-6" Conpeak 0-6" Irigul 0-6" Midelight 0-6"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to stockpiled Conpeak soils.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rate. Add fringed sagewort at 10 PLS/sq.ft. and big sagebrush or black sagebrush depending on dominant sagebrush at 10 PLS/sq.ft.
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Standard procedures.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	2C
UNIT DESCRIPTION:	Upland low-growing sagebrush generally on shallow, rocky soils - foreground views from Highway 28.
UNIT LOCATION (MPS):	527.9-528.6, 531.3-531.9
MITIGATION OBJECTIVES:	Reduce color and line contrast with adjacent landscapes through revegetation to simulate short-term highway ROW vegetation while establishing conditions to allow sagebrush reinvasion for long-term visual mitigation.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100'). Deflect pipeline alignment southeast of Oregon Buttes Road to restrict line of sight from Road and Highway 28.
ROW PREPARATION:	Salvage sagebrush with topsoil.
TOPSOIL SALVAGE: Depth:	Hoodle 4-10" Gelkie 5-12" Blackhall 4-10" Carmody 4-10"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to Hoodle, Blackhall and Carmody soils to prevent wind erosion. Water working side of ROW to reduce dust and wind erosion.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rate. Add fringed sagewort to mix at 10 PLS/sq.ft.
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Fence perimeter of planted area with three or four-strand wire fence where right-of-way is immediately adjacent to highway fence. Remove fence after revegetation is successful.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	2D
UNIT DESCRIPTION:	Upland low-growing sagebrush generally on shallow, rocky soils - dispersed recreation views.
UNIT LOCATION (MPS):	511.0-512.1, 512.4-514.0, 514.5-514.9, 516.2-516.4, 516.6-517.1, 518.5-518.7, 518.8-519.9, 520.0-520.4, 520.5-520.8, 526.9-527.9
MITIGATION OBJECTIVES:	Reduce long-term visual contrast through revegetation and reestablishing site conditions suitable for sagebrush reinvasion.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100')
ROW PREPARATION:	Salvage sagebrush with topsoil. Feather ROW edges.
TOPSOIL SALVAGE: Depth:	Handran 0-6" Midelight 0-6" Irigul 0-6" Rock outcrop 0" Hoodle 4-10" Gelkie 5-12" Lymanson 0-6" Conpeak 0-6" Uhl 5-12"
TOPSOIL PROTECTION:	Apply tackifier at 80 lbs/acre to stockpiles of Hoodle and Conpeak soils.
DITCHING:	Rip rock wherever possible to minimize blasting effects.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rates. Add fringed sagewort to mix at 10 PLS/sq.ft.
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Standard procedures.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	3D
UNIT DESCRIPTION:	Steep approach slopes to drainages with shallow, rocky soils and rock outcrops - dispersed recreation views.
UNIT LOCATION (MPS):	514.0-514.2, 514.4-514.5, 519.9-520.0
MITIGATION OBJECTIVES:	Reduce long-term visual contrast through revegetation and reestablishing site conditions suitable for sagebrush reinvasion. Emphasize erosion control.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100') unless additional working space required at top to temporarily store graded material.
ROW PREPARATION:	Salvage sagebrush with topsoil.
TOPSOIL SALVAGE: Depth:	Irigul 0-6" Midelight 0-6" Rock outcrop 0"
TOPSOIL PROTECTION:	Respread topsoil immediately prior to seeding and implementation of erosion control measures.
DITCHING:	Unit may require blasting.
BACKFILL:	Install trench breakers (ditch plugs) as required. Replace cuts unless otherwise directed by geotechnical engineer. Edges of any remaining cuts should be rounded.
REVEGETATION	
SEED MIX AND RATE:	Upland mix (Table 5-1) at standard rate. Add fringed sagewort to mix at 10 PLS/sq.ft.
PLANTING:	None
MULCHING:	Hydromulch at 2 tons/acre with tackifier at 40 lb/acre.
PROTECTION:	Install slope breakers (water bars) with a spacing of not less than 75 feet on slopes greater than 25 percent. On slopes steeper than 40 percent install erosion control netting as per manufacturers recommended installation procedures. Delete hydromulch if netting is used.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	4D
UNIT DESCRIPTION:	Sparsely vegetated badlands on exposed parent material - dispersed recreation views.
UNIT LOCATION (MPS):	533.2-533.4
MITIGATION OBJECTIVES:	Minimize changes in color and form by grading to match undisturbed landforms.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100')
ROW PREPARATION:	Minimize grading to retain color pattern and drainage network.
TOPSOIL SALVAGE:	Badlands mapping unit - 0"
Depth:	
TOPSOIL PROTECTION:	None salvaged
DITCHING:	Minimize blasting by using ripper or pneumatic rock chisel on sandstone.
REVEGETATION	
SEED MIX AND RATE:	None desirable, site is essentially barren.
PLANTING:	None
MULCHING:	None
PROTECTION:	Decrease spacing of slope breakers (water bars) to:

Slope (%)	Spacing (ft)
5-15	100
16-30	75
>30	50

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	5D
UNIT DESCRIPTION:	Woody riparian/wetland (willow) on deep soils of major drainages - dispersed recreation views.
UNIT LOCATION (MPS):	514.2-514.4, 516.4-516.6, 522.1-522.2, 526.8-526.9
MITIGATION OBJECTIVES:	Restore earthforms and minimize vegetation disturbance to reduce long-term contrast in form, color and texture. Reestablish vegetation structure and protect water quality.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75') unless additional space required for stream crossing.
ROW PREPARATION:	Hand salvage brush for respreading on ROW.
TOPSOIL SALVAGE: Depth:	Venapass 3-10" Silas 3-10" Placer piles 0"
TOPSOIL PROTECTION:	Stockpile away from flood-prone areas.
WATER CROSSINGS:	See Construction Column on Table 6-1.
REVEGETATION	
SEED MIX AND RATE:	Bottomland mix (Table 5-2).
PLANTING:	Hand plant willows from cuttings.
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre or straw mulch at 1 ton/acre and crimp.
PROTECTION:	The Stream and Wetland Construction and Mitigation procedures contained in Appendix C-3 of the DEIS will be implemented. These mitigation procedures may be modified through comments on the DEIS or upon approval by the Commission. In addition, site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this report.
WATER CROSSINGS:	See Rehabilitation Column on Table 6-1.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	6A
UNIT DESCRIPTION:	Herbaceous riparian/wetland on moderately deep to deep soils of swales and floodplains - foreground view from historic trails.
UNIT LOCATION (MPS):	515.1-515.3, 515.7-515.9
MITIGATION OBJECTIVES:	Restore earthforms and minimize disturbance to reduce long-term contrast in form, color and texture. Reestablish vegetation structure and protect water quality.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75') unless additional space required for stream crossing.
ROW PREPARATION:	Salvage vegetation with topsoil stripping.
TOPSOIL SALVAGE: Depth:	Silas 3-10" Uhl 5-12" Gelkie 5-12"
TOPSOIL PROTECTION:	Stockpile away from flood-prone areas. Tackify stockpiles at 80 lbs/acre.
WATER CROSSINGS:	See Construction Column on Table 6-1.
REVEGETATION	
SEED MIX AND RATE:	Bottomland mix (Table 5-2)
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Fence perimeter of planted area with three or four-strand wire fence. Remove fence after revegetation is successful. Stream and Wetland Construction and Mitigation procedures contained in Appendix C-3 of the DEIS will be implemented. These mitigation procedures may be modified through comments on the DEIS or upon approval by the Commission. In addition, site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this report.
WATER CROSSINGS:	See Rehabilitation Column on Table 6-1.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	6B
UNIT DESCRIPTION:	Herbaceous riparian/wetland on moderately deep to deep soils of swales and floodplains - selected middleground views from historic trails.
UNIT LOCATION (MPS):	518.0-518.1, 518.2-518.3
MITIGATION OBJECTIVES:	Restore earthforms and minimize disturbance to reduce long-term contrast in form, color and texture. Reestablish vegetation structure and protect water quality.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75') unless additional space required for stream crossing.
ROW PREPARATION:	Salvage vegetation with topsoil stripping.
TOPSOIL SALVAGE: Depth:	Silas 3-10"
TOPSOIL PROTECTION:	Stockpile away from flood prone areas. Tackify stockpiles at 80 lbs/acre.
WATER CROSSINGS:	See Construction Column on Table 6-1.
REVEGETATION	
SEED MIX AND RATE:	Bottomland mix (Table 5-2)
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Stream and Wetland Construction and Mitigation procedures contained in Appendix C-3 of the DEIS will be implemented. These mitigation procedures may be modified through comments on the DEIS or upon approval by the Commission. In addition, site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this report.
WATER CROSSINGS:	See Rehabilitation Column on Table 6-1.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	6C
UNIT DESCRIPTION:	Herbaceous riparian/wetland on moderately deep to deep soils of swales and floodplains - foreground views from Highway 28.
UNIT LOCATION (MPS):	532.4-532.5
MITIGATION OBJECTIVES:	Restore earthforms and minimize disturbance to reduce long-term contrast in form, color and texture. Reestablish vegetation structure and protect water quality.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75') unless additional space required for stream crossing.
ROW PREPARATION:	Salvage vegetation with topsoil stripping.
TOPSOIL SALVAGE: Depth:	Havre 6-12" Absher 0-6" Forelle 6-12"
TOPSOIL PROTECTION:	Stockpile away from flood-prone areas.
WATER CROSSINGS:	See Construction Column on Table 6-1.
REVEGETATION	
SEED MIX AND RATE:	Bottomland mix (Table 5-2)
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Stream and Wetland Construction and Mitigation procedures contained in Appendix C-3 of the DEIS will be implemented. These mitigation procedures may be modified through comments on the DEIS or upon approval by the Commission. In addition, site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this report.
WATER CROSSINGS:	See Rehabilitation Column on Table 6-1.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	6D
UNIT DESCRIPTION:	Herbaceous riparian/wetland on moderately deep to deep soils of swales and floodplains - dispersed recreation views.
UNIT LOCATION (MPS):	512.1-512.4, 514.9-515.0, 515.9-516.2, 518.7-518.8, 520.4-520.5, 521.6-521.7, 525.5-525.6, 526.4-526.8
MITIGATION OBJECTIVES:	Restore earthforms and minimize disturbance to reduce long-term contrast in form, color and texture. Reestablish vegetation structure and protect water quality.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Narrow (75') unless additional space required for stream crossing.
ROW PREPARATION:	Salvage vegetation with topsoil.
TOPSOIL SALVAGE: Depth:	Silas 3-10" Venapass 3-10" Uhl 5-12" Absher 0-6"
TOPSOIL PROTECTION:	Stockpile away from flood-prone areas.
WATER CROSSINGS:	See Construction Column on Table 6-1.
REVEGETATION	
SEED MIX AND RATE:	Bottomland mix (Table 5-2)
PLANTING:	None
MULCHING:	Hydromulch at 1 ton/acre with tackifier at 40 lb/acre.
PROTECTION:	Stream and Wetland Construction and Mitigation procedures contained in Appendix C-3 of the DEIS will be implemented. These mitigation procedures may be modified through comments on the DEIS or upon approval by the Commission. In addition, site-specific revegetation plans for all riparian areas will be filed with the Commission for review and approval of the Director of OPPR prior to construction. These site-specific plans will likely modify specifications contained in this report.
WATER CROSSINGS:	See Rehabilitation Column on Table 6-1.

REHABILITATION UNIT SPECIFICATIONS	
REHABILITATION UNIT CODE:	X
UNIT DESCRIPTION:	Crossings of Highway 28, the Oregon-Mormon Trail, and trail segments eligible for or potentially eligible for the National Register of Historic Places.
UNIT LOCATION (MPS):	515.5, 521.2, 529.0, 530.0, 538.6.
MITIGATION OBJECTIVES:	Retain historic appearance of the landscape by boring.
GENERAL MITIGATION MEASURES:	General measures discussed in Section 5.0 are applicable unless modified by these specifications.
CONSTRUCTION	
ROW WIDTH:	Standard (100') plus additional work space adjacent to the crossing to accommodate a large bell hole and extra spoil.
ROW PREPARATION:	As per appropriate Rehabilitation Unit.
TOPSOIL SALVAGE:	As per appropriate Rehabilitation Unit.
Depth:	As per appropriate Rehabilitation Unit.
TOPSOIL PROTECTION:	As per appropriate Rehabilitation Unit.
DITCHING:	There is no trench. Rather a hole is augered under the road/trail and the pipe pulled into position. NB. Not feasible in rocky areas. In these cases, an alternative approved open cut method would be used.
REVEGETATION	
SEED MIX AND RATE:	As per appropriate Rehabilitation Unit.
PLANTING:	As per appropriate Rehabilitation Unit.
MULCHING:	As per appropriate Rehabilitation Unit.
PROTECTION:	As per appropriate Rehabilitation Unit.
ADDITIONAL PRACTICES:	As per appropriate Rehabilitation Unit.

TABLE 6-1
PERENNIAL STREAM CROSSINGS - MP 511.0 - 540.8

DESCRIPTION							CONSTRUCTION[2]		REHABILITATION	COMMENTS
Stream	MP	Land Owner[1]	Cold Water Fish	Over-hanging Banks	Willow Cover	Bed & Bank	Vehicle Crossing Method	Pipeline Installation[3,4]		
Rock Creek	514.3	Private	Yes	No	Yes (west bank) No (east bank)	Coarse gravel	Use existing ford	Dry	1. Plant willows on west bank.	1. Tailing piles may be left graded out based on discussions with landowner and appropriate agencies. 2. Contaminated sediments will be tested.
Willow Creek	516.4	Private	Yes	Yes	Yes	Coarse-fine	Temporary bridge or culvert	Dry	1. Cribwall banks 2. Interplant willows	1. Contaminated sediments will be tested.
Unnamed Creek	520.1	Private	No	No	No	Coarse-fine	Swamp Mat	Conventional		
Slaughterhouse Gulch	520.5	Private	No	No	No	Coarse-fine	Swamp Mat	Conventional		
Pine Creek	522.1	Private	Yes	No	Yes	Coarse-fine	Temporary bridge or culvert	Dry	1. Plant willows	
Fish Creek	525.6	State	Yes	No	No	Coarse-fine	Temporary bridge or culvert	Dry		
Sweetwater River	526.8	Private	Yes	Yes	Yes	Fine	Shoofly or temporary bridge	Dam and Pump	1. Cribwall banks 2. Interplant willows	
West Pacific Creek	532.5	Private	No	No	No	Fine	Swamp Mat	Conventional		1. May be saline. 2. Creek was dry in February 1991.

1. Adjacent land
2. All crossings will be timed to meet appropriate windows.
3. Dry crossing means dam and pump around or dam and flume. Conventional crossing refers to ditching in the wet.
4. In-stream excavation, lowering-in and backfill will be completed within 48 hours, unless blasting is required.

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7.0 REFERENCES

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APPENDIX A

LITERATURE REVIEW - SAGEBRUSH REESTABLISHMENT

CONTENTS

INTRODUCTION

The dominant vegetation of the South Pass area consists of sagebrush-grassland communities, dissected by ephemeral and perennial stream drainages. Big sagebrush (Artemisia tridentata) forms extensive stands on upland sites, with willow-dominated riparian communities occupying floodplains of perennial streams. Wet meadows, dominated by sedges and grasses, typically grow along the bottoms of ephemeral stream drainages.

The potential use of sagebrush to mitigate long-term visual impacts of the pipeline in the area has been investigated through a review of scientific literature, conversations with reclamation specialists, and field observations of ROWs and reclamation projects in Montana and Wyoming. Factors which influence germination, growth and survival of sagebrush seeded or planted on disturbed lands are discussed in the following text.

Most of the reviewed studies of sagebrush reestablishment pertain to surface mining, and may not be applicable to pipeline right-of-way revegetation. The narrow configuration of the pipeline disturbance is within seed-fall distance of adjacent sagebrush plants and sagebrush can be expected to naturally reinvade. Techniques cited in this Appendix were discussed with representatives of the BLM (February 5, 1991), and rehabilitation unit recommendations (Section 6.0) reflect these discussions.

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REVEGETATION

Seed source

Locally adapted seed has been recommended to enhance sagebrush establishment (Monsen and Meyer 1990, Meyer and Monsen in press). Sagebrush ecotypes from cold-winter habitats germinate more slowly and exhibit more dormancy. Habitat-correlated variation in germination appears to be of adaptive significance (Meyer and Monsen, in press). Strong dormancy may have evolved to prevent premature germination due to autumn precipitation or snowpack.

Big sagebrush typically flowers in late summer or early fall, and seeds reach maturity in late fall. Flowering and seed production are variable, however, and may not occur annually. Also, the timing of seed maturation at various sites may differ considerably from year to year. Seed quality and quantity varies widely, depending on environmental factors such as temperature and moisture availability (Shaw and Monsen in press).

Under natural conditions, seed is dispersed within about 8 weeks of fruit maturity. Some seed is deposited on the soil surface or on snow, depending on temperature and precipitation during a given year. Fruits can be expected to mature in October or November, and seed disperse during November and December in the study area.

Because sagebrush seed is very small and has limited energy reserves, seeds usually remain viable for less than one year (Ed DePuit, pers. comm. 1990; Young and Evans 1989). Furthermore, only about 15 to 20 percent of pure live seed survives collection and cleaning (Richard Dunne, pers. comm. 1990).

Methods of seed collection, cleaning and storage are discussed in detail by Shaw and Monsen (in press). According to these researchers, seedlots of most sagebrush taxa retain viability under warehouse storage conditions for 2 to 4 years, but use of fresh seed is preferable. They also reported that little research has been conducted to determine optimal storage temperature and moisture content for retaining seed viability.

Seedbed preparation

Various studies (Monsen and Meyer 1990, Haferkamp et al. 1987, and Monsen and Richardson 1984) have found that a firmly compacted seedbed yields the highest rates of sagebrush seedling emergence and survival. Of emerged seedlings, approximately 35 percent survived the first summer and 21 percent survived the following winter. Since big sagebrush seeds are small (approximately 2 million seeds per pound of pure seed), they emerge best from surface sowing. When seeded beneath the soil surface, big sagebrush expends limited energy reserves through shoot growth.

Seeding method

Broadcast or other methods of seeding which do not deeply bury the seed are most successful (Monsen and Meyer 1990). Shaw and Monsen (in press) reported that broadcast seeding offers the greatest potential for reseeding large acreages. They also found that emergence and seedling establishment from broadcast seedings are highly variable due to the range of microsite conditions and potential desiccation of seeds near the soil surface.

In Wyoming, various researchers have confirmed that broadcast seeding of big sagebrush has a higher success rate than drill seeding. For example, at the Black Thunder Coal Mine near Gillette, big sagebrush seed was broadcast at a high rate during spring 1990. Seedling emergence was successful, but there was significant seedling mortality from wildlife grazing. Surviving seedlings were 1 to 2 inches tall by September 1990 (Richard Dunne, pers. comm. 1990).

Reclamation studies at the Glenrock Mine in Wyoming found that, using a high broadcast rate (0.5 to 1.5 pounds of pure live seed per acre), seeding of big sagebrush was highly successful (Ed DePuit, pers. comm. 1990). Establishment of big sagebrush at the Glenrock Mine was dependent on preparation of a firm seedbed, and reduction of perennial grass competition.

Natural invasion of a disturbed highway ROW by big sagebrush was observed near Jackson Hole, Wyoming, (Ed DePuit pers. comm. 1990). One year after disturbance, big sagebrush density averaged greater than 200 seedlings per square meter. Natural reinvasion occurs through wind deposition of seed on the soil surface. Broadcast seeding simulates natural seed dissemination.

Johnson and Fisser (1990) conducted a long-term monitoring study of revegetation success on the Colorado Interstate Gas pipeline ROW in the Big Horn Basin of Wyoming. They monitored 17 plots for seedling germination and establishment following pipeline construction in 1972, and assessed long-term survival in 1989. Over the 17-year study period, successful long-term revegetation with big sagebrush was observed on 2 of the 17 plots. Plots where sagebrush was successfully established from seed were on light, well-drained soils. Seeding was done with a rangeland drill, rather than broadcast, which may have contributed to the relatively low success rate. Johnson and Fisser (1990) observed that the young sagebrush were subjected to heavy grazing, but did not distinguish between livestock and wildlife grazing.

Herbaceous competition

Since sagebrush seedlings do not compete well with high densities of grasses and forbs (Richardson et al. 1986, Allen 1988), it may be best not to seed grasses and sagebrush concurrently, or else seed herbaceous species at very low rates. Shaw and Monsen (in press) described seeding methods using both a rangeland seed drill and a cultipacker, which allowed sagebrush, grasses, and forbs to be seeded in alternate rows. They also discussed how interseeding[1] has been used to establish big sagebrush in stands of crested wheatgrass, a strong competitor with big sagebrush and other shrubs. A seeding rate of 0.16 pound of pure live seed per acre provided high initial seedling establishment.

Sagebrush seedling establishment and vigor are jeopardized by seeding or colonization of herbaceous species, as well as invasion of weedy species. The potential for weed invasion would be reduced by selecting quality seed sources.

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[1] Interseeding is accomplished by disking, plowing, or otherwise removing strips of vegetation, and seeding the strips with sagebrush. Strips approximately 30 inches wide are required, to reduce competition with adjacent vegetation.

Application of nitrogen fertilizer often promotes the proliferation of invader species at the expense of desirable plants. Many invader species respond vigorously to nitrogen fertilization, and outcompete desirable plants for soil moisture, nutrients and sunlight. Nitrogen fertilization would probably not be necessary where soils are stockpiled for short time periods.

Climatic parameters

Reclamation monitoring indicates that revegetation success is largely dependent on weather. Snow accumulation and melting rate as well as spring precipitation are strong determinants of germination and growth. Snow accumulation on reclaimed areas can be enhanced with snowfence, straw bales, grass strips, or other means to increase sagebrush survival by increasing soil moisture during the critical period of emergence.

Planting patterns also influence growth of sagebrush seedlings. Near Kemmerer, Wyoming, Carpenter and West (1989) compared growth of regularly dispersed versus clumped transplanted mountain big sagebrush. They postulated that regularly dispersed plants showed a growth advantage over clumped plants due to reduced competition for soil moisture and greater deposition of blowing snow.

Soil moisture in reclaimed areas can also be enhanced by gouging small basins and seeding them. These depressions trap blowing snow and concentrate precipitation.

Tublings and transplanting

On sites where prompt revegetation is critical, the use of greenhouse-grown stock or transplanting of wild plants is an important option; however, costs per acre are greater than direct seeding. According to Shaw and Monsen (in press), sagebrush seedlings are easily grown in greenhouses using relatively standard techniques. Seeds are sown in variously sized tubes or containers, and require about 4 months' cropping time. Acceptable seedlings have 6 to 10-inch shoot and root systems and frequently are inoculated with vesicular-arbuscular mycorrhizae prior to outplanting.

Seedlings grown in a greenhouse must be hardened prior to outplanting to acclimate the plants to site conditions. About 3 to 6 weeks is required for the hardening process.

At the Pittsburgh-Midway Coal Company near Kemmerer, Wyoming, experimental shrub plantings were initiated in 1981. Approximately 150,000 tublings were hand-planted, watered once during the initial planting, and monitored for 9 years. No fertilizer was applied, no further irrigation was used, and no cover crop was planted. Some sites had no topsoil, while some had direct placement of topsoil. Tublings, 6 to 8 inches tall, were planted in March and April. Although the area was fenced during the first growing season to reduce grazing by large animals, some plantings were damaged by rabbits. Sagebrush survival after 9 years is estimated at 70 percent (Neil West, pers. comm. 1990). Success of planted tublings was considered to be very good at the Pittsburgh-Midway Coal Company (James MacMahon, pers. comm. 1990). On additional reclaimed sites within the mine acreage (but outside of MacMahon's tubling sites), most sagebrush plants apparently originated from colonization from adjacent, undisturbed communities (D. Lamborne, pers. comm. 1990).

Sagebrush transplanting is frequently quite successful and advantageous when rapid reestablishment is necessary (Shaw and Monsen, in press). Mature sagebrush have been successfully transplanted near Hanna, Wyoming (elevation about 6500 feet) during fall 1984 (Ron Schreibeis, pers. comm. 1990). Groups of sagebrush were removed with a front-end loader salvaging roots two to three feet deep. The transplants were placed in a prepared basin slightly oversized to enhance water accumulation.

Scrapers have also been used to successfully transplant sagebrush at the Bridger Mine salvaging roots 1.5 to 2 feet deep (Fred Parady, pers. comm. 1990).

Common transplanting methods include using a tree-spade, front-end loader (with specially adapted bucket), or by hand (using a shovel on smaller plants). Scrapers are rarely used and this type of equipment would not be available on the ROW.

Mulching

Mulching is usually considered valuable for revegetation because mulch reduces erosion, enhances soil moisture, improves infiltration, modifies soil temperature extremes, holds seed and seedlings in place and provides an energy source for soil microbiota (Vogel 1987). The most commonly used mulches are straw, hay and cellulose fiber (hydromulch). Unfortunately, straw and hay mulch frequently contain seed, and the volunteer plants growing from the mulch compete with seeded species, reducing their initial establishment (Western Technology and Engineering, unpublished data). Since herbaceous competition with seeded or planted shrubs is undesirable in the South Pass area, a mulch containing no seed or seed of less competitive species would be preferred.

SUMMARY AND CONCLUSIONS

Direct seeding, planting tublings and transplanting have been shown to be effective methods to reestablish sagebrush on disturbed lands if proper techniques are implemented.

Discussions with BLM indicated, however, that sagebrush will naturally reinvade and provide long-term visual mitigation on the narrow pipeline right-of-way if proper site conditions are reestablished and if highly competitive introduced species, such as crested wheatgrass, are not seeded. Even though long-term visual mitigation can be achieved without seeding or planting sagebrush, Altamont has proposed to plant tublings in the most visually sensitive areas (visual sensitivity category A) and seed sagebrush in moderately sensitive areas (visual sensitivity category B) to reduce time frames for sagebrush reestablishment (see Section 6.0).

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Appendix C. Water Quality and Fisheries

Appendix C-1. PGT: Water Quality and Fisheries of Perennial Water Bodies Crossed

Appendix C-1

WATER QUALITY AND FISHERIES OF PERENNIAL WATER BODIES CROSSED BY THE PGT PROJECT

Location	Milepost	Approximate Channel Width (ft)	State Water Quality Classification [a/b]	Fish Species Present [c]
IDAHO				
Moyie River 1	0.3	100	Special resource	RT, CT, NG, BiT
Moyie River 2	1.0	125	Special resource	RT, CT, NG, BiT
Moyie River 3	5.0	200	Special resource	RT, CT, NG, BiT
Moyie River 4	5.8	125	Special resource	RT, CT, NG, BiT
Bussard Creek	7.3	25	Special resource	RT, CT, NG
Moyie River 5	7.8	125	Special resource	RT, CT, NG, BiT
Snyder Creek	9.6	25	Special resource	RT, CT, NG
Moyie River 6	10.0	125	Special resource	RT, CT, NG, BiT
Moyie River 7	10.7	50	Special resource	RT, CT, NG, BiT
Moyie River 8	13.6	100	Special resource	RT, CT, NG, BiT
Cocolalla Creek	77.3	125	Special resource	BT, BnT, NG
E. Greenacres Main Ditch	101.5	25	NC	Unknown
WASHINGTON				
Union Flat Creek	179.1	50	NC	NG
Willow Creek	184.2	25	A	NG
Willow Creek (branch)	186.8	25	NC	Unknown
Willow Creek (branch)	187.5	25	NC	Unknown
Walla Walla River	254.2	125	B	CS, ST, RT, LB, SB, BC, NG
OREGON				
Willow Creek	318.6	50	NC	RT, NG
John Day River	10.0 JDV	150	Suspected WQL	CS, ST, SB, T, NG

Appendix C-1
(continued)
WATER QUALITY AND FISHERIES OF PERENNIAL WATER BODIES CROSSED
BY THE PGT PROJECT

Location	Milepost	Approximate Channel Width (ft)	State Water Quality Classification [a/b]	Fish Species Present [c]
Trout Creek	397.4	50	NC	ST, RT, NG
Crooked River	432.7	100	Suspected WQL	RT, MW, NG
Miller Creek	524.7	25	NC	Unknown
Scott Creek	540.6	50	NC	None
Sand Creek	544.1	25	NC	RT, NG
Williamson River	552.2	250	NC	NG
Wildhorse Creek	590.3	25	NC	NG
Buck Creek	597.7	25	NC	Unknown
Lost River	598.5	125	Suspected WQL	LB, SP, YP, BC, BB, NG
Wright Creek (1)	599.3	25	NC	Unknown
Wright Creek (2)	599.8	25	NC	Unknown
High Line Canal	610.1	25	NC	Unknown
Low Line Canal	611.0	25	NC	Unknown
D Canal	612.4	25	NC	Unknown

Appendix C-1. (continued)

Note: JDV = mileposts on the John Day River Variation, a 20-mile-long route variation that would depart from the existing route at MP 350.6 and rejoin in at MP 367.6.

a/ Special resource = special resource designation
NC = not classified
Suspected WQL = suspected water quality limited designation
A,B,C,U = letter classification

b/ Descriptions of the various state water quality classifications are shown below.

Idaho:

Special Resource Waters. Waters of the state may be designated as special resource waters. Designation as a special resource water recognizes at least one of the following characteristics:

- The water is of outstandingly high quality, exceeding both the criteria for primary contact recreation and cold water biota; or
- the water is of unique ecological significance; or
- the water possesses outstanding recreational or aesthetic qualities; or
- intensive protection of the quality of the water is in the paramount interest of the people of Idaho; or
- the water is part of the National Wild and Scenic River system, is within a state or national park or wildlife refuge, and is of prime or major importance to the park or refuge.
- Intensive protection of the quality of the water is necessary to maintain an existing, but jeopardized beneficial use

Reference: Idaho Water Quality Standards and Wastewater Treatment Requirements, Idaho Department of Health and Welfare, Division of Environment, January 1985

Washington:

Washington places all surface waters into the following classifications:

Class AA - extraordinary	(freshwater and marine)
Class A - excellent	(freshwater and marine)
Class B - good	(freshwater and marine)
Class C - fair	(marine)
Lake Class	(freshwater)

The following is a description of the freshwater classifications:

Class AA:

- All surface waters lying within national parks, national forests, and/or wilderness areas are classified Class AA or Lake Class
- All lakes and their feeder streams are classified Lake Class and Class AA, respectively.
- All unclassified surface waters that are tributaries to Class AA waters are classified Class AA.
- All other unclassified surface waters are classified Class A.

Appendix C-1. (continued)

Class A:

General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.
Characteristic uses. Characteristic uses shall include, but not be limited to the following:

- o Water supply (domestic, industrial, agricultural)
- o Stock watering
- o Fish and shellfish: salmonid migration, rearing, spawning, and harvesting; other fish migration, rearing, spawning, and harvesting; clam, oyster, and mussel rearing, spawning, and harvesting; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.
- o Wildlife habitat
- o Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment)
- o commerce and navigation

Class B:

General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.
Characteristic uses. Characteristic uses shall include, but not be limited to the following:

- o Water supply (industrial and agricultural)
- o Stock watering
- o Fish and shellfish: salmonid migration, rearing, and harvesting; other fish migration, rearing, spawning, and harvesting; clam, oyster, and mussel rearing and spawning; crustaceans, and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting
- o Wildlife habitat
- o Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment)

Class C:

General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.
Characteristic uses. Characteristic uses shall include, but not be limited to the following:

- o Water supply (industrial).
- o Fish (salmonid and other fish migration)
- o Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment)
- o Commerce and navigation
- o Fish and shellfish: salmonid migration, rearing, spawning, and harvesting; other fish migration, rearing, spawning, and harvesting; clam and mussel rearing, spawning, and harvesting; crayfish rearing, spawning, and harvesting
- o Wildlife habitat
- o Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment)

Reference: Statewide Water Quality Assessment, 305(b) report, Washington State Department of Ecology, June 1988.

Appendix C-1. (continued)

Oregon:

Oregon does not have a system for specifically classifying surface waters. However, the state is in the process of assessing ambient water quality data to identify water quality limited streams in the state. The following approach is used to identify such streams:

Available monitoring data are assessed relative to standards and criteria established to support identified beneficial uses. Emphasis is given to instream uses and irrigation (untreated water for out-of-stream use). Other out-of-stream uses such as municipal and industrial water supply assume some level of treatment is required. Ambient monitoring parametric coverage is not usually sufficient to assess water quality for drinking purposes. Uses assessed include:

- Fishery: cold water (survival, spawning, and rearing); warm water (survival, spawning, and rearing)
- Water contact recreation
- Aesthetics
- Irrigation
- Shellfish
- Animal watering

Data assessment makes use of appropriate water quality standards (OAR 340-41), criteria (U.S. EPA Gold Book) and 305(b) guidance. Specific guidelines and numerical criteria for each use are listed in the 1988 305(b) report.

Reference: Water Quality Status Assessment Report, 305(b) report, Oregon Department of Environmental Quality, 1988.

[e] Species codes:

BB	=	brown bullhead	KS	=	Klamath largescale sucker
BC	=	black crappie	LB	=	largemouth bass
BG	=	bluegill	MW	=	mountain whitefish
BiT	=	bull trout	NG	=	native nongame species
Bnt	=	brown trout	NP	=	northern pike
BT	=	brook trout	RT	=	rainbow trout
CC	=	channel catfish	SB	=	smallmouth bass
CS	=	chinook salmon	SP	=	Sacramento perch
CT	=	cutthroat trout	ST	=	steelhead trout
K	=	kokanee	T	=	trout
			YP	=	yellow perch

Appendix C-2. Altamont: Water Quality and Fisheries of Perennial Water Bodies Crossed

Appendix C-2

WATER QUALITY AND FISHERIES OF PERENNIAL WATER BODIES CROSSED BY THE ALTAMONT PROJECT

Location	Mile post	Approximate Channel Width (ft)	State Water Quality Classification [a]	State Fishery Classification [b]	Fish Species Present [c]
MONTANA					
Milk River	8.3	250	B-3	IV	W, S, NP, YP, NG
Missouri River	69.0	750	B-3	I	W, S, CC, NG, P, PS, B, SS
Sage Creek	133.3	25	C-3		
Louse Creek	139.7	50			None
Judith River	145.1	125	B-1	IV	RT, BnT, SB, NG
Hauck Coulee	148.9	50			None
Big Coulee Creek	154.2	25			None
Ross Fork Creek	154.8	50			RT, BnT, NG
East Buffalo Creek	156.8	25			None
Dry Creek	159.0	25			None
Meadow Creek	164.0	25			
Ross Fork Creek	165.8	25			RT, BnT, NG
East Fork Roberts Creek	171.9	25			None
Musselshell River	195.5	75	C-3	III	BnT, LB, MWF, SB, S, CC, NG
Fish Creek	204.2	25			RT, BT, NG
Middle Creek	225.3	25			
Cedar Creek	227.0	25			
Struck Creek	234.3	25			
Toll Creek	235.4	25			
Greenwood Creek	235.9	25			

Appendix C-2
(continued)
WATER QUALITY AND FISHERIES OF PERENNIAL WATER BODIES CROSSED BY THE ALTAMONT PROJECT

Location	Mile post	Approximate Channel Width (ft)	State Water Quality Classification [a]	State Fishery Classification [b]	Fish Species Present [c]
North Fork Valley Creek	245.4	25			
North Fork Valley Creek	248.3	25			
Valley Creek	250.7	25			RT, BnT
Swamp Creek	252.0	25			
Valley Creek	253.5	50			RT, BnT
Yellowstone River [d]	257.4	750	B-1	II	RT, BnT, L, MWF, NG
Rock Creek	265.0	25		IV	RT, BnT, L, BT, MWF, NG
Unnamed Stream	266.5	25			RT, BnT
Clark's Fork, Yellowstone River	268.1	125	B-2	III	L, BT, MWF, NG
Five Mile Creek	268.2	50			None
Five Mile Creek	268.7	25			None
Five Mile Creek	276.5	25			None
South Fork, Bluewater Creek	285	25			RT, BnT, NG
Sage Creek	289.1	25			RT, BT, CT, NG
Piney Creek	298.5	25			BT
WYOMING					
Shoshone River	319.5	200	II	III	RT, BnT, CT, CC, NG
Dry Creek	347.6	25	II		NG
Greybull River	352.2	200	II		NG
Sixmile Creek	373.7	25			None
Bighorn River	374.2	125	II	IV	W, S, CC, NG

Appendix C-2
(continued)
WATER QUALITY AND FISHERIES OF PERENNIAL WATER BODIES CROSSED BY THE ALTAMONT PROJECT

Location	Mile post	Approximate Channel Width (ft)	State Water Quality Classification [a]	State Fishery Classification [b]	Fish Species Present [c]
West Kirby Creek	417.8	25	II	IV	BT, NG
Unnamed Stream	421.5	25			
West Bridger Creek	423.9	25	II	IV	BT, NG
Beaver Creek	481.0	50	II		NG
Twin Creek	495.5	25		IV	RT, BnT, BT, NG
Twin Creek	503.8	25		IV	RT, BnT, BT, NG
Stambaugh Creek	505.6	25			BT, NG
Beaver Creek	508.2	25		IV	BnT, BT, NG
Little Beaver Creek	510.9	25			BT, NG
Rock Creek	514.3	25			RT, BnT, BT, NG
Willow Creek	516.4	25		III	BT, CT, NG
Unnamed Stream	520.1	25			
Slaughterhouse Gulch	520.5	25		IV	None
Pine Creek	522.1	25		IV	BT, NG
Fish Creek	525.6	25			BT, NG
Sweetwater River	526.8	50		III	RT, BnT, NG
West Pacific Creek	532.1	25			None
Little Sandy Creek	558.6	25			CC, NG
Big Sandy River	561.5	50	II	IV	BnT, CC, NG, F, R
Green River	593.5	200	II	II	RT, BnT, CT, K, SB, W, NG
Hams Fork	613.3	50	II	IV	CC, NG

[a] Montana Water Use Classification (Montana Department of Health and Environmental Sciences 1988):

B-1: Suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

B-2: Suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

B-3: Suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of nonsalmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply.

C-3: Suitable for bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers. The quality of these waters is naturally marginal for drinking, culinary, and food processing purposes; and agricultural and industrial water supply.

Note: Degradation that will impact established beneficial uses will not be allowed. The Montana water use classification ranges from A-closed to C-3 (Class A waters are the highest quality). No Class A waters would be crossed by the Altamont project.

Wyoming Water Use Classification (Wyoming Department of Environmental Quality 1989):

Class II: Those surface waters, other than those classified Class I, that are determined by the Wyoming Game and Fish Department to be presently supporting game fish or having the hydrologic and natural water quality potential to support game fish.

Class IV: Those surface waters, other than those classified Class I, which are determined by the Wyoming Game and fish Department to be presently supporting game fish or have the hydrologic and natural water quality potential to support game fish.

Note: No Class I or III waters would be crossed by the Altamont project.

[b] Montana Stream Fishery Classification (Montana Department of Fish, Wildlife and Parks 1980):

Class I streams provide exceptional habitat for outstanding populations of species of high interest. Class II streams provide moderate habitat for highly valued species and exceptional habitat for less highly valued species. Class III streams provide substantial habitat for highly valued species and moderate habitat for less valued species. Class IV streams have moderate fishing resources.

Note: No Class II streams would be crossed.

Wyoming Stream Fishery Classification (Wyoming Game and Fish Department 1987):

Class I streams are premium trout water of national importance.
Class II streams are very good trout water of statewide importance.
Class III streams are important trout waters.
Class IV streams are low-production trout waters.

Appendix C-2 (continued)

c Species codes:

B	=	blue sucker	L	=	ling (burbot)	RT	=	rainbow trout
BT	=	brook trout	LB	=	largemouth bass	S	=	sauger
BnT	=	brown trout	MWF	=	mountain white fish	SB	=	smallmouth bass
CC	=	channel catfish	NG	=	native nongame species	SS	=	shovelnose sturgeon
CT	=	cutthroat trout	NP	=	northern pike	T	=	trout
F	=	flannelmouth sucker	P	=	paddlefish	W	=	walleye
K	=	kokanee	PS	=	pallid sturgeon	YP	=	yellow perch
			R	=	roundtail chub			

d Width of Yellowstone River includes 250 feet of open water and 500 feet of gravel bar.

Appendix C-3. FERC Stream and Wetland Construction and Mitigation Procedures

STREAM AND WETLAND CONSTRUCTION AND MITIGATION PROCEDURES FOR THE PGT/PG&E AND ALTAMONT NATURAL GAS PIPELINE PROJECTS

These Stream and Wetland Construction and Mitigation Procedures (Procedures) require proposed pipeline projects to be routed in a manner that minimizes the crossing and disturbance of stream and wetland ecosystems to the maximum extent practicable. If a project sponsor considers a specific part of these Procedures to be technically infeasible to implement due to site-specific engineering constraints, the project sponsor must identify the alternative provision(s) that it would implement, on a site-specific basis, which would provide an equal or greater level of protection to stream and wetland ecosystems. The Commission's staff will review these alternative provision(s) during the environmental analysis process, and will forward recommendations to the Commission for consideration during the certification process.

One Environmental Inspector is required for each pipeline spread used during construction. Environmental Inspectors shall have the direct responsibility to represent the project sponsor and to enforce these Procedures. They shall have peer status with all other activity inspectors. The Environmental Inspector shall have the authority to order the correction of acts that clearly violate the environmental conditions of the FERC certificate.

The Procedures detailed below require that some judgment be applied in the field and must be implemented under the supervision of the project sponsor's Environmental Inspector or other qualified professional with knowledge of stream and wetland conditions in the project area. Problems with contractor compliance with the Procedures must be reported to the Environmental Inspector for remedial action. Deviations from these Procedures will only be permitted as certificated by the Commission or by the written approval of the Director, Office of Pipeline and Producer Regulation, or his designee, upon an appropriate showing of need.

I. PERENNIAL STREAM CROSSINGS

A. STAGING AREAS/ADDITIONAL RIGHT-OF-WAY (ROW)

1. Locate at least 50 feet away from streambank, where topographic conditions permit.

2. Limit size to minimum needed to construct the stream crossing.

3. Do not store hazardous materials, chemicals, fuels, and lubricating oils, or perform concrete coating activities, within 100 feet of streambanks or within any municipal watershed area.

4. Attempt to refuel all construction equipment at least 100 feet from streambanks. Where conditions require that construction equipment be refueled within 100 feet of streambanks (e.g., barge-mounted backhoes, trench dewatering pumps), prepare a Spill Prevention, Containment, and Control Plan which specifically addresses these activities.

B. SPOIL PILE PLACEMENT/CONTROL

1. Trench spoil shall be placed at least 10 feet away from streambanks at all minor and major stream crossings.

2. Spoil piles located above streambanks shall be protected with sediment filter devices.

3. Prevent flow of spoil off of ROW.

C. TIME WINDOW FOR CONSTRUCTION

1. June 1 through September 30 unless expressly permitted or further restricted by appropriate state agency on a site-specific basis.

2. Notify authorities responsible for potable water supplies located within 3 miles downstream at least 1 week prior to commencement of instream work.

D. CROSSING PROCEDURES

1. Provide notification to the U.S. Army Corps of Engineers (COE) concerning the proposed construction activities, and submit to FERC staff a copy of the COE's determination regarding the need for individual Section 404 and/or Section 10 permits.

2. Comply with nationwide Section 404 permit Nos. 12 and 14 conditions (33 CFR §330) at a minimum.

3. Apply for state-issued stream crossing permits and obtain individual or generic Section 401 water quality certification or waiver.

4. Crossings shall be constructed as perpendicular to axis of stream channel as engineering and routing conditions permit.

5. Utilize clean gravel for upper 1 foot of fill over backfilled trench in all minor and major streams which contain coldwater fisheries.

6. Maintain downstream flow rates at all times.

7. Minor Streams ($\leq$ 10 feet wide and $\leq$ 2 feet average depth)

   a. For crossings of all coldwater and warmwater fisheries, construction equipment will cross the stream on a bridge consisting of one of the following:

      - equipment pads and culvert(s)
      - clean rockfill and culvert(s)
      - flexi-float or portable bridge

   b. For crossings of all coldwater fisheries, and warmwater fisheries considered significant by the state fish management agency, route stream across trench using flume pipe, and install pipeline using all of the "dry-ditch" techniques as follows:

      - install flume after blasting, but prior to trenching
      - use sand bag/plastic dam structure
      - properly align flume pipe
      - do not remove flume during trenching, pipe-laying, or backfilling activities
      - dewater trench, as required, to prevent discharge of silt laden water into stream during construction and backfilling operations
      - remove all flumes and dams upon completion of construction

   c. For all other minor perennial stream crossings, complete instream construction (not including blasting) within 24 hours.

8. Major Streams (> 10 feet wide or > 2 feet average depth, but $\leq$ 100 feet wide)

   a. Construction equipment crosses on bridge consisting of one of the following:

      - equipment pads and culvert(s)
      - clean rockfill and culvert(s)
      - flexi-float or portable bridge

   b. In-stream equipment limited to that needed to construct crossing.

   c. Notify state authorities which request such notification at least 48 hours prior to commencement of in-stream trenching or blasting.

   d. Attempt to complete in-stream trenching and backfill work (not including blasting) within 48 hours, with a maximum of 72 hours allowed unless site-specific physical conditions make completion within 72 hours impossible.

9. Rivers (> 100 feet wide)

    a. Submit site-specific construction procedures to FERC staff for review and approval prior to construction.

E. TEMPORARY EROSION AND SEDIMENT CONTROL

1. Perform daily inspection, and repair as needed.

2. Install and maintain sediment filter devices at all streambanks.

3. Use trench plugs at non-flumed minor stream, major stream, and river crossings to prevent diversion of streamflow into upland portions of pipeline trench during construction.

F. BANK STABILIZATION AND REVEGETATION

1. All riprap activities must comply with nationwide Section 404 permit No. 13 conditions at a minimum.

2. Limit use of riprap to areas where flow conditions preempt vegetative stabilization, unless otherwise specified by state permit.

3. Revegetate disturbed riparian areas with conservation grasses and legumes.

4. Allow a riparian strip at least 10 feet wide above each perennial streambank to permanently revegetate with native woody plant species across the entire ROW. However, to facilitate periodic corrosion/ leak surveys, a corridor centered on the pipeline up to 10 feet wide may be maintained in a herbaceous state. In addition, trees that are located within 15 feet of the pipeline and greater than 15 feet in height may be selectively cut and removed from the ROW.

5. Maintain sediment filter devices at base of all slopes located adjacent to streams until ROW revegetation is complete.

6. Install permanent slope breakers at base of all slopes adjacent to streams.

G. TRENCH DEWATERING

1. Dewater trench in such a manner that no silt laden water flows into any perennial stream or river.

II. FEDERALLY DELINEATED WETLAND CROSSINGS a/

A. STAGING AREAS

1. Locate at least 50 feet away from wetland edge, where topographic conditions permit.

2. Limit size to minimum needed to construct the wetland crossing.

3. Do not store hazardous materials, chemicals, fuels, and lubricating oils, or perform concrete coating activities, within 100 feet of wetland boundary.

4. Attempt to refuel all construction equipment at least 100 feet from wetland boundary. Where conditions require that construction equipment be refueled within 100 feet of any wetland boundary (e.g., pontoon-mounted backhoes, trench dewatering pumps), prepare a Spill Prevention, Containment, and Control Plan which specifically addresses these activities.

5. Do not construct aboveground facilities in any federally delineated wetland, except where the relocation of such facilities would prohibit compliance with DOT regulations.

B. SPOIL PILE PLACEMENT/CONTROL

1. Utilize sediment filter devices to prevent flow of spoil off of ROW.

C. CROSSING PROCEDURES

1. Provide notification to the COE concerning the proposed construction activities, and submit to FERC staff a copy of the COE's determination regarding the need for individual Section 404 permits.

2. Comply with nationwide Section 404 permit conditions (33 CFR §330) at a minimum.

3. Apply for state-issued wetland crossing permit and obtain individual or generic Section 401 water quality certification or waiver.

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a/ These procedures must be utilized when crossing any wetland which satisfies the delineation requirements contained in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" (Manual). The Applicant must delineate all wetlands using this Manual prior to construction, and upon request must provide the FERC staff with a wetland delineation report which identifies all federally delineated wetlands by milepost.

4. Pipeline should be routed to avoid wetland areas to the maximum extent practicable. If wetland cannot be avoided or crossed by following an existing ROW, route new pipeline in a manner that minimizes disturbance to wetland. Where looping an existing pipeline, locate loop line no more than 25 feet away from existing pipeline.

5. Minimize width of construction right-of-way to $\leq$ 75 feet.

6. Cut vegetation off only at ground level, leaving existing root systems intact, and remove from wetland for disposal.

7. Limit pulling of tree stumps and grading activities to directly over trench. Do not remove stumps or root systems from the rest of the ROW in wetlands, unless in the judgement of the Environmental Inspector safety-related construction constraints require removal of tree stumps from under the workpad. Where tree stumps are removed from under the workpad area, the project sponsor must specifically identify the areas where the pulling of tree stumps is required, and must develop and implement a detailed plan to actively reestablish native woody vegetation in these areas. This plan must be submitted to the FERC staff prior to construction.

8. Segregate and replace the top 1 foot of topsoil from the area disturbed by trenching, except in areas with standing water or saturated soils.

9. Limit construction equipment operating in wetland to that needed to dig trench, install pipe, backfill trench, and restore ROW.

10. Do not use dirt, rockfill, tree stumps, or brush riprap to stabilize ROW.

11. Utilize wide-track or balloon-tire construction equipment, or operate normal equipment off of timber pads, prefabricated equipment pads, or geotextile fabric overlain with gravel fill, if standing water or saturated soils are present.

12. Do not cut trees located outside of ROW to obtain timber for equipment pads, and attempt to utilize no more than two layers of timber or equipment pads to stabilize the ROW. In the event that more than two layers of timber riprap must be utilized due to site-specific construction constraints, the following information must be provided to the FERC staff:

    a. Specific procedures and criteria describing how the project sponsor will determine the locations where more than two layers of timber riprap are required. Such procedures should give priority consideration to using alternate methods that do not involve the use of timber riprap (e.g., prefabricated equipment mats, special low ground weight equipment, winter construction);

b. A detailed plan which addresses the procedures to be used to remove all timber riprap, specific measures (including the import of additional fill material) to restore preconstruction surface contours, and specific measures (including the planting of herbaceous and shrub species) to ensure successful revegetation of the construction ROW with native wetland plant species within three years after construction;

c. An agreement to provide the staff with at least two weeks advance notice prior to removing any timber riprap; and

d. A determination from the COE that the project sponsor's proposal either complies with the nationwide section 404 permit program or requires an individual section 404 permit.

13. Remove all timber pads, prefabricated equipment pads, and geotextile fabric overlain with gravel fill upon completion of construction.

14. Assemble pipeline in upland area and utilize "push-pull" or "float" technique to place pipe in trench whenever water and other site conditions allow.

D. TEMPORARY EROSION AND SEDIMENT CONTROL

1. Perform daily inspection, and repair as needed.

2. Install and maintain sediment filter devices at edge of all wetlands until ROW revegetation is complete.

3. Install permanent slope breakers at base of all slopes adjacent to wetlands.

E. REVEGETATION TECHNIQUES

1. Do not use fertilizer or lime, unless required by appropriate state permitting agency.

2. Restore topsoil to original horizon and temporarily revegetate disturbed areas with annual ryegrass at a rate of 40 lbs per acre, unless standing water is present.

3. Ensure that all disturbed areas permanently revegetate with native herbaceous and woody plant species.

4. Develop specific procedures, in coordination with the appropriate state agency, to prevent the invasion or spread of undesirable exotic vegetation (e.g., purple loosestrife and phragmites).

F. TRENCH DEWATERING

1. Dewater in such a manner that no silt laden water flows into wetland areas off of construction ROW.

G. ROW MAINTENANCE PRACTICES

1. Vegetation maintenance practices over the full width of the permanent ROW are prohibited. However, to facilitate corrosion/leak surveys, a corridor centered on the pipeline up to 10 feet wide may be maintained in a herbaceous state. In addition, trees that are located within 15 feet of the pipeline and greater than 15 feet in height may be selectively cut and removed from the ROW.

III. HYDROSTATIC TESTING

A. TIMING

1. Perform 100 percent radiographic inspection of all pipeline section welds, or hydrotest pipeline sections, prior to installation under streams or wetlands.

B. INTAKE SOURCE AND RATE

1. Screen intake hose to prevent entrainment of fish.

2. Do not utilize state designated exceptional value waters, or streams designated as public water supplies, unless appropriate state and/or local permitting agencies grant permission.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours prior to testing activities.

4. Adequate flow rates shall be maintained to protect aquatic life, provide for all in-stream uses, and provide for downstream withdrawals of water by existing users.

5. Apply for state-issued withdrawal permit, as required.

C. DISCHARGE LOCATION, METHOD, RATE

1. Regulate discharge rate and utilize energy dissipation device(s) in order to prevent erosion of upland areas, streambottom scour, suspension of sediments, or excessive stream flow.

2. Discharge test water from existing pipelines, using velocity dispersion device, into haybale/silt fence containment structure.

3. Obtain National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permit, as required.

4. Sample test water during discharge in accordance with any NPDES or state-issued discharge permit requirements. Provide a copy of the results to FERC staff upon request.

Appendix D. Land Use

Appendix D-1. PGT Right-of-Way Requirements

Appendix D-1. Proposed PGT Project Right-of-Way Requirements

Milepost (miles)	Length (feet)	Existing Right-of-Way Width (feet)	Existing Right-of-Way Area (acres)	New Right-of-Way Width (feet)	New Right-of-Way Area (acres)	Temporary Work Strip Width (feet)	Temporary Work Strip Area (acres)	Construction Area Width (feet)	Construction Area Area (acres)
Idaho									
0.00 - 0.10	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
0.10 - 0.30	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
0.30 - 1.30	5,280	100.00	12.12	0.00	0.00	30.00	3.64	130.00	15.76
1.30 - 2.40	5,808	73.25	9.77	0.00	0.00	40.00	5.33	113.25	15.10
2.40 - 3.90	7,920	100.00	18.18	0.00	0.00	30.00	5.45	130.00	23.64
3.90 - 4.30	2,112	73.25	3.55	0.00	0.00	40.00	1.94	113.25	5.49
4.30 - 7.30	15,840	100.00	36.36	0.00	0.00	30.00	10.91	130.00	47.27
7.30 - 7.40	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
7.40 - 8.20	4,224	100.00	9.70	0.00	0.00	30.00	2.91	130.00	12.61
8.20 - 8.40	1,056	73.25	1.78	0.00	0.00	40.00	0.97	113.25	2.75
8.40 - 10.70	12,144	100.00	27.88	0.00	0.00	30.00	8.36	130.00	36.24
10.70 - 12.00	6,864	73.25	11.54	0.00	0.00	40.00	6.30	113.25	17.85
12.00 - 12.40	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
12.40 - 12.60	1,056	73.25	1.78	0.00	0.00	40.00	0.97	113.25	2.75
12.60 - 13.40	4,224	100.00	9.70	0.00	0.00	30.00	2.91	130.00	12.61
13.40 - 14.60	6,336	73.25	10.65	0.00	0.00	40.00	5.82	113.25	16.47
14.60 - 16.40	9,504	100.00	21.82	0.00	0.00	30.00	6.55	130.00	28.36
16.40 - 17.00	3,168	73.25	5.33	0.00	0.00	40.00	2.91	113.25	8.24
17.00 - 18.20	6,336	100.00	14.55	0.00	0.00	30.00	4.36	130.00	18.91
18.20 - 20.90	14,256	100.00	32.73	0.00	0.00	30.00	9.82	130.00	42.55
20.90 - 72.70	273,504			Existing looped section					
72.70 - 84.70	63,360	100.00	145.45	0.00	0.00	30.00	43.64	130.00	189.09
84.70 - 85.10	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
85.10 - 88.80	19,536	100.00	44.85	0.00	0.00	30.00	13.45	130.00	58.30
88.80 - 89.20	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
89.20 - 89.30	528	100.00	1.21	0.00	0.00	30.00	0.36	130.00	1.58
89.30 - 89.90	3,168	100.00	7.27	0.00	0.00	30.00	2.18	130.00	9.45
89.90 - 106.70	88,704	100.00	203.64	0.00	0.00	30.00	61.09	130.00	264.73
Total			648.59		0.00		205.94		854.53
Washington									
106.70 - 108.30	8,448	100.00	19.39	0.00	0.00	30.00	5.82	130.00	25.21
108.30 - 179.00	373,296			Existing looped section					
179.00 - 181.90	15,312	100.00	35.15	0.00	0.00	30.00	10.55	130.00	45.70
181.90 - 182.10	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
182.10 - 197.80	82,896	100.00	190.30	0.00	0.00	30.00	57.09	130.00	247.39
197.80 - 225.30	145,200			Existing looped section					
225.30 - 252.30	142,560	100.00	327.27	0.00	0.00	30.00	98.18	130.00	425.45
252.30 - 252.60	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
252.60 - 254.10	7,920	100.00	18.18	0.00	0.00	30.00	5.45	130.00	23.64
254.10 - 254.30	1,056	104.75	2.54	0.00	0.00	40.00	0.97	144.75	3.51
254.30 - 255.60	6,864	100.00	15.76	0.00	0.00	30.00	4.73	130.00	20.48
255.60 - 277.40	115,104			Existing looped section					
Total			614.66		0.00		184.61		799.27

Appendix D-1. Continued

Milepost (miles)	Length (feet)	Existing Right-of-Way Width (feet)	Existing Right-of-Way Area (acres)	New Right-of-Way Width (feet)	New Right-of-Way Area (acres)	Temporary Work Strip Width (feet)	Temporary Work Strip Area (acres)	Construction Area Width (feet)	Construction Area Area (acres)
Oregon									
277.40 - 282.80	28,512	100.00	65.45	0.00	0.00	30.00	19.64	130.00	85.09
282.80 - 284.40	8,448			Existing looped section					
284.40 - 350.70	350,064	100.00	803.64	0.00	0.00	30.00	241.09	130.00	1,044.73
350.70 - 359.70	47,520	0.00	0.00	100.00	109.09	30.00	32.73	130.00	141.82
359.70 - 360.00	1,584	53.50	1.95	0.00	0.00	60.00	2.18	113.50	4.13
360.00 - 360.50	2,640	0.00	0.00	100.00	6.06	30.00	1.82	130.00	7.88
360.50 - 360.80	1,584	53.50	1.95	0.00	0.00	60.00	2.18	113.50	4.13
360.80 - 361.40	3,168	0.00	0.00	100.00	7.27	30.00	2.18	130.00	9.45
361.40 - 362.30	4,752	53.50	5.84	0.00	0.00	100.00	10.91	153.50	16.75
362.30 - 362.80	2,640	53.50	3.24	0.00	0.00	50.00	3.03	103.50	6.27
362.80 - 365.40	13,728	0.00	0.00	100.00	31.52	30.00	9.45	130.00	40.97
365.40 - 365.70	1,584	53.50	1.95	0.00	0.00	40.00	1.45	93.50	3.40
365.70 - 370.90	27,456	0.00	0.00	100.00	63.03	30.00	18.91	130.00	81.94
367.70 - 393.10	134,112	100.00	307.88	0.00	0.00	30.00	92.36	130.00	400.24
393.10 - 393.30	1,056	83.25	2.02	0.00	0.00	40.00	0.97	123.25	2.99
393.30 - 394.30	5,280	100.00	12.12	0.00	0.00	30.00	3.64	130.00	15.76
394.30 - 395.90	8,448	83.25	16.15	0.00	0.00	40.00	7.76	123.25	23.90
395.90 - 403.80	41,712	100.00	95.76	0.00	0.00	30.00	28.73	130.00	124.48
403.80 - 404.60	4,224	83.25	8.07	0.00	0.00	40.00	3.88	123.25	11.95
404.60 - 406.40	9,504	100.00	21.82	0.00	0.00	30.00	6.55	130.00	28.36
406.40 - 407.00	3,168	83.25	6.05	0.00	0.00	40.00	2.91	123.25	8.96
407.00 - 409.80	14,784	100.00	33.94	0.00	0.00	30.00	10.18	130.00	44.12
409.80 - 428.60	99,264	83.25	189.71	0.00	0.00	40.00	91.15	123.25	280.86
428.60 - 434.10	29,040	100.00	66.67	0.00	0.00	30.00	20.00	130.00	86.67
434.10 - 434.30	1,056	83.25	2.02	0.00	0.00	40.00	0.97	123.25	2.99
434.30 - 435.20	4,752	100.00	10.91	0.00	0.00	30.00	3.27	130.00	14.18
435.20 - 440.40	27,456	83.25	52.47	0.00	0.00	40.00	25.21	123.25	77.68
440.40 - 440.50	528	100.00	1.21	0.00	0.00	30.00	0.36	130.00	1.58
440.50 - 448.00	39,600	83.25	75.68	0.00	0.00	40.00	36.36	123.25	112.05
448.00 - 448.30	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
448.30 - 449.80	7,920	83.25	15.14	0.00	0.00	40.00	7.27	123.25	22.41
449.80 - 450.10	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
450.10 - 450.30	1,056	83.25	2.02	0.00	0.00	40.00	0.97	123.25	2.99
450.30 - 455.20	25,872	100.00	59.39	0.00	0.00	30.00	17.82	130.00	77.21
455.20 - 456.30	5,808	83.25	11.10	0.00	0.00	40.00	5.33	123.25	16.43
456.30 - 457.20	4,752	100.00	10.91	0.00	0.00	30.00	3.27	130.00	14.18
457.20 - 459.20	10,560	100.00	24.24	0.00	0.00	30.00	7.27	130.00	31.52
459.20 - 468.60	49,632	83.25	94.85	0.00	0.00	40.00	45.58	123.25	140.43
468.60 - 477.90	49,104	73.25	82.57	0.00	0.00	40.00	45.09	113.25	127.66
477.90 - 478.90	5,280	73.25	8.88	0.00	0.00	40.00	4.85	113.25	13.73
478.90 - 480.20	6,864	100.00	15.76	0.00	0.00	30.00	4.73	130.00	20.48
480.20 - 484.00	20,064	73.25	33.74	0.00	0.00	40.00	18.42	113.25	52.16
484.00 - 484.40	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
484.40 - 485.40	5,280	73.25	8.88	0.00	0.00	40.00	4.85	113.25	13.73

Appendix D-1. Continued

Milepost (miles)	Length (feet)	Existing Right-of-Way Width (feet)	Existing Right-of-Way Area (acres)	New Right-of-Way Width (feet)	New Right-of-Way Area (acres)	Temporary Work Strip Width (feet)	Temporary Work Strip Area (acres)	Construction Area Width (feet)	Construction Area Area (acres)
485.40 - 486.00	3,168	100.00	7.27	0.00	0.00	30.00	2.18	130.00	9.45
486.00 - 487.50	7,920	73.25	13.32	0.00	0.00	40.00	7.27	113.25	20.59
487.50 - 488.00	2,640	100.00	6.06	0.00	0.00	30.00	1.82	130.00	7.88
488.00 - 491.40	17,952	73.25	30.19	0.00	0.00	40.00	16.48	113.25	46.67
491.40 - 491.70	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
491.70 - 492.00	1,584	73.25	2.66	0.00	0.00	40.00	1.45	113.25	4.12
492.00 - 492.60	3,168	100.00	7.27	0.00	0.00	30.00	2.18	130.00	9.45
492.60 - 493.40	4,224	73.25	7.10	0.00	0.00	40.00	3.88	113.25	10.98
493.40 - 496.40	15,840	100.00	36.36	0.00	0.00	30.00	10.91	130.00	47.27
496.40 - 496.50	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
496.50 - 496.70	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
496.70 - 497.30	3,168	73.25	5.33	0.00	0.00	40.00	2.91	113.25	8.24
497.30 - 502.60	27,984	100.00	64.24	0.00	0.00	30.00	19.27	130.00	83.52
502.60 - 502.70	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
502.70 - 503.30	3,168	100.00	7.27	0.00	0.00	30.00	2.18	130.00	9.45
503.30 - 503.80	2,640	73.25	4.44	0.00	0.00	40.00	2.42	113.25	6.86
503.80 - 504.10	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
504.10 - 504.40	1,584	73.25	2.66	0.00	0.00	40.00	1.45	113.25	4.12
504.40 - 504.60	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
504.60 - 505.70	5,808	73.25	9.77	0.00	0.00	40.00	5.33	113.25	15.10
505.70 - 506.30	3,168	100.00	7.27	0.00	0.00	30.00	2.18	130.00	9.45
506.30 - 506.60	1,584	73.25	2.66	0.00	0.00	40.00	1.45	113.25	4.12
506.60 - 507.70	5,808	100.00	13.33	0.00	0.00	30.00	4.00	130.00	17.33
507.70 - 514.30	34,848	73.25	58.60	0.00	0.00	40.00	32.00	113.25	90.60
514.30 - 514.80	2,640	100.00	6.06	0.00	0.00	30.00	1.82	130.00	7.88
514.80 - 516.30	7,920	73.25	13.32	0.00	0.00	40.00	7.27	113.25	20.59
516.30 - 521.60	27,984	73.25	47.06	0.00	0.00	40.00	25.70	113.25	72.75
521.60 - 553.00	165,792	100.00	380.61	0.00	0.00	30.00	114.18	130.00	494.79
553.00 - 565.40	65,472	100.00	150.30	0.00	0.00	30.00	45.09	130.00	195.39
565.40 - 565.80	2,112	73.25	3.55	0.00	0.00	40.00	1.94	113.25	5.49
565.80 - 566.10	1,584	100.00	3.64	0.00	0.00	30.00	1.09	130.00	4.73
566.10 - 566.20	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
566.20 - 566.40	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
566.40 - 566.50	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
566.50 - 566.70	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
566.70 - 566.80	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
566.80 - 567.00	1,056	100.00	2.42	0.00	0.00	30.00	0.73	130.00	3.15
567.00 - 567.40	2,112	73.25	3.55	0.00	0.00	40.00	1.94	113.25	5.49
567.40 - 567.80	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
567.80 - 570.30	13,200	73.25	22.20	0.00	0.00	40.00	12.12	113.25	34.32
570.30 - 570.70	2,112	100.00	4.85	0.00	0.00	30.00	1.45	130.00	6.30
570.70 - 581.00	54,384			Existing looped section					
581.00 - 582.00	5,280	73.25	8.88	0.00	0.00	40.00	4.85	113.25	13.73
582.00 - 583.20	6,336	73.25	10.65	0.00	0.00	70.00	10.18	143.25	20.84
583.20 - 600.90	93,456	100.00	214.55	0.00	0.00	30.00	64.36	130.00	278.91

Appendix D-1. Continued

Milepost (miles)	Length (feet)	Existing Right-of-Way Width (feet)	Existing Right-of-Way Area (acres)	New Right-of-Way Width (feet)	New Right-of-Way Area (acres)	Temporary Work Strip Width (feet)	Temporary Work Strip Area (acres)	Construction Area Width (feet)	Construction Area Area (acres)
600.90 - 601.00	528	73.25	0.89	0.00	0.00	40.00	0.48	113.25	1.37
601.00 - 612.50	60,720	100.00	139.39	0.00	0.00	30.00	41.82	130.00	181.21
Total			3,490.08		216.97		1,312.36		5,019.42

Appendix D-2. PGT Designated Land Use

Appendix D-2. Designated Land Use along the PGT Route in Idaho, Washington, and Oregon

Designated Land Use	Boundary County		Bonner County		Kootenai County		State Total	
	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres
IDAHO								
General agriculture	5.0	69.0	0.0	0.0	6.6	81.0	11.6	150.0
Agriculture preservation/ prime agricultural land	13.0	181.0	0.0	0.0	0.0	0.0	13.0	181.0
Rural	0.0	0.0	8.0	96.0	13.6	165.0	21.6	261.0
Residential	3.0	35.0	2.0	21.0	1.7	21.0	6.7	78.0
Industrial	0.0	0.0	0.0	0.0	2.6	2.0	2.6	32.0
Total	21.0	285.0	10.0	117.0	24.5	299.0	55.5	701.0

Designated Land Use	Spokane County		Whitman County		Walla Walla County		State Total	
	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres
WASHINGTON								
General agriculture	0.0	0.0	0.0	0.0	30.0	322.0	30.0	372.0
Agriculture preservation/ prime agricultural land	0.0	0.0	19.0	251.0	0.0	4.0	19.0	255.0
Rural	2.0	18.0	0.0	0.0	0.0	0.0	2.0	18.0
Total	2.0	18.0	19.0	251.0	30.0	326.0	51.0	646.0

Appendix D-2. Designated Land Use along the PGT Route in Idaho, Washington, and Oregon (continued)

Designated Land Use	Umatilla County		Morrow County		Gilliam County		Sherman County		Wasco County	
	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres
OREGON										
General agriculture	0.0	0.0	34.0	455.0	0.0	0.0	10.0	145.0	0.0	0.0
Agriculture preservation/prime agricultural land	16.0	196.0	0.0	0.0	32.0	480.0	3.0	51.0	24.0	360.0
Forestry/Forest preservation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rural	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Urban transition	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Residential	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Industrial	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scenic corridor	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	16.0	203.0	34.0	460.0	32.0	480.0	13.0	196.0	24.0	360.0

Appendix D-2. Designated Land Use along the PGT Route in Idaho, Washington, and Oregon (continued)

Designated Land Use	Jefferson County		Crook County		Deschutes County		Klamath County		State Total	
	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres	Miles	Acres
OREGON (continued)										
General agriculture	32.0	481.0	9.0	133.0	21.0	318.0	33.0	403.0	138.0	1,935.0
Agriculture preservation/prime agricultural land	0.0	0.0	0.0	0.0	0.0	0.0	3.0	36.0	78.0	1,123.0
Forestry/Forest preservation	0.0	0.0	0.0	0.0	23.0	338.0	87.0	1,102.0	110.0	1,440.0
Rural	0.0	0.0	0.0	0.0	3.0	37.0	1.0	14.0	4.0	55.0
Urban transition	0.0	0.0	0.0	0.0	1.0	8.0	0.0	0.0	1.0	12.0
Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Industrial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	5.0
Commercial	0.0	0.0	0.0	0.0	0.0	6.0	0.0	4.0	1.0	10.0
Scenic corridor	0.0	0.0	0.0	0.0	3.0	38.0	0.0	0.0	3.0	38.0
Total	32.0	481.0	9.0	133.0	51.0	746.0	124.0	1,564.0	335.0	4,622.0

Appendix E. Vegetation and Wildlife

Appendix E-1. PGT Special-Status Plant Species

Appendix E-1

SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR ALONG THE PGT/PG&E ROUTE

Scientific and Common Names	Listing Status: Federal [a]	Listing Status: State [b]	Distribution	Habitat	Comments
IDAHO					
Botrychium minganense Moonwort grape fern	FS	-	Southern California to Alaska and eastern Canada	Mid-elevation montane and subalpine conifer forests on moist sites	Occurs in Panhandle National Forest; listed in Washington (WS)
Juneus effusus pacificus Pacific rush	FS	-	Disjunct populations in Idaho, along North Fork Clearwater River in Clearwater County and one collection site in Kootenai County; common west of Cascade Mountains from California to British Columbia	Most riparian sites between 1,600 and 2,300 feet	
WASHINGTON					
Lomatium laevigatum Smooth desert parsley	C2	-	Local endemic in Klickitat County	Basaltic cliffs along Columbia River Gorge	
OREGON					
Artemisia ludoviciana var. *estesii* Estes' artemisia	C2	-	Eastern slopes of Cascades and northcentral Oregon	Sagebrush-steppe	
Astragalus collinus var. *laurentii* Laurence's milk vetch	C2	-	Originally widespread in northcentral Oregon; currently known only from near Nye Junction, Umatilla County	Sandy areas in basaltic scablands	
Astragalus peckii Peck's milk vetch	FS/C2	-	Deschutes and Klamath Counties (last seen 1950)	On sandy soils and pumace	Documented in Deschutes National Forest between MP 525 to 530; suspected in Winema National Forest
Calochortus longebarbatus var. *longebarbatus* Long-haired star tulip	FS/C3c	-	Patchy distribution along the east base of the Cascade Mountains from Yakima County, Washington, to north-eastern California	Moist meadows in sagebrush scrub and juniper woodland	Documented in Winema National Forest; suspected in Deschutes and Ochoco National Forests
Mimulus jepsonii Jepson's monkeyflower	FS	-	About Davis and Crater Lakes in Oregon; Sierra Nevada and Cascade Mountains in California	Bare disturbed ground and gravelly pumice areas near high mountain lakes	Documented in Deschutes National Forest; suspected in Winema National Forest

Appendix E-1
(continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR
ALONG THE PGT/PG&E ROUTE

Scientific and Common Names	Listing Status		Distribution	Habitat	Comments
	Federal [a]	State [b]			
Mimulus junermannoides Hepatic monkeyflower	C3c	-	Disjunct distribution in Columbia River Gorge, Deschutes and Umatilla River Canyons, and a tributary of Imnaha River	Moist Basaltic and limestone cliffs along river canyons	Occurs near Codon storage site
Penstemon glaucinus Blue-leaved penstemon	C2	-	Known only from Gearhart Mountain and Lake Campbell in Lake County	Lodgepole pine forest	
Perideridia erythrorhiza Red root yampah	C2	-	Scattered distribution in Umpqua Valley, Douglas County; near Grants Pass, Josephine County; near Klamath Agency, Klamath County	Native prairies of southwest Oregon	
Rorippa columbiae Columbia cress	C2	-	Columbia River region to northern California east of the Cascades	On lava slopes in juniper woodland and sagebrush steppe	
Silene scaposa var. *scaposa*	C3c	-	Currently known only from one location in the Strawberry Mountains, Grant County; historically from Wheeler and Gilliam Counties to the Blue Mountains	Sagebrush steppe and juniper woodland	
CALIFORNIA [c]					
Amsinckia grandiflora Large-flowered fiddleneck	E	E	Historically reported in foothills of Mt. Diablo Range in Alameda, Contra Costa, and San Joaquin Counties; currently known from two sites near Livermore	Lower portions of steep, protected, north- and east-facing slopes in grasslands and oak woodlands	
Caulanthus californicus California jewelflower	PE	E	Historically reported form throughout the central and southern portions of the San Joaquin Valley and adjacent Coast Ranges; presently known from five locations in Kern, Santa Barbara, and San Luis Obispo Counties	Well-drained (sandy) soils in grassland and oak woodland	
Cordylanthus palmatus Palmate bird's beak	E	E	Widespread but infrequent in southern Sacramento and northern San Joaquin Valleys and adjacent Coast Range valleys	Seasonal wetlands in alkali sinks with valley sink scrub, alkali meadow, and alkali marsh communities	

Appendix E-1
(continued)
SPECIAL-STATUS PLANT SPECIES THAT MAY OCCUR
ALONG THE PGT/PG&E ROUTE

Scientific and Common Names	Listing Status		Distribution	Habitat	Comments
	Federal [a]	State [b]			
Eriastrum hooveri Hoover's woolly-star	PT	-	Southern San Joaquin Valley in Fresno, Kern, Santa Barbara, and San Luis Obispo Counties	Alkali sink and valley saltbush scrub, typically with low forb cover	
Erysimum capitatum var. *angustatum* Contra Costa wallflower	E	E	Presently known only from dunes along the San Joaquin River east of Antioch, Contra Costa County	Inland dunes in coastal strand vegetation	
Lembertia congdonii San Joaquin woolly threads	PE	-	Western portion of the southern San Joaquin Valley; Fresno, Kings, Kern, and San Luis Obispo Counties	Well-drained sandy soils in alkali sink scrub, valley saltbush scrub, and grassland habitats	
Oenothera deltoides var. *howellii* Antioch Dunes evening primrose	E	E	Only one natural population on dunes along San Joaquin River, east of Antioch, Contra Costa County; introduced population on Brannon Island, Sacramento County	Inland dunes in coastal strand vegetation	
Tuctoria mucronata Crampton's tuctoria	E	E	Presently known only from Solano County in and near the Nature Conservancy's Jepson Prairie Preserve	Bottoms of large, alkaline, northern claypan vernal pools	

[a] Status definitions: Federal - U.S. Fish and wildlife Service (USFWS) (50 CFR 17.12; 55 FR 6184, February 21, 1990)

- E = listed as endangered under the federal Endangered Species Act
- PE = proposed for listing as endangered
- PT = proposed for listing as threatened
- C1 = a candidate species under review for federal listing. Category 1 includes species for which the USFWS has substantial information on biological vulnerability and threats to support the appropriateness of proposing to list them as threatened or endangered.
- C2 = A candidate species under review for federal listing. Category 2 includes species for which the USFWS has some information indicating that proposed to list them as threatened or endangered is possibly appropriate but for which further biological research and field study are needed to determine biological vulnerability and threats.
- C3c = plants previously considered candidates and included on past lists but currently considered too widespread or not threatened and so not presently considered for listing.
- FS = U.S. Forest Service listed as sensitive

Appendix E-1 (continued)

[b] State Definitions

Idaho: Idaho Natural Heritage Program 1989
INPS 2 = Idaho Native Plant Society priority level 2 - threatened

Washington: Washington Department of Natural Resources Natural Heritage Program 1989
WE = endangered in Washington
WS = sensitive; not presently threatened or endangered
WT = threatened in Washington
WX = possibly extirpated from Washington

Oregon: Oregon Natural Heritage Program Database 1989
OC = threatened or endangered in Oregon but more common or stable elsewhere
OE = endangered in Oregon and elsewhere
OR = review list
OS = limited in abundance throughout range but currently stable
OT = threatened in Oregon and elsewhere
OX = possibly extinct or extirpated

[c] Includes federal listed species only

Appendix E-2. PGT Wetland and Riparian Area Crossings

Appendix E-2

WETLAND AND RIPARIAN AREA CROSSINGS ALONG THE PGT ROUTE [a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
IDAHO			
Moyie River (1)	0.3	PFO1	100
Moyie River (3)	5.0	PSS1/EM1	300
Moyie River Overflow (4)	6.0	PSS1	350
Adjacent Wetland	8.2	PSS1/FO1	1,000
Moyie River (6)	10.0	PFO4	200
Moyie River (6)	10.0	PFO1	50
Moyie River (7)	10.7	PFO1	50
Unnamed creek	72.8	PSS1	25
Marsh	74.5	PEM1	1,250
Wetland	75.0	PSS1	500
Marsh	75.6	PEM1	250
Wetland	75.8	PSS1	500
Marsh	76.5	PSS1	250
Cocolalla Creek	77.3	PSS1	125
Marsh	105.0	PEM1	500
WASHINGTON			
Willow Creek	185.2	PEM1	25
Willow Creek (branch)	185.9	PEM2	200
Willow Creek (branch)	186.8	PEM1	25
Willow Creek (branch)	187.5	PEM1	100
Unnamed Creek	187.9	PEM1	100
Unnamed creek	189.5	PEM1	100

Appendix E-2
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS ALONG THE PGT ROUTE [a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
WASHINGTON (continued)			
Unnamed Creek	192.2	PSS	100
Rock Spring Gulch	193.9	PFO1	50
Unnamed Canyon	231.2	PSS	200
Walla Walla River	254.1	PSS/EM	100
OREGON			
Marsh	284.5	PEM1	200
Marsh	285.0	PEM1	1,125
Butter Creek	289.9	PEM1	25
Four Mile Canyon	294.2	PSS	100
Sand Hollow	299.4	PEM1	50
Strawberry Canyon Creek	307.5	PSS	100
Juniper Creek Canyon	308.8	PEM	150
Unnamed creek	299.7	PEM1	25
Drainage	318.4	PEM1	50
Unnamed creek	320.5	PEM1	50
Willams Creek	325.3	PSS	200
Eight Mile Canyon	327.2	PEM1	50
Eight Mile Canyon (branch)	328.4	PEM	50
Hay Creek	345.5	PEM	100
Ferry Canyon (branch)	348.0	PSS1/FO1	50
Hannafin Canyon	17.6 JDV	PSS	150
Unnamed spring (creek)	384.3	PEM1	100

Appendix E-2
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS ALONG THE PGT ROUTE [a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
OREGON (continued)			
Bull/Cow Canyon	396.0	PEM1	50
Trout Creek	397.4	PEM	1000
Willow Creek	420.4	PEM1	100
Crooked River	432.7	PEM1	25
Crooked River	432.7	PSS1	25
Long Prairie Creek	487.8	PEM	50
Unnamed Creek	491.6	PSS1/FO1	50
Miller Creek	524.7	PSS	200
Sand Creek	544.1	PFO/EM	50
Williamson River	552.2	PSS	250
Marsh	561.5	PEM	250
Unnamed spring	564.0	PEM	50
Unnamed creek	564.5	PEM	25
Long Prairie	566.0	PEM	500
Long Prairie	567.0	PEM	1,000
Unnamed pond	580.8	PAB	125
Unnamed creek	580.9	PEM	750
Marsh	581.9	PEM	50
Unnamed Creek	588.3	PEM	50
Unnamed canal	597.6	PEM	25
Wright Creek (1)	599.3	PEM	25
Wright Creek (2)	599.8	PEM	25

Note: JDV = mileposts on the John Day River variation, a 20-mile-long route variation that would depart from the existing route at MP 350.6 and rejoin it at MP 367.6

a/ Wetlands were identified through the use of U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps, USGS topographic maps, and limited field reconnaissance. No NWI maps were available between MP 321.0 to MP 536.5 and MP 587.5 to 593.5. Aerial photography was also used to aid in the identification of wetland and riparian vegetation.

b/ Classification system:

PFO1	=	Palustrine forested broad-leaved deciduous
PFO4	=	Palustrine forested needle-leaved evergreen
PSS1	=	Palustrine scrub/shrub broad-leaved deciduous
PEM1	=	Palustrine emergent persistent
PEM	=	Palustrine emergent
PSS	=	Palustrine scrub/shrub
PAB	=	Palustrine aquatic bed
PFO/EM	=	Palustrine forested and emergent mix
PSS1/EM1	=	Palustrine scrub/shrub broad-leaved deciduous and persistent emergent mix
PSS1/FO1	=	Palustrine broad-leaved deciduous mix scrub/shrub and forested
PSS/EM	=	Palustrine scrub/shrub and emergent mix
PSS2/FO2	=	Palustrine narrow-leaved deciduous scrub/shrub and forested mix

Appendix E-3. Altamont Wetland and Riparian Area Crossings

Appendix E-3

WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
MONTANA			
Milk River	8.3	PSS	250
Unnamed Creek	12.2	PSS	25
Undrained depression	14.5	PEM	100
Ninemile Coulee	15.0	PEM	200
Spring Coulee	21.2	PEM	50
Dry Lake Coulee	23.9	PEM	50
Sage Creek	33.1	PEM	50
Faulkners Coulee	38.0	PEM	75
Halfway Coulee	42.5	PEM	50
Lonesome Lake	50.8	PEM	100
Twelvemile Coulee	51.2	PEM	250
Coal Banks Coulee	65.9	PSS	25
Missouri River	68.5	PFO1	50
Undrained depression	82.6	PEM	500
Crow Coulee	83.9	PEM/SS	500
Undrained depression	84.2	PEM	500
Undrained depression	88.6	PSS/EM	50
Undrained depression	88.7	PEM	50
Undrained depression	88.8	PEM	50
Flat Creek	96.7	PEM	2,000
Flat Creek	98.3	PEM	23,500
Arrow Creek	111.5	PEM/SS	600

Appendix E-3
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
Coffee Creek	118.2	PEM	250
Wolf Creek	123.0	PEM	1,750
Wolf Creek	123.3	PEM	100
Coyote Creek	124.0	PEM	100
Dry Wolf Creek	130.2	PSS/EM	500
Sage Creek	133.2	PSS/EM	500
Squaw Coulee	135.7	PEM	125
Louse Creek	139.7	PEM	200
Judith River	144.6-145.1	PSS/EM	2,000
Unnamed pond	147.9	PEM	150
Hauck Coulee	148.9	PEM	500
Big Coulee Creek	154.2	PEM	100
Ross Fork Creek	154.6	PEM	3,750
Ross Fork Creek	159.0	PEM/SS	2,000
Ross Fork Creek	165.8	POW/EM	100
Unnamed drainage	168.3	PEM	50
Unnamed drainage	176.1	PEM	50
Roberts Creek	179.9	PEM	600
Roberts Creek	180.3	PEM	50
Alkali Creek	183.9	PEM	50
Unnamed drainage	192.9	PEM	250
Musselshell River	195.5	PFO	250

Appendix E-3
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
Fish Creek	204.2	PEM	25
Van Winkle Creek	213.0	PEM	100
North Fork Big Coulee Creek	214.0	PSS	300
South Fork Big Coulee Creek	215.9	PSS	200
Sixshooter Creek	221.5	PEM	25
Middle Creek	225.2	PEM	1,000
Cedar Creek	227.0	PEM	25
Tributary of Cedar Creek	228.0	PEM	50
Gurney Creek	229.2	PEM	50
Struck Creek	234.8	PEM	50
Toll Creek	235.3	PEM/SS	100
Greenwood Creek	236.0	PEM	200
North Fork Valley Creek	245.5	PEM	50
Valley Creek	249.5	PEM	1,250
Valley Creek	250.7	PEM	3,000
Valley Creek	253.4	PEM	750
Yellowstone River	257.1	PFO	1,200
Yellowstone River	257.3	PFL	500
Yellowstone River	257.4	PFO	400
Rock Creek	264.9	PFO	750
Clarks Fork Yellowstone River	268.2	PFO	700
Piney Creek	298.5	PSS	400
Cottonwood Coulee	300.0	PFO	150

Appendix E-3
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a/]

Crossing (number)	Milepost	Classification [b/]	Crossing Width (feet)
WYOMING			
Unnamed drainage	306.8	PSS	100
Unnamed drainage	308.2	PSS	200
Peterson Creek	318.0	PFO	50
Shoshone River	319.1	PFO	1,000
Lovell Lake	323.0	PEM	1,300
Dry Creek	347.6	PEM	50
Greybull River	352.0	PFO	1,000
Antelope Creek	358.4	PSS	50
Elk Creek	361.9	PSS	25
Dobie Creek	365.0	PSS	25
Fivemile Creek	372.8	PEM/FO	250
Sixmile Creek	373.7	PEM	250
Bighorn River	374.2	PFO	600
East Fork Nowater Creek	392.0	PFO/SS	500
Nowater Creek	399.2	PFO/SS	350
Lake Creek	407.0	PSS	100
Kirby Creek	410.2	PSS/FO	3,000
West Kirby Creek	417.8	PSS	50
West Bridger Creek	423.9	PSS	50
South Bridger Creek	427.3	PSS	25
Unnamed drainage	432.1	PSS	100
Schoening Creek	435.8	PSS	200

Appendix E-3
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
Badwater Creek	440.1	PSS	1,250
Poison Creek	447.0	PSS	200
Deflation depression	450.2	PEM	2,000
Muskrat Creek	454.4	PSS	500
Deflation depression	460.0	PEM	50
Dry Cheyenne Creek	463.8	PSS	500
Kirby Draw	472.5	PSS	200
Beaver Creek	480.9	PSS	2,500
Dry Twin Creek	493.7	PSS	50
Twin Creek	495.5	PSS	50
Stambaugh Creek	505.6	PSS	50
Beaver Creek	508.2	PSS	100
Rock Creek	514.2	PSS	750
Willow Creek	516.6	PSS	500
Slaughterhouse Creek	520.0	PSS	25
Pine Creek	522.2	PSS	200
Fish Creek	525.4	PSS	25
Unnamed drainage	526.4	PSS	200
Sweetwater River	526.5	PFO/SS	600
West Pacific Creek	532.0	PSS/EM	100
North Pacific Creek	547.2	PEM	25
Little Sandy Creek	558.2	PEM/SS	2,400
Big Sandy River	561.5	PEM/SS	400

Appendix E-3
(continued)
WETLAND AND RIPARIAN AREA CROSSINGS
ALONG THE ALTAMONT ROUTE[a]

Crossing (number)	Milepost	Classification [b]	Crossing Width (feet)
Deflation basin	565.8	PEM	500
Simpson Gulch	569.5	PSS	100
Twelvemile Canyon	579.9	PEM	3,150
Deflation basin	580.9	PEM	500
Buckhorn Canyon	583.6	PSS/EM	250
Green River	593.5	PFO/SS	600
Shute Creek	602.6	PSS	400
Hams Fork	613.1	PFO/SS	500

[a] U.S. Fish and Wildlife Service National Wetland Inventory (NWI) maps were not available for Montana and Wyoming at the time of this analysis. Wetlands were identified through the review of aerial photographs, USGS topographic maps, and limited field reconnaissance. Intermittent stream channels with no riparian vegetation are not included in this table.

[b] Classification system:

PSS = Palustrine scrub/shrub
PEM = Palustrine emergent
PFO = Palustrine forested
PEM/PSS = Palustrine emergent and scrub/shrub mix
PSS/EM = Palustrine scrub/shrub and emergent mix
PFL = Palustrine flat
POW/EM = Palustrine open water and emergent mix
PEM/FO = Palustrine emergent and forested mix
PFO/SS = Palustrine forested and scrub/shrub mix
PSS/FO = Palustrine scrub/shrub and forested mix

Appendix E-4. Altamont Special-Status Plant Species

Appendix E-4

SPECIAL-STATUS PLANT SPECIES WHICH POTENTIALLY OCCUR ALONG THE ALTAMONT PROJECT ROUTE IN MONTANA AND WYOMING

Scientific and Common Names	Listing Status [a]	Distribution	Habitat
MONTANA			
Erioganum brevicaule var. *canum* Wild buckwheat	C2	Carbon County, Montana	Limestone
WYOMING			
Antennaria arcuata Meadow pussytoes	C2	Fremont County	Moist soils in sagebrush/grassland
Arabis pusilla Small rockcress	C2	Fremont County	Coarse, rocky soil
Arabis williamsii var. *williamsii* William's rockcress	C2	Widespread in northcentral, central, and southwest Wyoming	Sagebrush/grassland
Cryptantha subcaptitata Owl Creek miner's candle	C2	Fremont County	Rocky slopes with juniper
Lesquerella fremontii Fremont's bladderpod	C3	Fremont County	Crevices in limestone
Phlox pungens Beaver Rim phlox	C2	Fremont County	Dry desert hills
Rorippa calycina Persistent sepal yellowcress	C2	Northwest and central Wyoming and Carbon and Albany Counties	Sandy edges of reservoir and ponds

a U.S. Fish and Wildlife Service (55 FR 6184-6229, February 21, 1990):

C2 = A candidate species under review for federal listing. Category 2 includes species for which the USFWS presently has some information indicating that proposing to list them as threatened or endangered is possible but for which further biological research and field study are needed to determine biological vulnerability and threats.

C3c = Plants previously considered candidates and included on past lists, but currently too widespread or not threatened and presently not considered for listing.

Note: Montana and Wyoming do not have Endangered Species Acts.

Appendix F. Fisheries

Appendix F-1. PGT's Proposed Moyie River Pipeline Crossings: Construction, Mitigation, Restoration Plan

PGT-PG&E
Pipeline Expansion Project

MOYIE RIVER PIPELINE CROSSINGS

CONSTRUCTION MITIGATION RESTORATION PLAN

February 1991

Prepared by
Pacific Gas Transmission Company
Pacific Gas and Electric Company

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MOYIE RIVER CROSSINGS

CONSTRUCTION, MITIGATION, AND RESTORATION PLAN

Prepared by
Pacific Gas Transmission Company
and
Pacific Gas and Electric Company

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TABLE OF CONTENTS

LIST OF FIGURES

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SUMMARY

Beginning at the Canadian border, the initial twenty miles of the proposed PGT-PG&E Pipeline Expansion Project crosses the Moyie River in Idaho eight times. The proposed 42-inch natural gas pipeline will be adjacent and parallel to the existing PGT pipeline and will be constructed in the existing right-of-way. Because of the sensitivity of the Moyie River Valley and its natural resources, this Construction, Mitigation, and Restoration Plan was developed to reduce and mitigate the potential effects of pipeline construction at the stream crossings.

Studies conducted to prepare this plan have determined that standard procedures for construction, mitigation, and restoration can be used in most areas. Special techniques will be used at some crossings to deal with unique resources, such as wetlands. Consultations with Federal Energy Regulatory Commission staff; US Forest Service; Idaho Department of Fish and Game; US Department of Agriculture, Soil Conservation Service; and US Army Corps of Engineers, Walla Walla District have led to suggestions which have been incorporated into the plan. Continued agency consultation will be requested.

Based upon evaluation of the long term effects of the original 1960 pipeline construction and the natural regrowth of vegetation at the eight crossings, the implementation of this plan should result in complete restoration of the environment at the crossings. PGT is also proposing to enhance fish habitat in the Moyie River by implementing a Fishery Enhancement Conceptual Plan (Appendix B of this document). In the event preferred rock structure sites as depicted in the Plan are not available, PGT will pursue alterntive placement locations. As a consequence, the Project should result in a net benefit to the environment in the Moyie valley.

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I. INTRODUCTION

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I. INTRODUCTION

In December 1988 Pacific Gas Transmission Company (PGT) and Pacific Gas and Electric Company (PG&E) filed an application with the Federal Energy Regulatory Commission (FERC) to construct the PGT portion of the PGT-PG&E Pipeline Expansion Project. The FERC released a Draft Environmental Impact Statement for public review in January, 1991.

This project will expand the capacity of the existing PGT-PG&E transmission system to deliver additional supplies of natural gas to ready markets in the Pacific Northwest and California. The expected operational date is November 1993, with construction planned to begin in early 1992.

The route for the proposed pipeline, which travels from the International Boundary near Kingsgate, British Columbia to Fresno County, California, parallels the PGT Alberta-California Pipeline constructed in 1960. By utilizing the existing rights-of-way, the Expansion Project will minimize environmental impacts and potential land use conflicts.

This report focuses on the Moyie River Valley in the Idaho panhandle (Figure I-1) where the parallel pipeline will cross the Moyie River eight times in a 20-mile stretch (Figure I-2). Because of this area's environmental sensitivity, it is important that construction is planned and conducted in a way that will avoid or minimize impacts to sensitive resources.

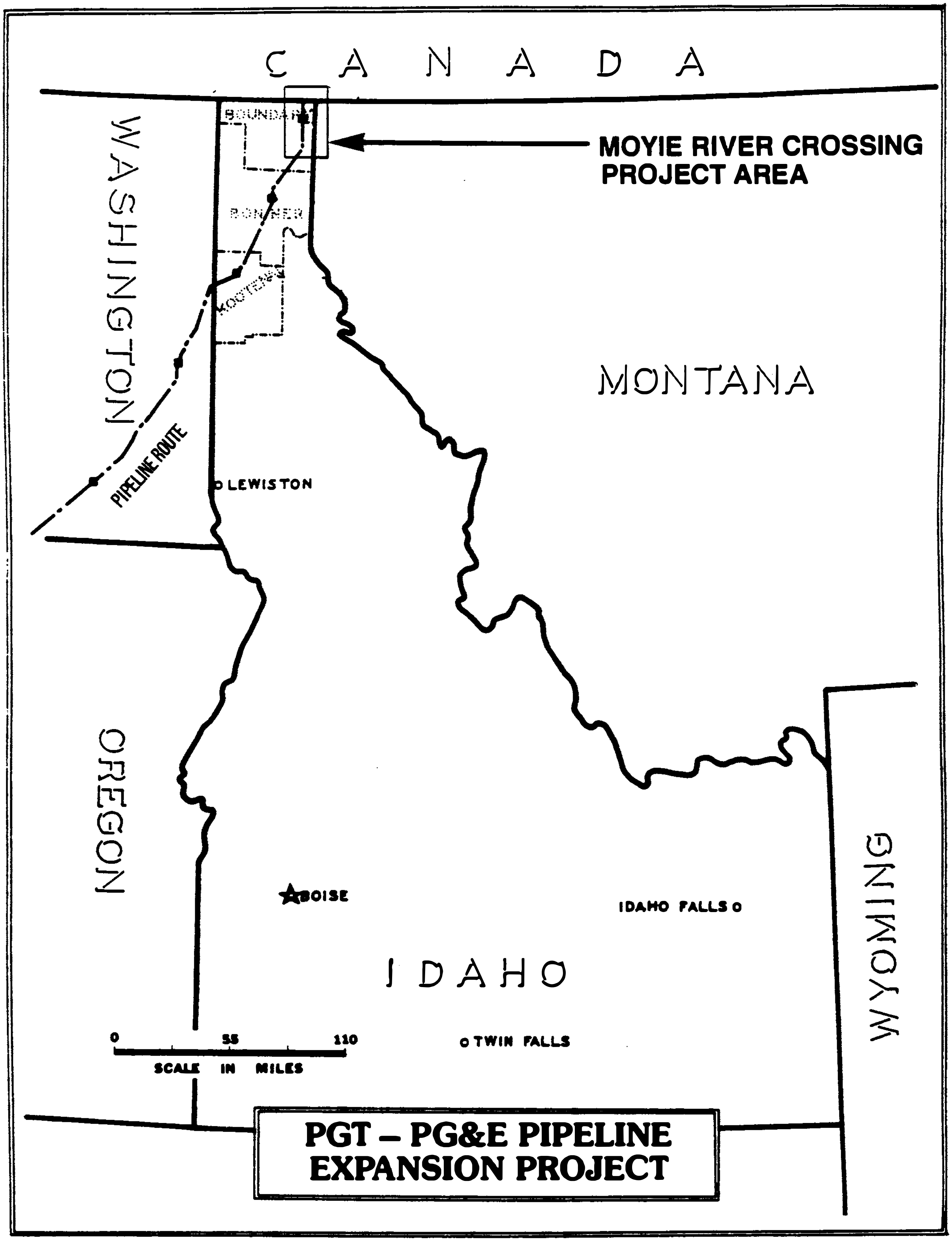
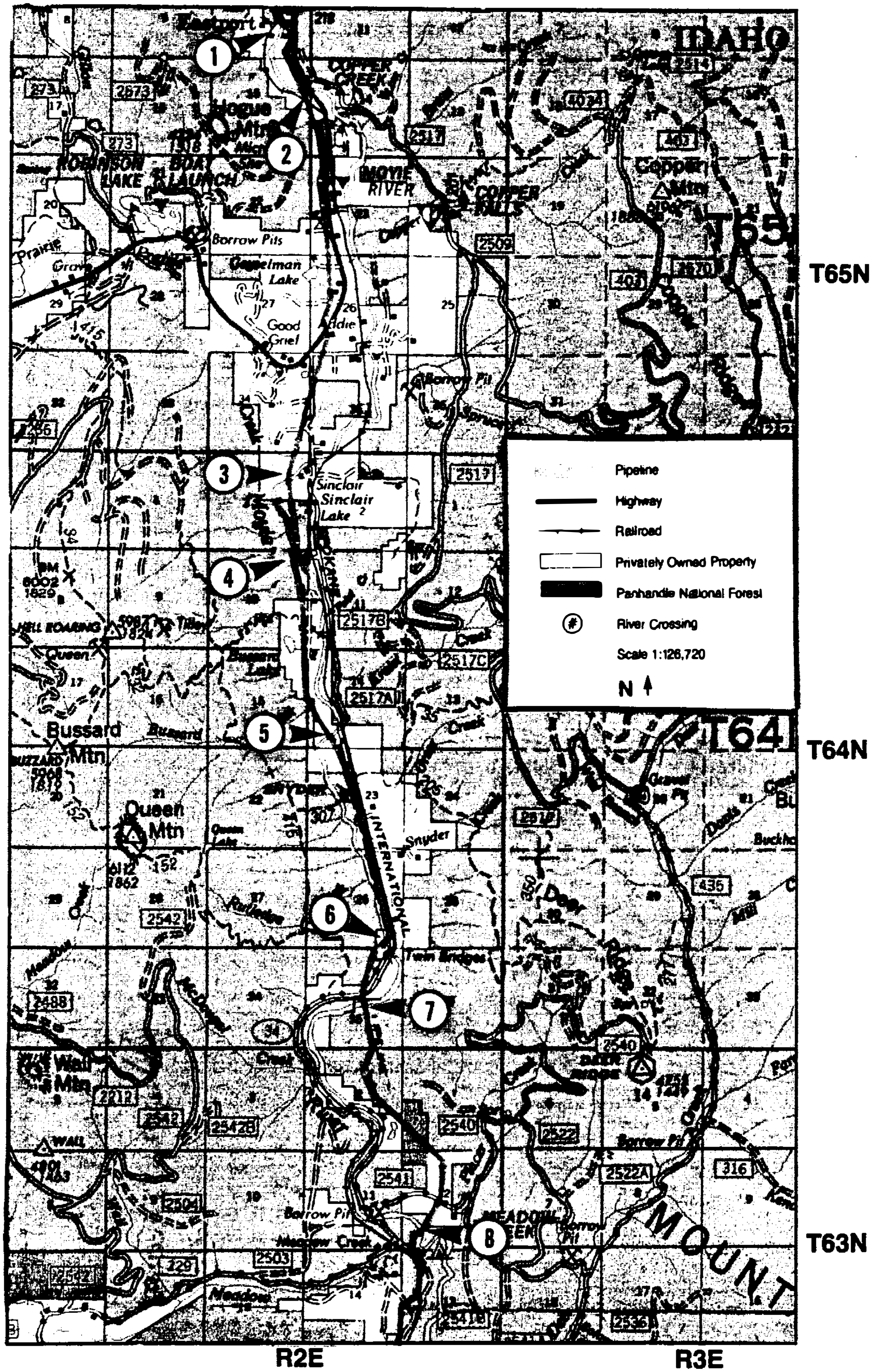

CANADA
MOYIE RIVER CROSSING
PROJECT AREA
BOUNDARY
BONNER
KOOTENAI
WASHINGTON
MONTANA
PIPELINE ROUTE
LEWISTON
OREGON
BOISE
IDAHO FALLS
IDAHO
WYOMING
0
55
110
SCALE IN MILES
TWIN FALLS
PGT – PG&E PIPELINE
EXPANSION PROJECT

FIGURE I-1



MOYIE RIVER PIPELINE CROSSINGS

FIGURE 12

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II. THE MOYIE RIVER - EXISTING SETTING

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II. THE MOYIE RIVER VALLEY - EXISTING SETTING

TOPOGRAPHY

The Moyie River Valley stretches from the Canadian border in eastern British Columbia south into the Panhandle National Forest in northeastern Idaho. The Moyie River cuts through the steep-sloped Cabinet Mountains to form a narrow valley.

The valley floor averages just over 2,500 feet in elevation at the north end and about 2,300 feet at the south end. The river valley is almost flat in its northern part; its floodplain averages one-third mile in width. The southern part of the valley is a more rugged, narrow canyon which averages less than 1000 feet in width.

Pipeline Crossings 1 through 7 are located in the upper Moyie River Valley; pipeline Crossing 8 is located farther south where the valley narrows and the river gradient increases significantly.

WATER RESOURCES

Moyie River

In the upper Moyie Valley in the vicinity of Crossings 1 through 7, the river flows slowly with a gradient ranging from 13 to 16 feet per mile. The average water velocity at these crossings is estimated at approximately one to two feet per second. During the summer and fall, water depth is estimated at two to three feet and the width of the river ranges from 60 to 140 feet.

The substrate at the first seven crossings consists of large cobbles six to twelve inches in diameter. Deposits of large cobbles are exposed on the banks at Crossings 4 and 5 while the remaining crossings are generally vegetated to the water's edge.

The gradient at Crossing 8 increases substantially to approximately 100 feet per mile. The average water velocity at this crossing is in excess of two feet per second. The water depth is less than two feet. In addition to a cobbled substrate, the streambed at Crossing 8 is dotted with boulders, resulting in a choppy water surface.

Snyder Creek

Snyder Creek, a tributary to the Moyie River, crosses the right-of-way just north of Crossing 6. It is approximately 25 feet in width. The creek channel has been altered at the proposed crossing by previous railroad, highway and pipeline construction. The significance of this creek as a fish habitat will be discussed in the Fisheries Section.

Bussard Creek

Bussard Creek flows into the Moyie River north of Crossing 5. It is approximately 10 feet in width. The significance of this creek as a fish habitat will be discussed in the Fisheries Section.

VEGETATION

Forestlands

In the study area the right-of-way traverses two major plant associations: mixed conifer forest and lodgepole pine forest. Both associations are dominated by evergreen coniferous tree species including lodgepole pine, Douglas fir, white fir, and western red cedar. Mixed conifer forests generally occupy sites that are more moist than lodgepole pine forests; mixed conifer forests tend to be found in lowland areas.

Riparian Communities

Riparian communities which consist largely of deciduous, broad-leaved trees are present at the river crossings. Species characteristic of these communities include: black cottonwood, birch, mountain alder and willow.

Wetlands

PGT-PG&E is conducting a wetlands delineation of the right-of-way with an expected completion date of early June. Until the delineation is complete and approved by the Corps of Engineers, the exact location of wetlands cannot be defined. However, two recorded wetlands identified United States Fish and Wildlife Service (USWFS) National Wetland Inventory (NWI) are crossed by the right-of-way and two additional wetland areas identified in the NWI lie adjacent to it. These wetlands are shown in Part III on the topographic maps provided for each of the eight crossings.

The two recorded wetlands crossed by the right-of-way are located at Crossings 1 and 7. At Crossing 1 along the south side of the river, there is a wetland area approximately 100 feet in length which has been classified as a palustrine broad-leaved deciduous forest that is seasonally flooded (PF01C). Along the north bank of the Moyie at Crossing 7, a wetland of approximately 350 feet in length is classified as palustrine broad-leaved deciduous scrub-shrub that is seasonally flooded (PSS1C).

In addition the proposed pipeline runs adjacent to two other wetlands near Crossings 3 and 6. On the north bank of the river north of Crossing 3, a wetlands area classified as a palustrine persistent emergent that is seasonally flooded (PEM1C), exists adjacent to the pipeline for approximately 250 feet. At Crossing 6 a wetlands area classified as a palustrine needle-leaved evergreen forest that is temporarily flooded (PF04A) is located approximately 100 feet along the east bank of the river next to the right-of-way.

Rare, Threatened or Endangered Plant Species

The Idaho Natural Heritage Program Database has not listed any known occurrences of rare, threatened, or endangered plant species within the right-of-way in the Moyie River Valley. However, the following special status plant species were found on or near the right-of-way in the Moyie River valley:

Podgrass, or American scheuchzeria, (Scheuchzeria palustris var. americana) was found one-quarter mile east of the right-of-way near M.P. 5.8.

Yellow sedge (Carex flava) was located partly within the right-of-way near M.P. 5.9.

Pacific rush (Juncus effusus var. pacificus) was found partly within the right-of-way near M.P. 5.9 and near M.P. 7.8.

Black snake-root (Sanicula marilandica) was found 500 feet east of the right-of-way near M.P. 10 and partly within the right-of-way near M.P. 9.8.

An individual Victoria's grape fern, or Mingan moonwort, (Botrychium minganese) was found in the right-of-way near M.P. 18.4.

FISHERIES

The Moyie River

The Moyie River supports a recreational fishery for residential rainbow and west slope cutthroat trout. Bull trout are native to the drainage and are found in limited numbers in the river, mainly in deep pool habitat. Occasionally, bull trout are caught by anglers. Anadromous species do not enter the river due to the dam constructed just above the confluence of the Kootenai and Moyie Rivers.

The Moyie River drainage is very large, encompassing approximately 570 square miles. Approximately 90 percent of the watershed is located in Canadian Rocky Mountains. Because of the size of the drainage, when spring thaw occurs, very high flows fill the river. The highest flows on record occurred on June 16, 1916, when the river was flowing at a rate of 10,600 cfs.

The trout fishery in the Moyie River is in a somewhat degraded condition. By the time river enters the United States at Eastport, Idaho, it has become, for most of the year, a slow-moving, wide, and rather shallow river. This upper section is characterized by run/glide and shallow riffle habitats. The river is somewhat monotypic with respect to habitat. Trout habitat is somewhat limited because pools and object-cover are relatively scarce. However, the Moyie does provide some suitable habitat for juvenile and adult trout that, for the most part, originate in tributary streams or, otherwise, are planted..

Most of the stocked rainbow trout are planted in the upper river above Meadow Creek. Trout planting is required more in the upper river, because most of the spawning tributaries which account for trout recruitment in the Moyie River are located in the middle to lower portion of the affected reach.

Below Meadow Creek, near Crossing 8, the Moyie River is characterized as low gradient riffle habitat. In the vicinity of Crossing 8, larger substrate elements, many of them boulders, create limited cover for juvenile and adult trout. This river section supports small populations of wild and stocked rainbow trout and westslope cutthroat trout populations. In deeper water areas, bull trout may also be present.

Meadow Creek

Meadow Creek, a stream with great potential as a spawning tributary to the Moyie River, is a source of few or no young trout to the main river. An impassable culvert which conveys Meadow Creek under a railroad line is located just upstream of the Moyie River confluence. According to Idaho Panhandle National Forest personnel, Moyie River trout are denied access to approximately 12 miles of spawning habitat due to the blockage of the culvert.

Snyder Creek and Bussard Creek

Along the upper Moyie River, the right-of-way crosses two tributary creeks, Snyder Creek and Bussard Creek. These small streams provide spawning and rearing habitat for Moyie River rainbow and cutthroat trout. According to Milo Meioli, fishery biologist for Idaho Fish and Game, these small streams are especially important to westslope cutthroat trout for spawning. Moyie River rainbow trout would prefer to use larger tributaries, such as Meadow Creek. Westslope cutthroat trout have a higher survival and recruitment rate into mainstem rivers when they do not have to compete with rainbow trout for spawning space.

Snyder and Bussard creeks also contain resident populations of trout, including brook trout. Most of the resident fish are somewhat stunted in size because of the extremely low flows that occur in these streams in late summer and fall.

Rare, Threatened, or Endangered Aquatic Species

The Idaho Natural Heritage Program Database has not listed any known occurrences of rare, threatened, or endangered aquatic species within the area. The Idaho Panhandle

National Forest has listed three fish species which they consider to be sensitive species. They are the westslope cutthroat, wild rainbow, and bull trout. PGT and PG&E is preparing biological evaluations for these three fishes at the request of the Forest.

WILDLIFE

Several amphibian species have the potential to occur in this area, especially where aquatic habitats occur. These include the long-toed salamander, western toad, and pacific treefrog.

Few reptiles are adapted to the cold, moist climate characteristic of this region. Those that may occur in the area include the western skink, western terrestrial garter snake, and common garter snake.

The forests which dominate this area provide habitat for a large number of resident and migratory birds including red-tailed Steller's jay, mountain chickadee, dark-eyed junco, and pine siskin.

Mammals potentially occurring in the area include deer mouse, porcupine, raccoon, mule deer, elk and mountain lion.

Rare, Threatened, or Endangered Animal Species

In 1990 PGT conducted surveys for a number of rare, threatened, endangered animal species that potentially inhabit the area of the proposed route. In addition, the Idaho Natural Heritage Program Database lists known occurrences of rare, threatened or endangered animal species. The results of the 1990 survey and known occurences within two miles of the proposed route that are listed in the INHPD are identified below:

Gray Wolf (Canis lupus). Observed in 1978 near M.P. 2 approximately one and one-half miles west of the right-of-way and in 1984 near the town of Good Grief. A gray wolf was heard howling one and one-half miles from M.P. 2.5 in the 1990 survey.

Coeur d'Alene salamander (Plethodon idahoensis). Observed in 1987 near M.P. 2 approximately 1.5 miles east of the right-of-way near Copper Falls and in 1989 one and one-half miles west of the right-of-way near M.P. 4.75. None were found in the 1990 survey.

Wolverine (Gulo gulo). Observed in 1953 near M.P. 3.25 approximately one quarter mile east of the right-of-way and in 1965 one and three-quarter miles east of the right-of-way near M.P. 4.5. None were observed in the 1990 survey.

Bald Eagle (Haliaeetus leucocephalus). Observed in 1986 near M.P. 20 approximately one-half mile east of the proposed route. In the 1990 survey, a bald eagle nest was found one and one-half miles west of the M.P. 2 and two bald eagles were observed roosting in this area. Bald eagles were observed foraging near M.P. 2.5, one-half mile east of M.P. 3.5, and near M.P. 7.3.
Harlequin duck (Histrionicus histrionicus) has been reported in 1989 within the right-of-way at M.P. 10.5 and 1,320 feet of the right-of-way at M.P. 15.25.

Other Special-Status Animal Species

In addition, the following observations were made in the 1990 surveys:

The red-tailed hawk (Buteo jamaicensis) was observed in flyovers at M.P. 3.2, M.P. 5.0, and M.P. 10.5.

The Cooper's hawk (Accipiter cooperii) was observed in flyovers at M.P. 5 and M.P. 10.5.

The Osprey (Pandion haliaetus) was observed in flyovers at M.P. 5, M.P. 13.6, and M.P. 16.5. An inactive nest was observed 3,000 feet west of the right-of-way and an active nest at 2,000 feet east of the right-of-way at M.P. 15.5.

The American kestrel (Falco sparserius) was observed in flyovers at M.P. 4, M.P. 10.6, and M.P. 16.5.

RECREATION

In addition to the fishing activities discussed previously, during the summer months of July and August, the Moyie River offers other recreational opportunities including rafting, kayaking and canoeing.

III. CONSTRUCTION PROCEDURES

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III. CONSTRUCTION PROCEDURES

The construction of pipeline river crossings follows a carefully planned procedure which consists of: a complete survey of the crossing contours; clearing the right-of-way and temporary work area; assembling the pipeline crossing section; testing the section; excavating the trench across the river; installing the pipeline section; backfilling the trench; and recontouring the right-of-way. This sequence is described in the following paragraphs. PGT proposes to comply with FERC's "Stream and Wetland Construction and Mitigation Procedures."

Site-specific details regarding the construction of the eight river crossings are noted in Part IV. A photograph and a United States Geological Survey (USGS) topographic map of each crossing area are also provided.

SURVEY

Along the proposed route, the area in the vicinity of each crossing is carefully surveyed to determine the surface contour of the river and its banks. It is from this survey that the slope of the new pipe section will be determined.

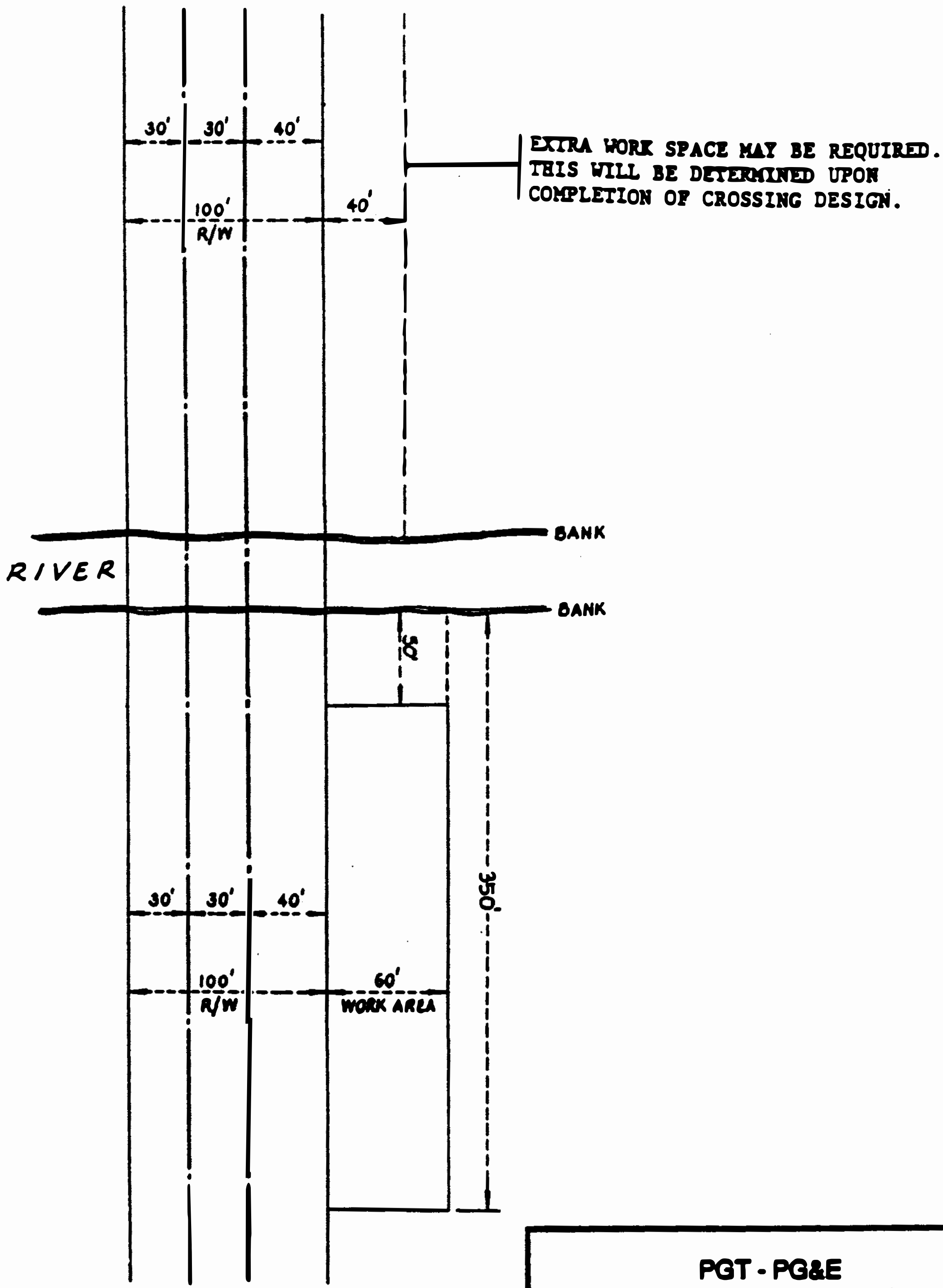
CLEARING

The right-of-way will be cleared of vegetation on the north and south banks of each crossing to provide adequate work space for construction equipment. In the Panhandle National Forest the combined widths of the rights-of-way for the existing and proposed new pipeline is 76.5 feet. (53 feet for the existing pipeline and an overlapping and offset 53.5 feet for the new pipeline.) The width of the right-of-way on private land is 100 feet.

At each crossing an additional area will be cleared on one side of the river, 50 feet away from the water, adjacent to the cleared right-of-way. This area will be used for a temporary work space to assemble the pipeline crossing section. The overall work area required, including the pipeline right-of-way, will be 160 feet wide and 300 feet long. (Figure III-1 illustrates the dimensions of a typical temporary work area.) The locations of the temporary work areas for each crossing are shown on the USGS maps provided in Part IV.

ASSEMBLY

Each river crossing section is made from high strength, heavy wall steel pipe. The pipe is 42 inches in diameter. The crossing section will be made to conform with the proper



PGT - PG&E
PIPELINE EXPANSION PROJECT

Typical Temporary Work Area Configuration at River Crossing Locations
N. T. S.
FIGURE III - 1

slope and length of the river crossing. The total length of each pipeline crossing section will be approximately 200 feet. This length is typically determined by high water zone. The pipe will be brought to the temporary work area in sections and welded together to obtain the proper length for each crossing. All welds will be examined by x-ray and by visual inspection. After completion of the weld examination, the pipe section will be concrete coated to provide negative buoyancy and protection to the pipe.

Next the crossing section will be hydrostatically tested to a pressure which is a minimum of 90% of the specified minimum yield strength of the steel pipe. The purpose of this test is to verify the integrity of the piping materials and welds. The welded areas will then be coated with concrete to add weight and protection to the joint. The river crossing section is then ready for placement in its trench.

EXCAVATION

The trench will be excavated across the river using a backhoe and/or clamshells. The trench depth will be sufficient to place the top of the pipeline below scour line of the river bed at each crossing. In no case will the depth of the cover over the pipe be less than six feet. This will result in a minimum trench depth of 10 feet. The width of the trench at the top will be determined by the soil conditions and the depth of the trench. (Diagrams of typical crossing profiles are shown in Figure III-2.)

If large boulders or rock outcroppings are encountered, it may be necessary to blast the trench through the rock. Blasting may be required at Crossings 7 and 8.

Trench plugs will be left at streambanks to protect upland portions at the trench. Excavated materials will be placed in the river over the working area. Construction equipment will cross the stream using either equipment pads and culverts, clean rockfill and culverts, flexi-floats, or portable bridges. Sediment filter devices will be used to control siltation.

Trenches adjacent to the streambanks will be dewatered in a manner so as to avoid silt-laden water discharge into the stream, such as hay bales or other suitable natural or man-made filters.

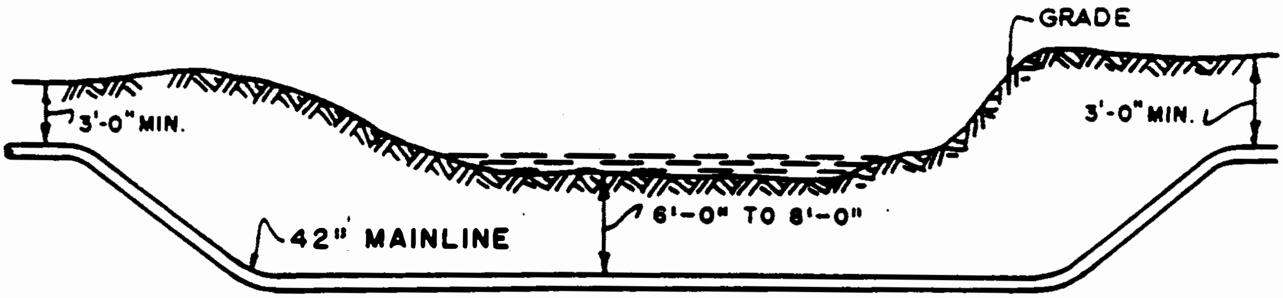
INSTALLATION

When the trench is ready, the pre-built and tested pipe section will be lifted and carried to the trench by a series of sideboom tractors. The section will then be laid into the trench.

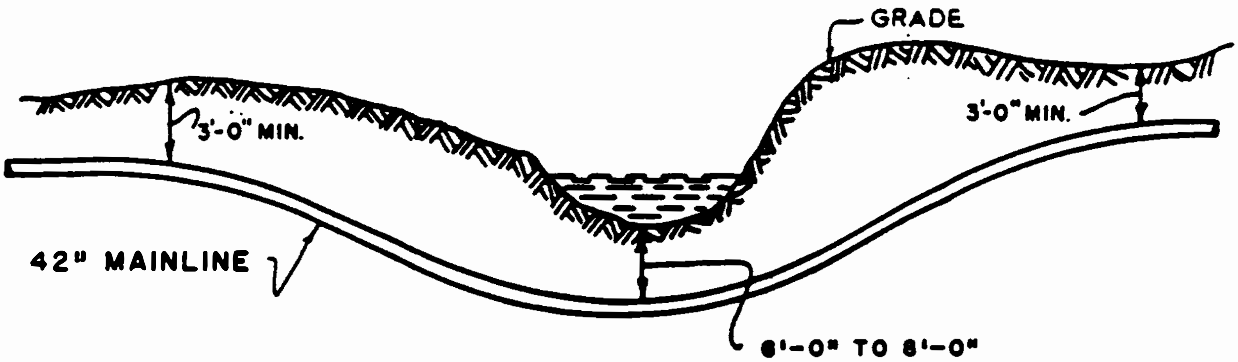
BACKFILLING

After the pipe has been placed into the trench, backfilling will begin. Materials excavated from the trench will be placed over the pipe section using bulldozers or other digging equipment. Excess materials from the trench will be spread and blended into the existing stream banks.

At this point, the river crossing construction is complete. The pipeline sections on either side of the river crossings will now be welded to the river section and backfilled. The entire pipeline section including the river section will be hydrostatically tested as a single section to further verify the integrity of the pipeline. This second hydrostatic test will verify that the river crossing section was not damaged during installation.



TYPICAL DOUBLE SAG CROSSING



TYPICAL SINGLE SAG CROSSING

NOTE:

1. NORMALLY, USE SINGLE SAG CROSSING WHERE IT IS POSSIBLE TO MAINTAIN MINIMUM COVER AND WHERE THERE IS NO EVIDENCE OF CAVING BANKS, WASH, SCOUR, OR SHIFTING BOTTOM.

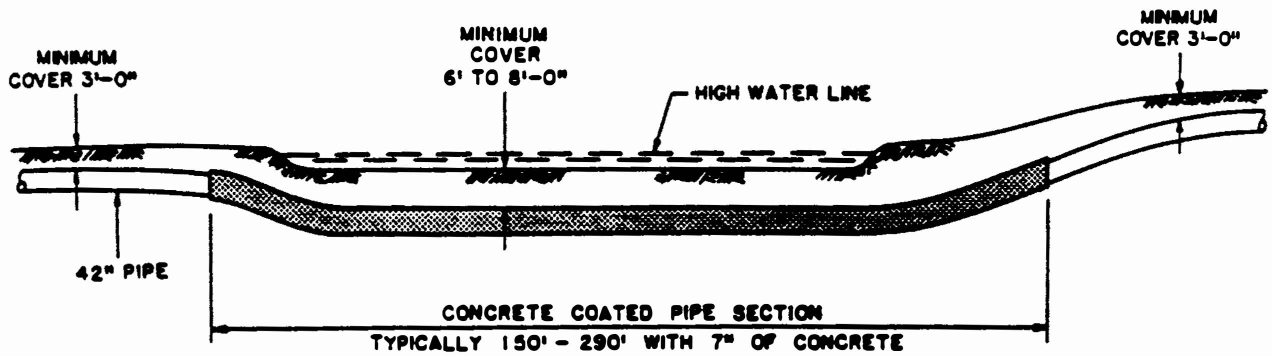
2. NORMALLY, USE DOUBLE SAG CROSSING WHERE WIDTH PROHIBITS USE OF SINGLE SAG OR WHERE BANKS ARE WASHING AND PIPELINE MUST BE CARRIED INTO THE BANKS TO MAINTAIN MINIMUM COVER.

PGT - PG&E
PIPELINE EXPANSION PROJECT

Typical River Crossing Profile

FIGURE III - 2

Page 1 of 2



NOTE: THE ACTUAL SHAPE OF THE PIPE SECTION AND DEPTH OF COVER OVER THE PIPE IN THE RIVER CROSSING AREA WILL BE CONFIRMED DURING THE FINAL DESIGN OF THE CROSSING.

SCALE : NONE

PGT - PG&E
PIPELINE EXPANSION PROJECT

Typical River Crossing Profile

FIGURE III - 2

Page 2 of 2

BANK RECONTOURING AND RESTORATION

Upon completion of construction activities, the river banks, cleared right-of-way and temporary work area will be restored to their original contours. The river bed will be restored to maintain the original gradient. Cobble removed during construction will be replaced along the river bottom to recreate the protective "armoring" which minimizes erosion.

In addition to recontouring, the river banks will be stabilized where necessary by placing cobbles from the excavation along the water's edge. Topsoil removed from areas adjacent to the river will be replaced to promote rapid revegetation of these riparian areas. FERC procedures for bank stabilization an revegetation will be followed. Erosion control, revegetation and restoration are discussed further in Appendix A.

MONITORING

Construction Monitors

During construction, PGT will monitor construction activities to ensure compliance with all mitigation requirements contained in this plan, the Final Environmental Impact Statement, the Temporary Use Permit for construction on federal lands, and other permit requirements. Monitors will be fully qualified for the tasks they are assigned, and will include, as necessary, biological, cultural resources, and reclamation specialists.

Fishery Enhancement Monitoring

Prior to construction of the rock drop structures, PGT will document stream channel morphology at each of the final structure locations. PGT will also conduct a snorkeling survey of the entire river reach between the first and last crossing to note pre-construction fish species composition and numbers.

After construction, PGT proposes to conduct annual monitoring for three years to assess the structures as habitat utilization for trout. The monitoring will consist of snorkeling surveys to document changes in channel morphology, fish species composition, and fish population. Copies of the annual monitoring report will be distributed to interested agencies.

CONSTRUCTION STANDARDS AND SCHEDULES

Due to special circumstances involved in constructing river crossings, the construction standards are more rigorous. Heavier wall pipe is used, and each weld is carefully radiographed. The hydrostatic test pressure used to test the river crossing section is higher than that used for the connecting pipeline due to the heavy walled pipe. All work is performed according to strict federal requirements as defined in Department of Transportation regulations in Title 49 Code of Federal Regulations Section 192. Construction of the river crossings will comply with FERC procedures contained in Appendix C.

Construction of the crossings will take place in July, August, and September of 1992 to minimize impacts to the fish population and to decrease the potential for erosion which can occur during winter rain and snow storms. The duration of time for installing each crossing is five to seven days for streams greater than 100 feet. Streams less than 100 feet will be trenched and backfilled within seventy-two hours according to FERC procedures. Depending on the number of crews that are assigned to the area, one or more crossings may be constructed during the same five to seven day time period.

IV. THE EIGHT MOYIE RIVER CROSSINGS

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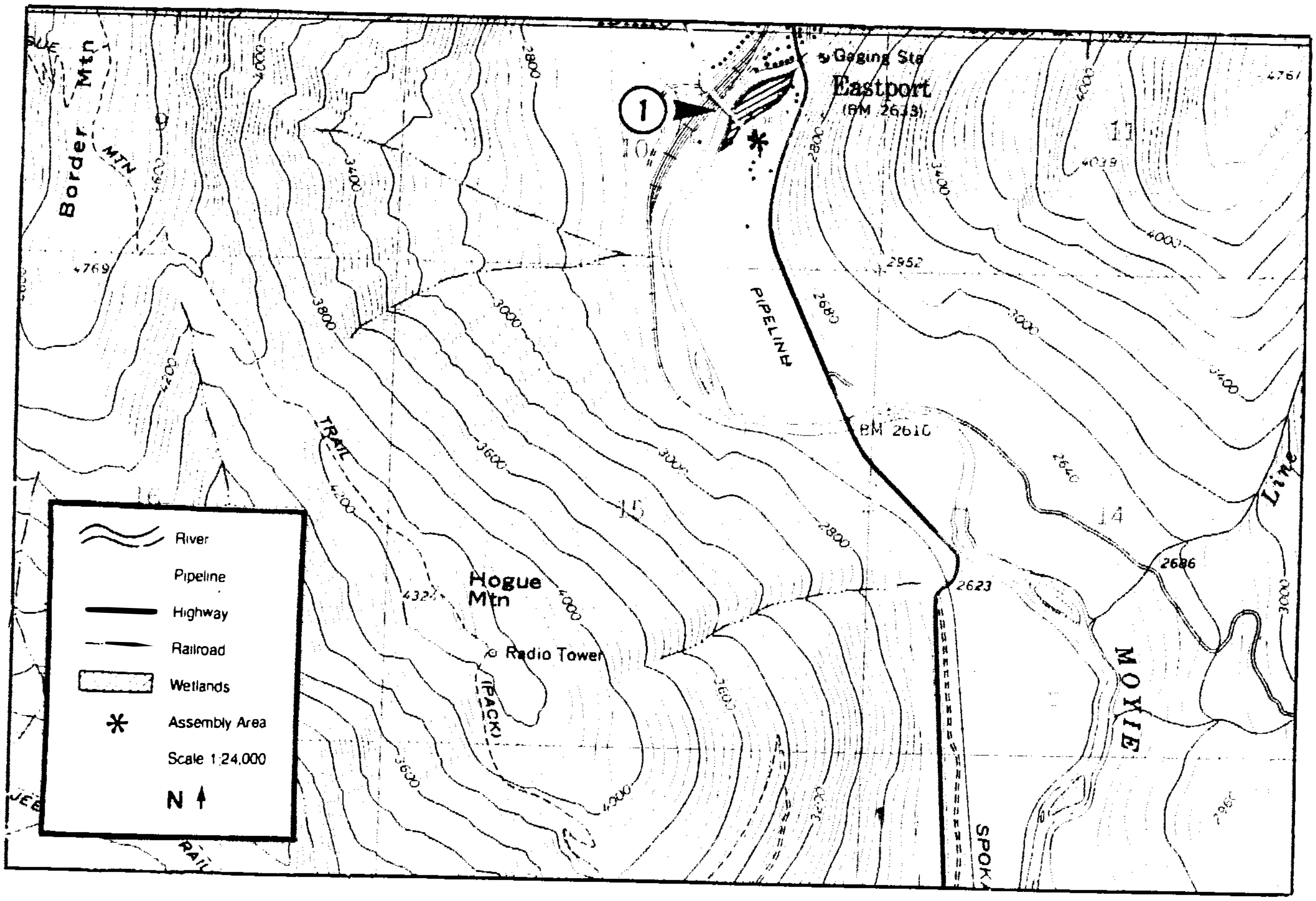
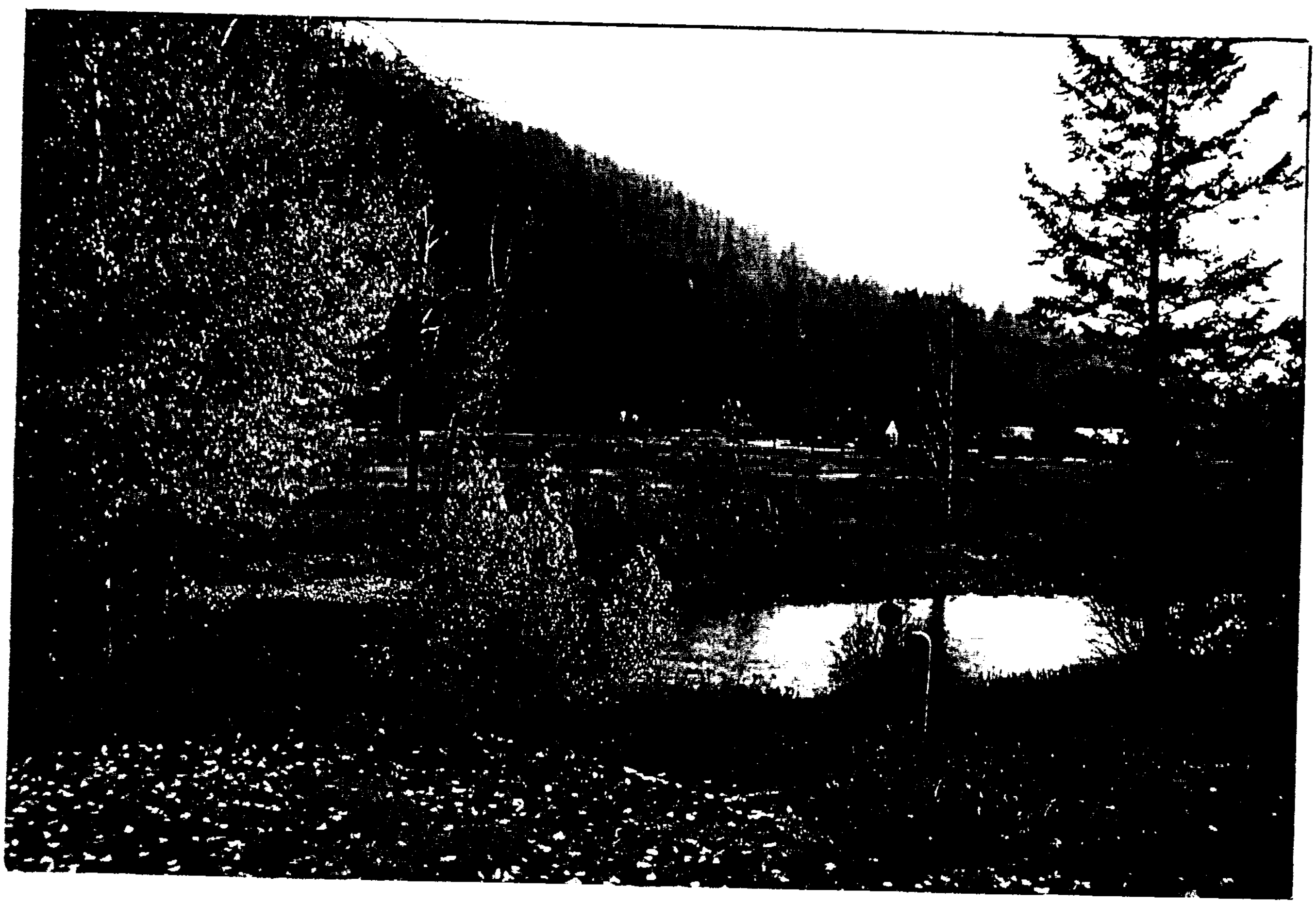
IV. THE EIGHT MOYIE RIVER CROSSINGS

In the following section each river crossing is described in terms of the existing conditions, the construction process, and the mitigation and restoration work planned for the crossing.

Whenever standard construction, mitigation and restoration practices will be used, this has been noted. Standard construction procedures and restoration and mitigation methods were presented in detail in Part III, The Pipeline Construction Process and in Appendix A, the Mitigation and Restoration Plan. Whenever the construction, restoration and mitigation practices at a river crossing differ substantially from the standard procedures, the variation is described in this section. A photograph and a USGS topographic map of each crossing follows.

MOYIE RIVER - CROSSING 1





MOYIE RIVER CROSSING #1 VIEW SOUTH

FIGURE IV-1

CROSSING 1

A. EXISTING CONDITIONS

River Configuration

River width: 60 feet.
Depth: two to three feet during summer and fall.
Velocity: one to two feet per second.
Bed: 6 to 12 inch cobble.

River Banks

North: Stable. Bank height: 15 to 20 feet. From river abrupt rise to a terrace five feet above the channel and 25 feet wide; then rises 10 feet to U.P.R.R. railroad lines.

South: Stable. Bank Height: seven to ten feet. Adjacent open field is PF01C wetland.

Access to Crossing

North: Railroad right-of-way.
South: Highway 95 via open field (primary access).

Adjacent Ownership

North: Private.
South: Private.

B. CONSTRUCTION

Clearing

North: Minimal clearing. Several trees adjacent to bank will be removed.

South: Up to 360 square feet of vegetation will be removed for Temporary Assembly Area and Pipe Storage Area. Storage Area will be adjacent to wetland.

Assembly

Standard Procedure.

Excavation

Because of railroad tracks on right-of-way along north side of crossing, it will be necessary to bore under tracks. A larger trench on north bank will be necessary to accommodate pipeline tie-in.

Installation

Standard Procedure with the exception of north bank discussed above.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure. Recontour wetland near south bank to recreate original hydraulic conditions.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan

Revegetation

Seeding: Reseed north and south banks including wetland on south bank with native seed. Use agency seeding mix in upland areas (see Appendix A). Cuttings of riparian woody species will be collected and propagated in the nursery. The site-specific plants will be replanted during the revegetation phase.

Planting: Wild Rose, Rocky Mountain Maple, Wild Plum, Mountain Alder, Black Cottonwood. The number and species used depends on site conditions including wetland delineation information, and availability at the time of construction. Cuttings of riparian woody species will be collected. Specific plants will be replanted during the restoration phase.

Erosion Control

Stabilize north and south banks by applying straw mulch and seeding with native seed or agency seed mixes. Water checks, hay bales, or silt fencing will be used to prevent sedimentation into stream.

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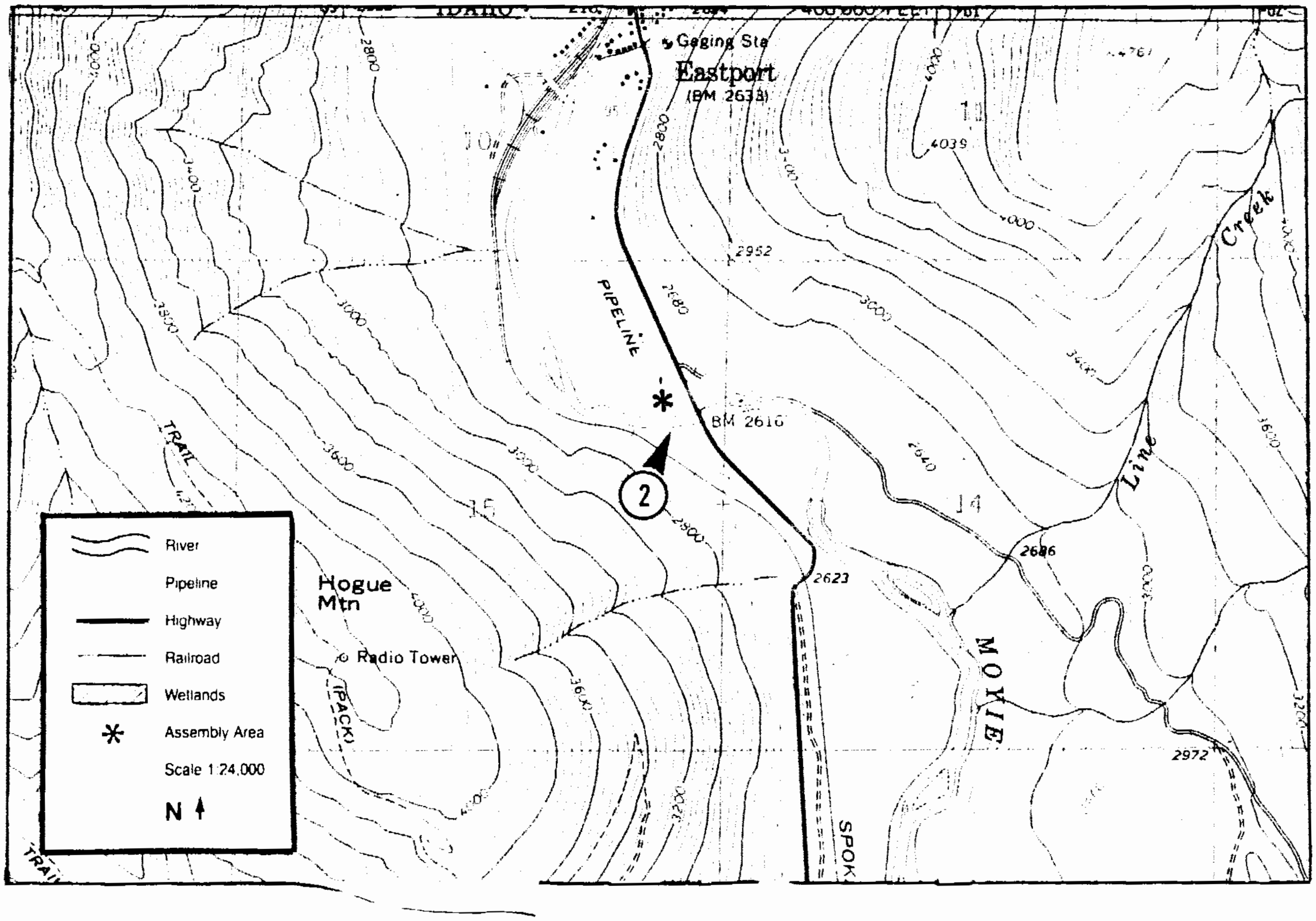
MOYIE RIVER - CROSSING 2



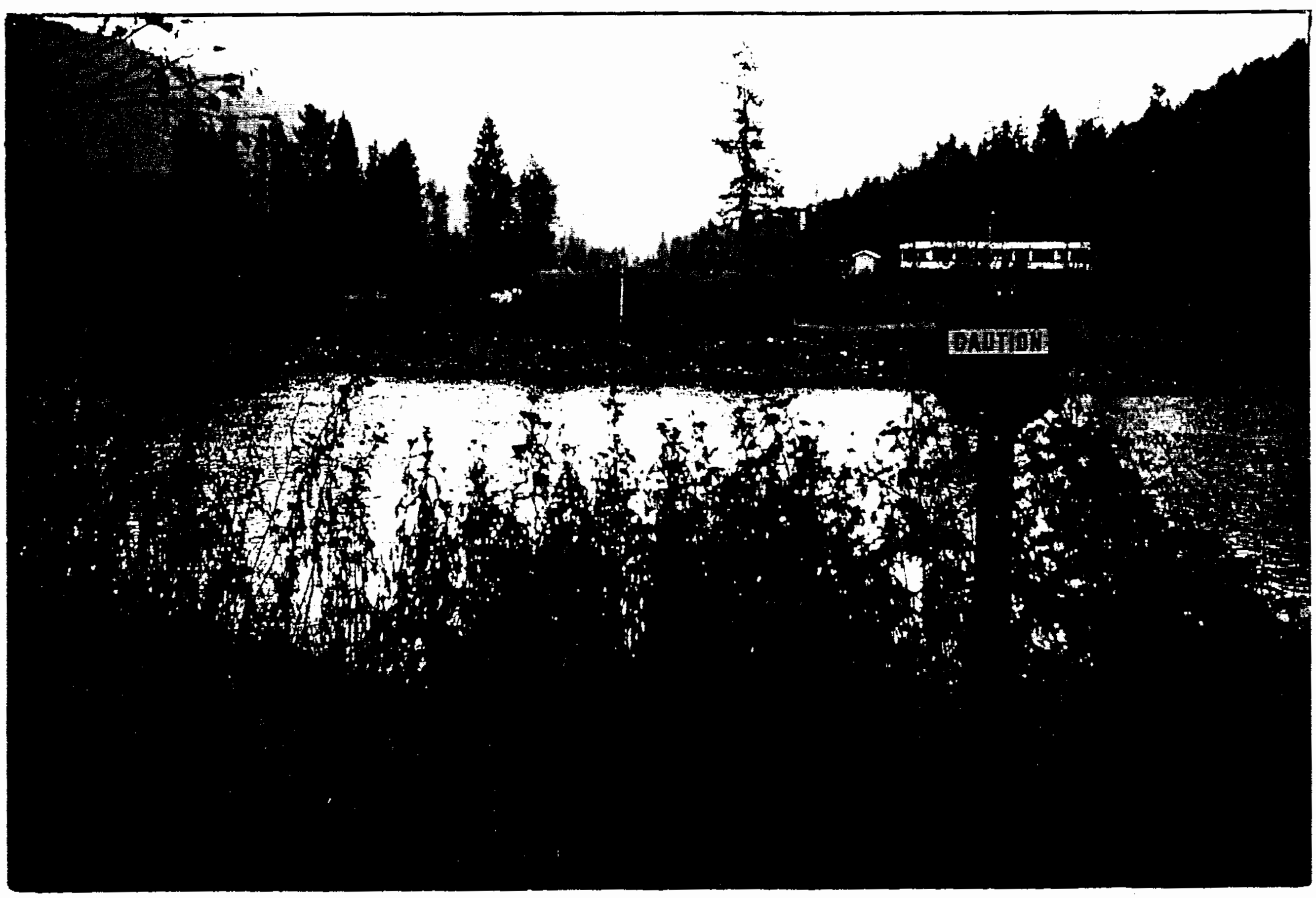


FIGURE IV-2

MOYIE RIVER CROSSING #2 VIEW NORTH

MOYIE RIVER - CROSSING 2

A. EXISTING CONDITIONS

River Configuration

Width: 100 feet.
Depth: one to two feet during summer and fall.
Velocity: one to two feet per second.
Bed: 6 to 12 inch cobble.

River Banks

North: Stable. Bank height: three to four feet. Open field extends to river.

South: Stable. Bank height: five feet. Vegetation and trees extend to river.

Access to Crossing

Highway 95 through open field on north side of crossing.

Adjacent Ownership

North: Private.
South: Private.

B. CONSTRUCTION

Clearing

North: Open field. Minimal clearing of vegetation for right-of-way and Temporary Assembly Area.

South: Moderate clearing of riparian vegetation and trees for right-of-way.

Assembly

Standard Procedure.

Excavation

Standard Procedure.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard procedure.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: Reseed with native seed in wetland and riparian areas and an agency seeding mix in upland areas. When native seed harvesting is not feasible, appropriate adapted species will be seeded.

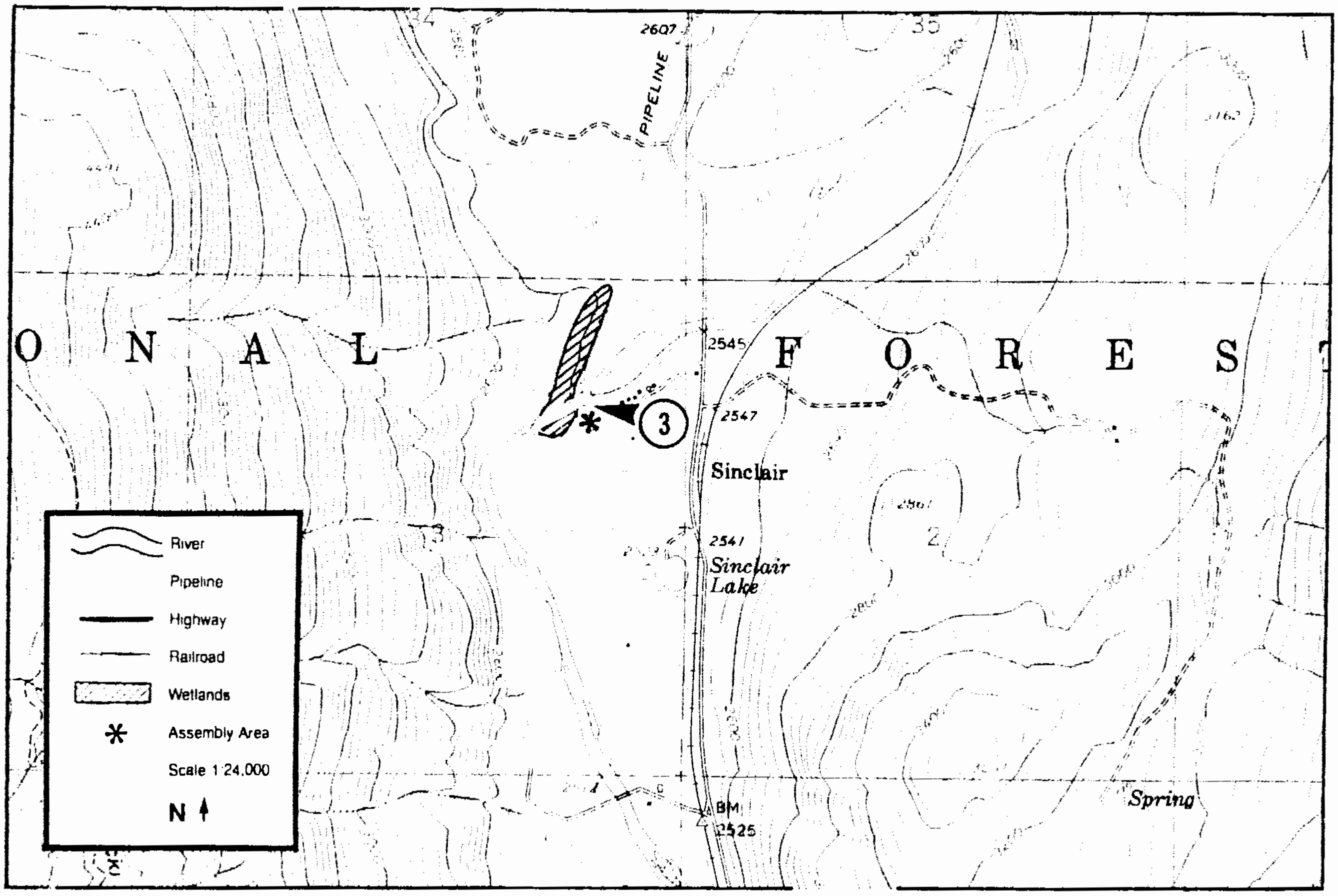
Planting: Elderberry, Wild Rose, Wild Plum, Mountain Alder, Black Cottonwood, Red Stem Dogwood, Snowberry, Douglas Fir. The number and species used depends on site conditions including wetland delineation information and availability at the time of construction.

Erosion Control

North: Stabilize two to one bank by installing jute mesh and seeding area with native seed in wetland or riparian areas and agency seeding mix in upland areas.

South: Stabilize gentle bank by applying straw mulch and seeding area with native seed in wetland or riparian areas and agency seeding mix in upland areas.

MOYIE RIVER - CROSSING 3



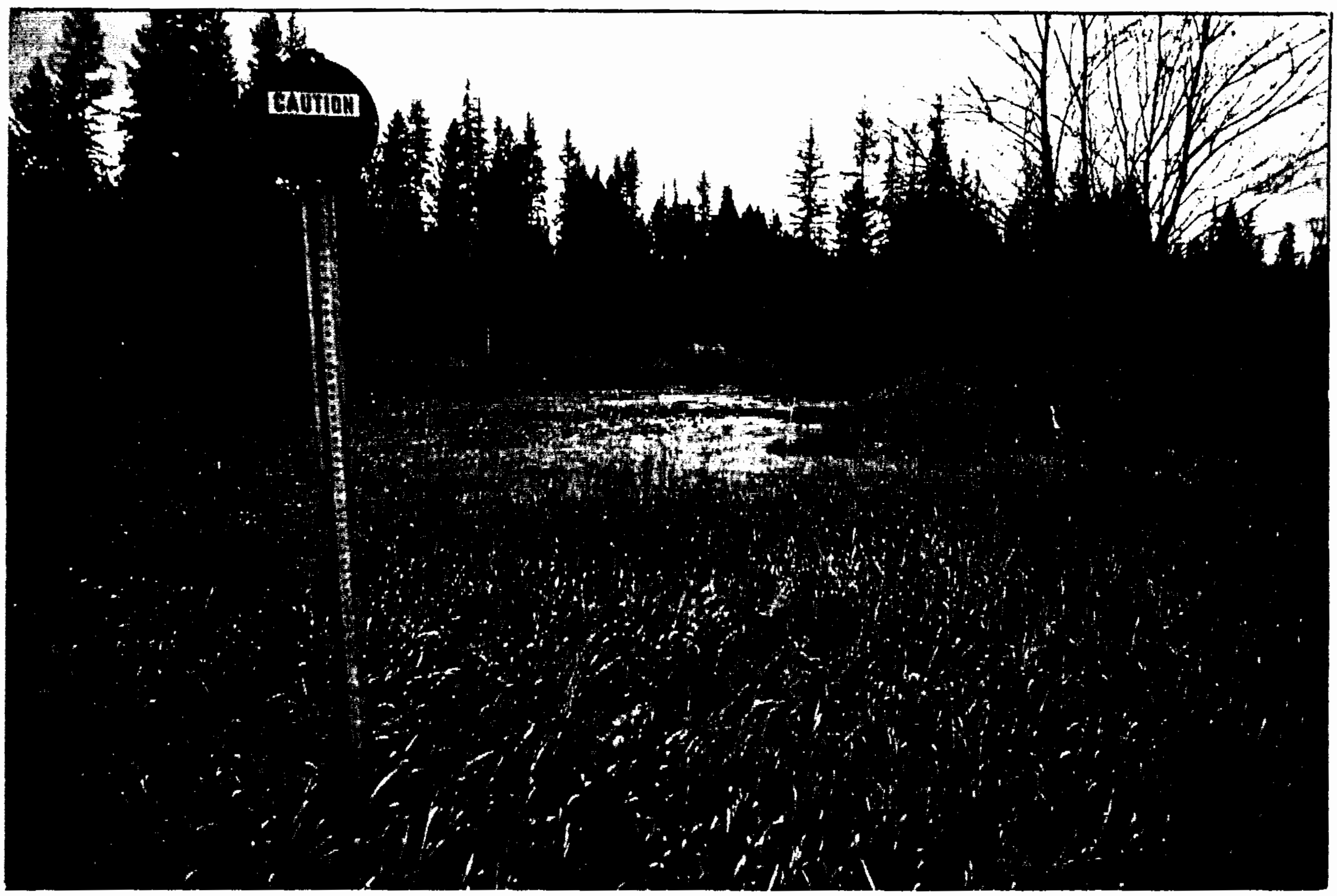


FIGURE IV-3

MOYIE RIVER CROSSING #3 VIEW NORTH

CROSSING 3

A. EXISTING CONDITIONS

River Configuration

Width: 140 feet.
Depth: two feet during summer and fall.
Velocity: one and one-half feet per second.
Bed: 6 to 12 inch cobble. Right-of-way crosses southern tip of island composed primarily of deposited cobble.

River Banks

North bank: Stable. Bank height: gentle rise to five feet. Vegetation and trees adjacent to right-of-way.

South bank: Stable. Bank height: gentle rise to five feet. PEM1C wetlands to river. Beaver dam between island and south bank of river. Harlequin duck has been recorded on this island.

Access to Crossing

North: County Road 34 and pipeline right-of-way.
South: County Road 34.

Adjacent Ownership

North: Private.
South: Private.

B. CONSTRUCTION

Clearing

North: Minimal clearing of vegetation and scattered trees for right-of-way.

South: Some clearing of vegetation and trees for right-of-way and Temporary Work Area.

Assembly

Standard Procedure.

Excavation

Standard Procedure. Beaver dam will be preserved during excavation by reducing working strip width. If necessary to protect the integrity of the beaver dam, a temporary steel coffer dam may be installed between the beaver dam and the trench.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure.

C. MITIGATION AND RESTORATION:

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: Reseed with native seed in wetland or riparian areas and agency seeding mix in upland areas.
Planting: Wild Plum, Mountain Alder, Black Cottonwood, Red Stem Dogwood, Willow, Kinnikinnick. The number and species used depends on site conditions and availability at the time of construction.

Erosion Control

Stabilize gentle to moderate slopes on north and south banks by laying jute mesh, if necessary, applying straw mulch and seeding area with native seed or appropriate seed mixes.

MOYIE RIVER - CROSSING 4

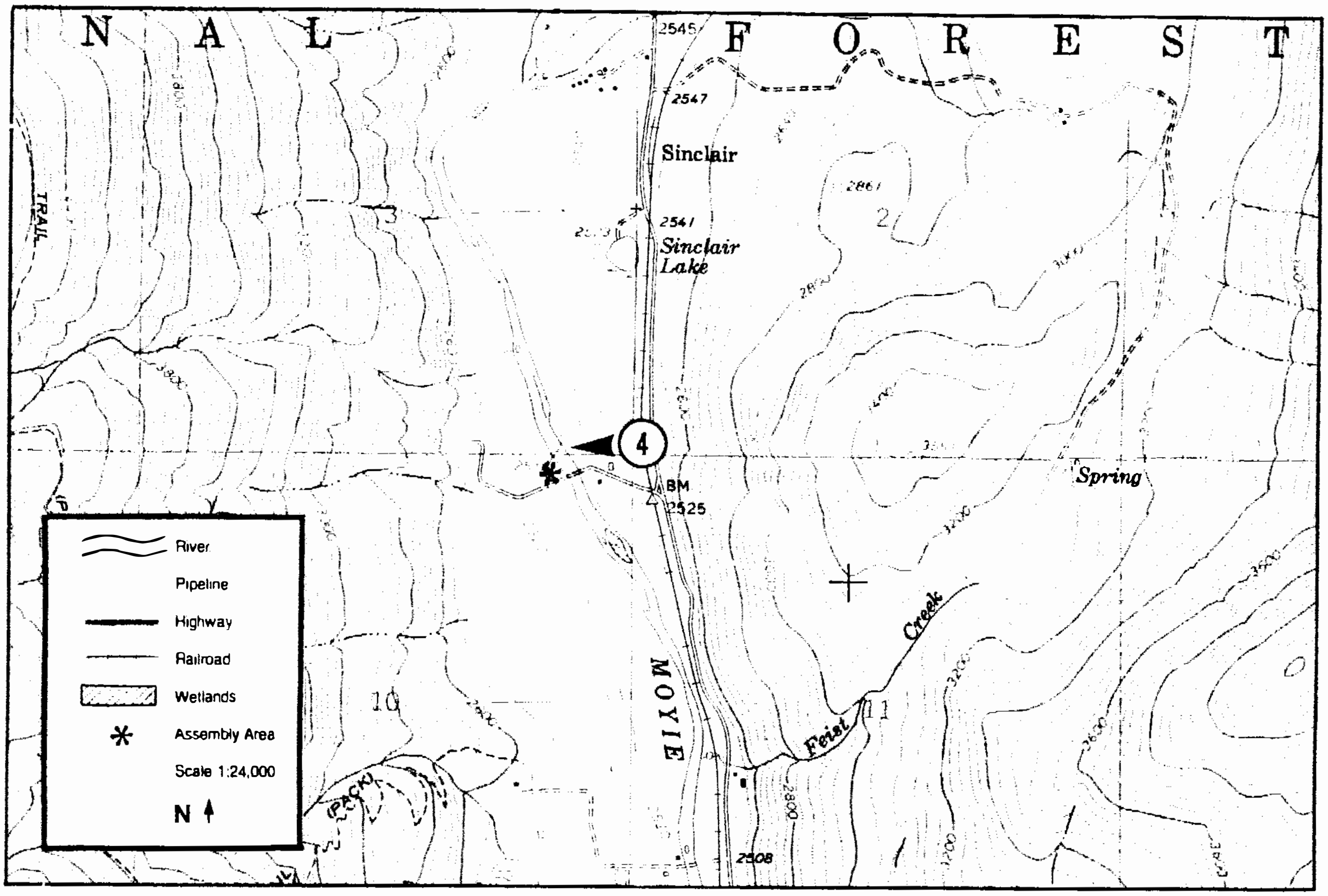


FIGURE IV-4

MOYIE RIVER CROSSING #4 VIEW SOUTH

CROSSING 4

A. EXISTING CONDITIONS

River Configuration

Width: 100 feet.
Depth: one to two feet during the summer and fall.
Velocity: one to two feet per second.
Bed: 6 to 12 inch cobble.

River Banks

North: Stable. Bank height: moderate rise to five feet, then benches with gradual rise to 10 foot bank top. Open field with scattered trees. Shore is rocky.

South: Stable. Bank height: 6-foot moderate rise to 60-foot terrace, then 15-foot moderate rise to bank top. Open field with scattered trees. Shore is rocky.

Access to Crossing

North: County Road 34 and down pipeline right-of-way.

South: Right-of-Way.

Adjacent Ownership

North: Panhandle National Forest, U.S. Forest Service.
South: Panhandle National Forest, U.S. Forest Service.

B. CONSTRUCTION

Clearing

North: Minimal clearing of vegetation and new tree regrowth for right-of-way.

South: Minimal clearing of vegetation and scattered trees for right-of-way and adjacent Temporary Assembly Area.

Assembly

Standard Procedure.

Excavation

Standard Procedure.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan. Existing fisheries enhancement work by U.S.F.S. will be preserved.

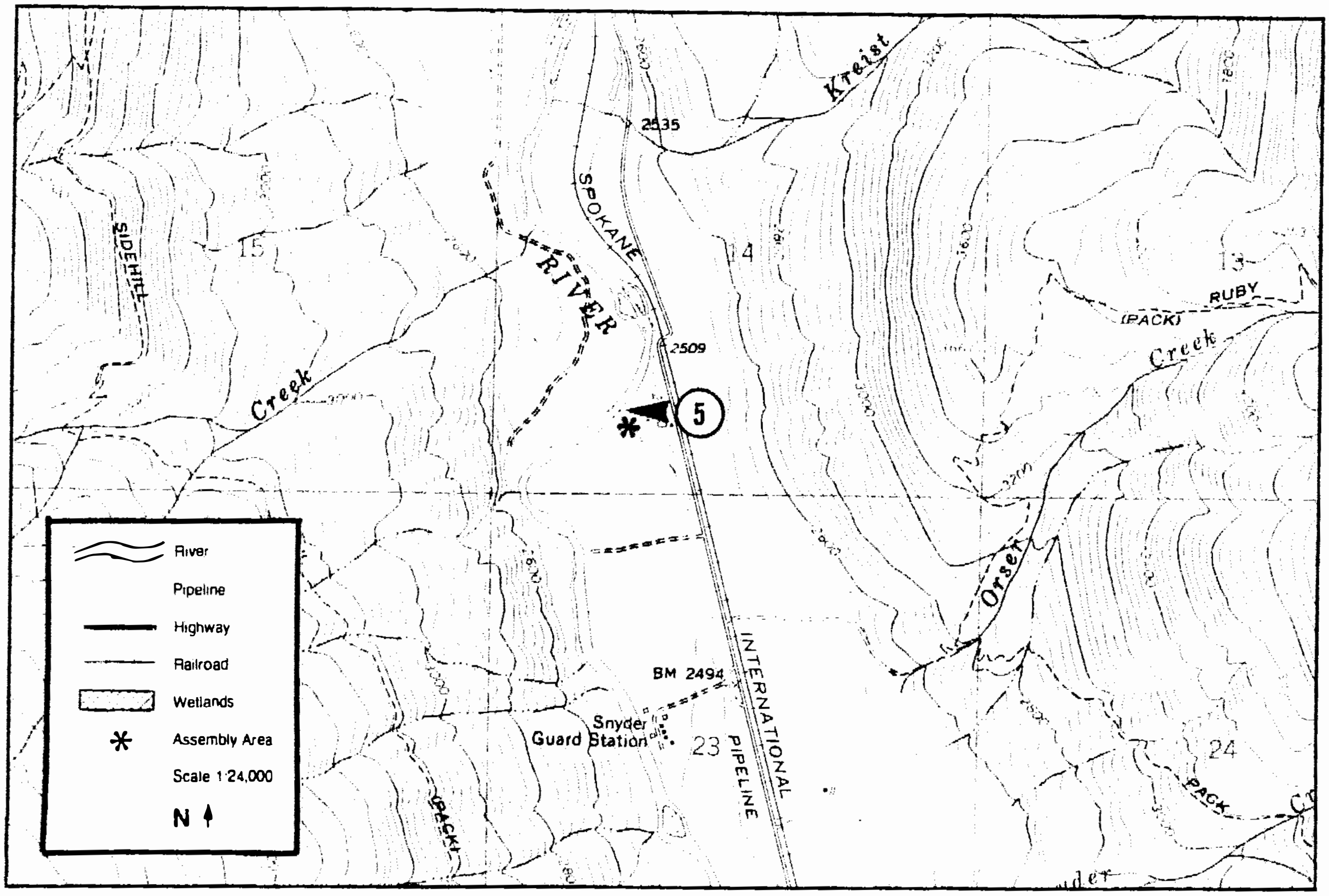
Revegetation

Seeding: Reseed with native seed in wetland or riparian areas and agency seeding mix in upland areas.
Planting: Birch, Wild Plum, Hawthorn, Kinnikinnick, Thimbleberry, White Fir, Douglas Fir, Tamarack, Lodgepole Pine, Englemann Spruce. The number and species used depends on site conditions and availability at the time of construction.

Erosion Control

The rock and gravel soil along the shores does not tend to erode easily. On both banks straw mulch and native seed will be applied. On the moderate to steep slopes away from the shore, jute mesh will be laid down and seeded with native seed or appropriate seed mixes.

MOYIE RIVER - CROSSING 5



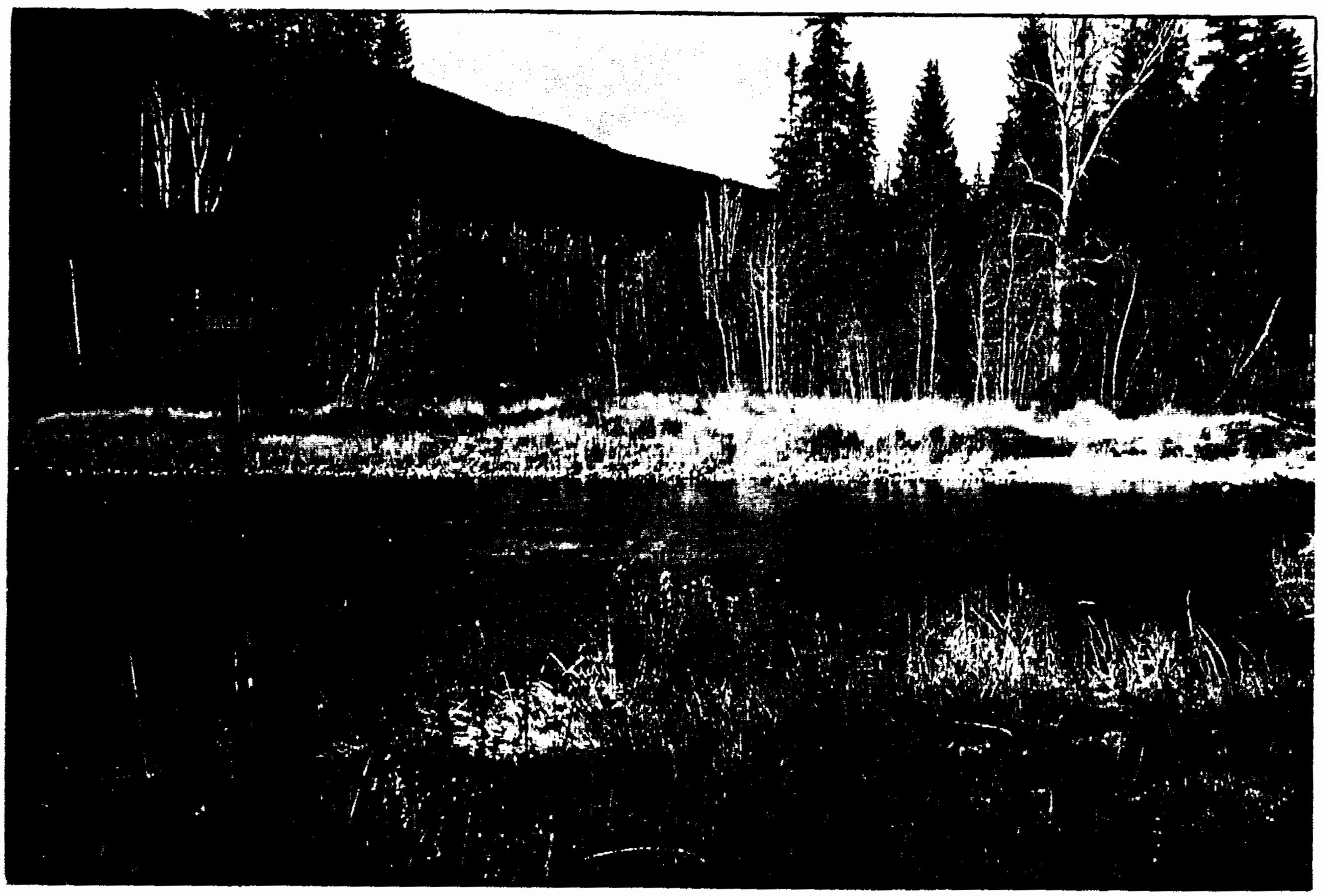


FIGURE IV-5

MOYIE RIVER CROSSING #5 VIEW NORTH

CROSSING 5

A. EXISTING CONDITIONS

River Configuration

River Width: 100 feet.
Depth: one to two feet during summer and fall.
Velocity: two feet per second.
Bed Composition: 6 to 12 inch cobble.

River Banks

North: Stable. Bank height: gentle rise to four feet. Grassland to 30 feet, then new growth of trees in right-of-way. Shore is rocky.

South: Stable. Bank height: moderate rise to 10 feet, one to one slope. Grassland and new growth of trees in right-of-way. Shore is rocky.

Access to Crossing

South: County Road 34 and down pipeline right-of-way.

Adjacent Ownership

North: Private.
South: Private.

B. CONSTRUCTION

Clearing

North: Clearing of new tree regrowth and brush.

South: Minimal clearing of vegetation and scattered trees for right-of-way and adjacent Temporary Assembly Area.

Assembly

Standard procedure.

Excavation

Steep south bank requires trench 30 feet wide and 20 feet deep.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: Reseed with native seed in wetland or riparian areas and agency seeding mix in upland areas.

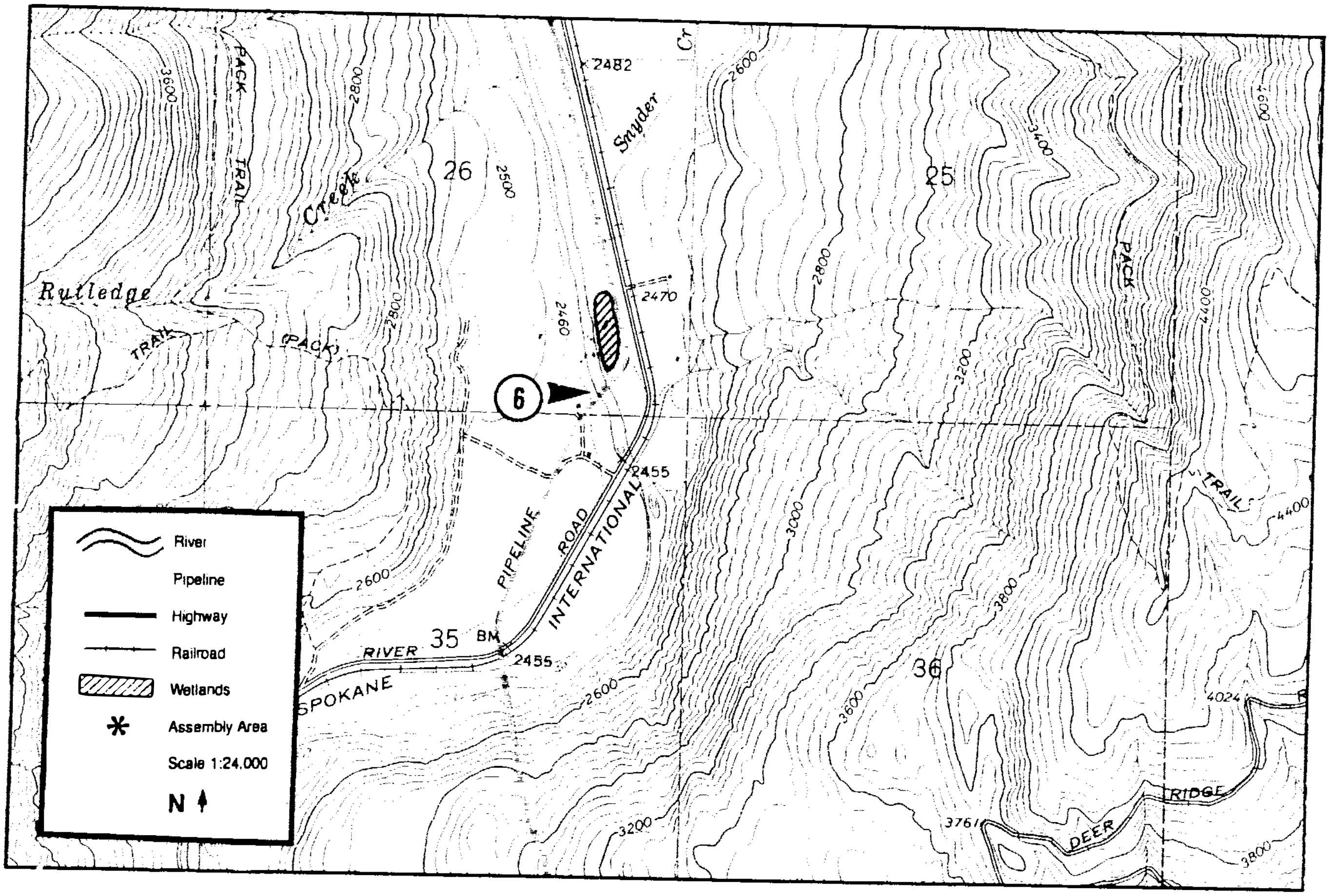
Planting: Willow, Wild Rose, Wild Plum, Mountain Alder, Birch, Snowberry, Wild Raspberry, Kinnikinnick' Western Red Cedar, Lodgepole Pine, Englemann Spruce. The number and species used depends on site conditions and availability at the time of construction.

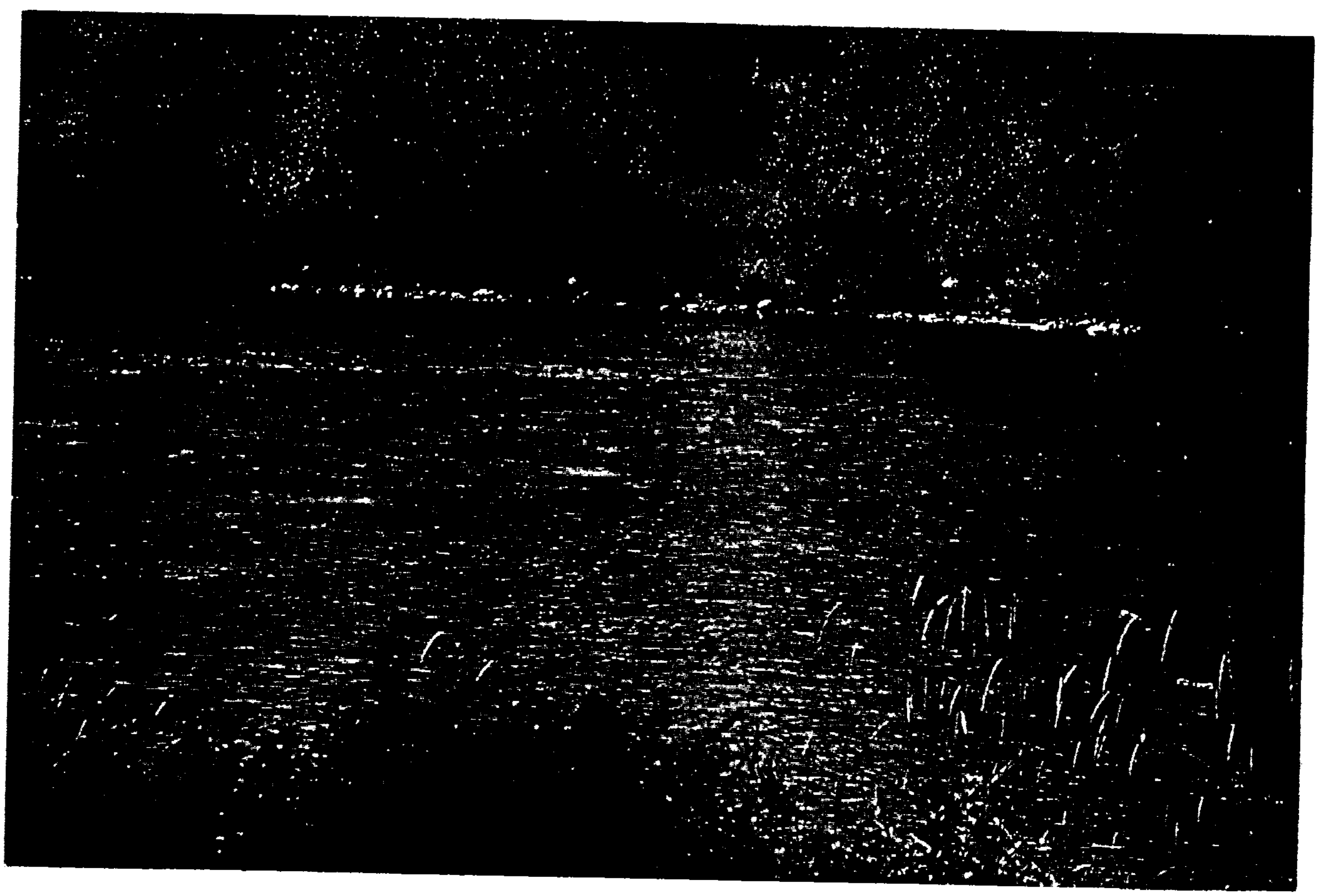
Erosion Control

North bank: The gentle slope of the bank will be stabilized by applying straw mulch and seeding.

South bank: The moderate slope of this bank will be stabilized by laying jute mesh and seeding.

MOYIE RIVER - CROSSING 6





MOYIE RIVER CROSSING #6 VIEW SOUTH

FIGURE IV-6

CROSSING 6

A. EXISTING CONDITIONS

River Configuration

River Width: 140 feet
Depth: one to two feet during summer and fall.
Velocity: two feet per second.
Bed Composition: 6 to 12 inch cobble.

River Banks

North: Bank height: Gradual rise to five feet. Rocks to two foot diameter along shore. PFO4A wetlands north of crossing in forest between pipeline right-of-way and river. Grass, riparian plants, and moderate new tree growth in right-of-way. Residence on east side of right-of-way.

South: Bank height: From river, bank rises five feet to a nearly level terrace about 80 feet wide, then slopes upward 10 feet on four to one slope. Rocks to two foot diameter along shore. Grass and heavy new tree growth in right-of-way. Residence on west side of right-of-way, 150 feet south of crossing.

Adjacent Ownership

North: Private.
South: Private.

Access to Crossing

North: County Road 34 across Twin Bridges.
South: Pipeline right-of-way.

B. CONSTRUCTION

Clearing

North: Clear vegetation and tree regrowth along right-of-way and for Temporary Storage Area. Location of Temporary Storage Area minimizes disruption of nearby residence and minimizes tree removal.

South: Clear vegetation and tree regrowth along right-of-way.

Assembly

Standard Procedure.

Excavation

If large rock outcroppings are found during excavation, some blasting may be required to construct the trench.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: Reseed with native seed in wetland or riparian areas and agency seeding mix in upland areas.

Planting: Willow, Red Stem Dogwood, Mountain Alder, Birch, Snowberry, Elderberry, Spiraea, White Fir, Douglas Fir, Western Red Cedar, Tamarack. The number and species used depends on site conditions and availability at the time of construction.

Erosion Control

The gentle slopes on north and south banks will be stabilized by applying straw mulch and seeding. The moderate slope on the south bank will be stabilized by laying jute mesh and seeding the area.

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MOYIE RIVER - CROSSING 7

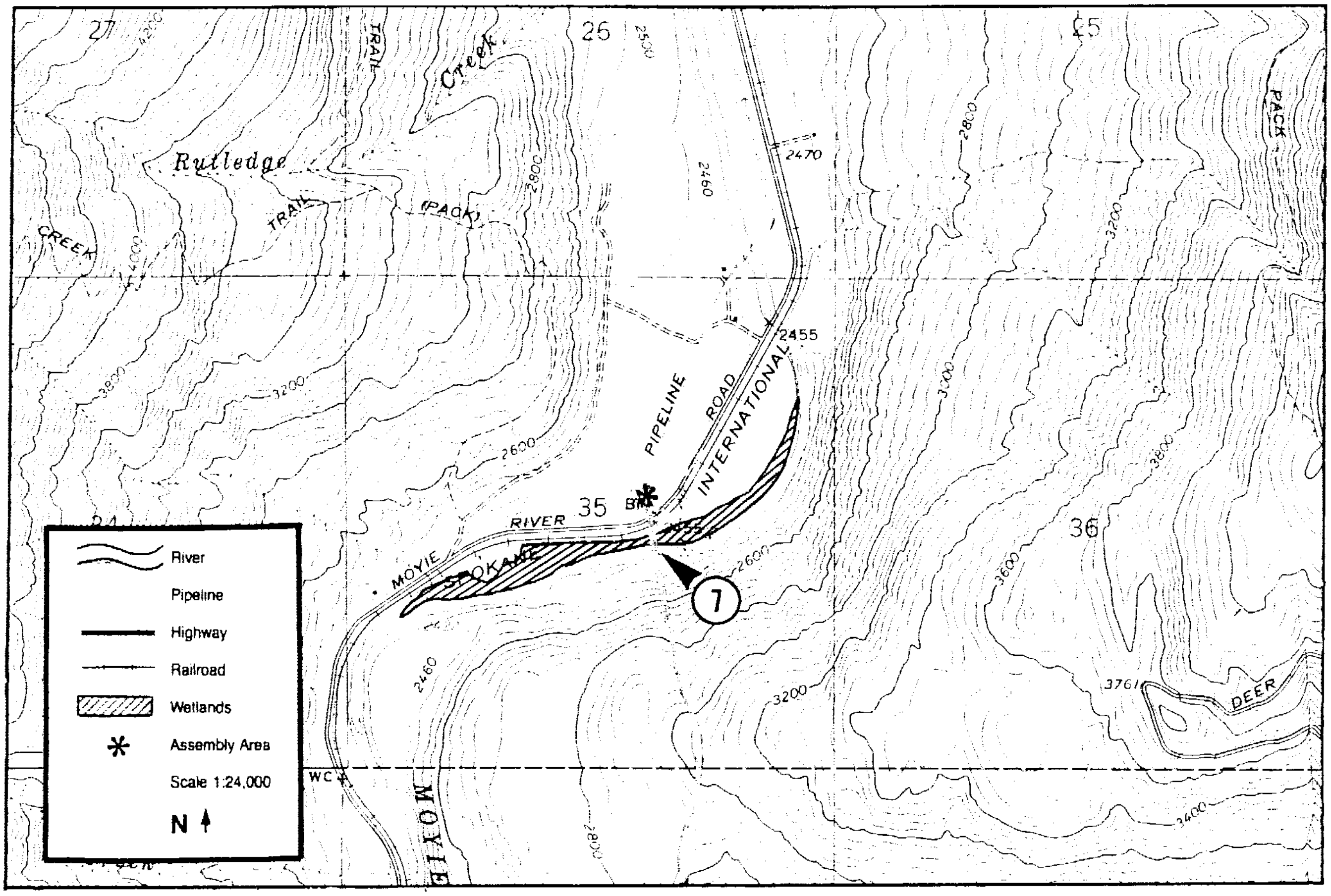

FIGURE IV-7

MOYIE RIVER CROSSING #7 VIEW SOUTH

CROSSING 7

A. EXISTING CONDITIONS

River Configuration

River Width: 90 feet
Depth: one to two feet during summer and fall.
Velocity: two feet per second.
Bed Composition: 6 to 12 inch cobble and one to three feet boulders.

River Banks

North: Bank height: Gently sloping floodplain extends from shore 100 feet; then rises abruptly 10 feet to a terrace about 100 feet wide. Slope then rises steeply to a railroad bed. Rocky shore. Right-of-way crosses PSS1C wetland on this bank. Vegetation and scattered trees on bank.

South: Bank height: gentle rise of five feet to river terrace. Two to one slope 600 feet up Deer Ridge. Rocky shore. Vegetation and trees on bank. Abundant regrowth of trees along right-of-way.

Adjacent Ownership

North: Panhandle National Forest, United States Forest Service.

South: Panhandle National Forest, United States Forest Service.

Access to Crossing

North: County Road 34 across railroad tracks.

B. CONSTRUCTION

Clearing

North: Clear vegetation and scattered trees for right-of-way, temporary assembly area and temporary work strip.

Temporary Assembly Area: to minimize the potential impacts to the wetland, the 60 x 300-foot area will be located 200 feet north of the crossing on an existing railroad right-of-way. To move the pipeline crossing section to the river, a 100-foot strip will be cleared along right-of-way from Temporary

Assembly Area to the river crossing. The work strip runs through the wetland.

South: Clear vegetation and scattered trees from right-of-way. If rock is encountered and blasting is required, a wider, cleared right-of-way will be required on this bank.

Assembly

Standard Procedure.

Excavation

Standard Procedure. If rock outcroppings are encountered, some blasting may be required to construct trench.

Installation

Move crossing section down 200-foot work strip from Temporary Assembly Area to crossing.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard procedure. Recontour wetland on north bank to recreate original hydraulic environment.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: Riparian areas adjacent to the north bank and in wetland will be reseeded with native seeds. The uplands on the north and south bank will be seeded with a commercial seed mix to speed revegetation and minimize erosion. (See Appendix A.)

Planting: Mountain Alder, Birch, Douglas Fir, Western Red Cedar, Lodgepole Pine, Willow. The number and species used depends on site conditions and availability at time of construction.

Erosion Control

Boulders and cobble will be replaced along shore. On south bank, water checks will be installed on steep slope. On the steep slopes of north and south banks, hay mulch will be applied, then jute mesh will be installed and seeded.

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MOYIE RIVER - CROSSING 8

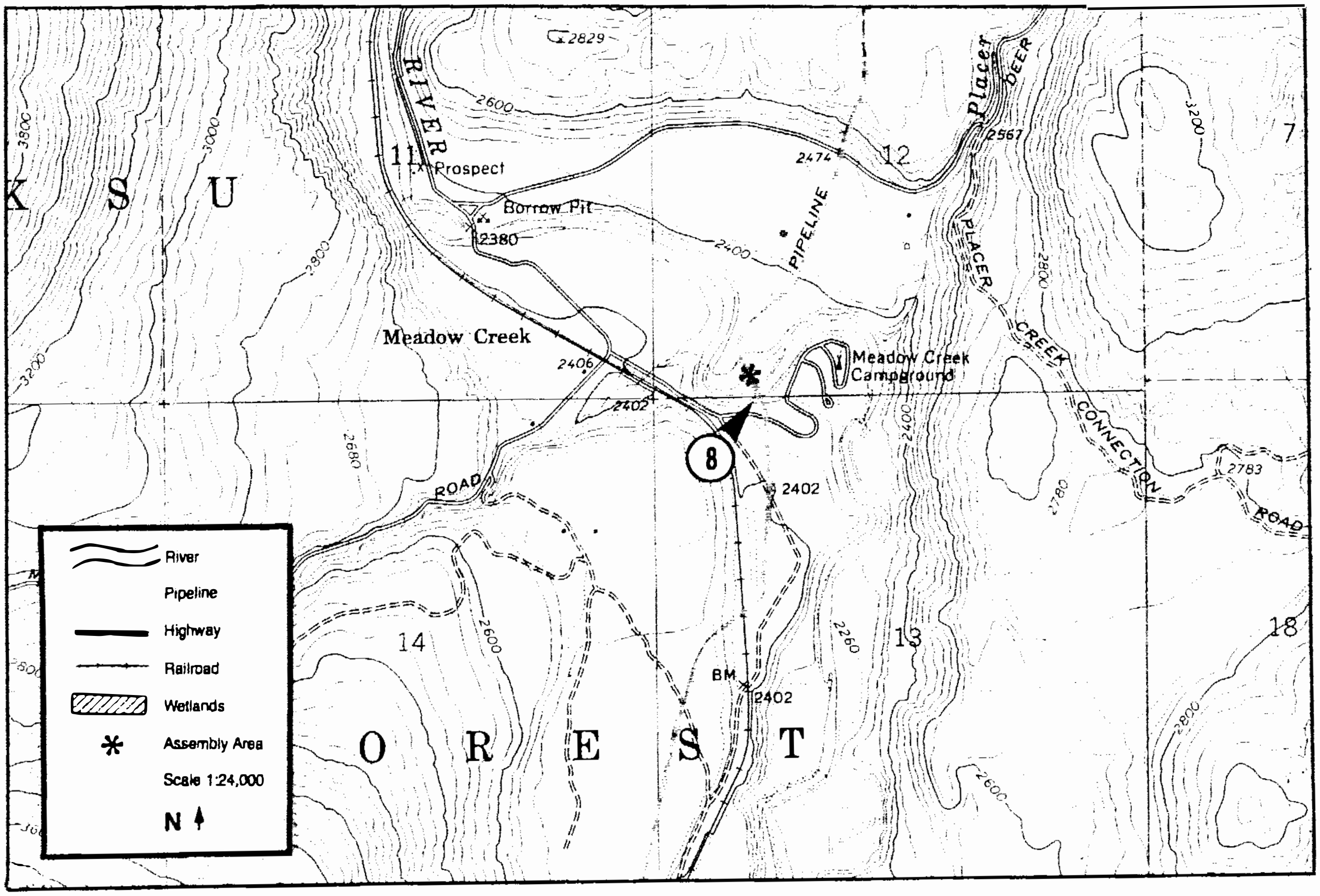

FIGURE IV-8

MOYIE RIVER CROSSING #8 VIEW NORTH

CROSSING 8

A. EXISTING CONDITIONS

River Configuration

River Width: 80 feet.
Depth: two feet during summer and fall.
Velocity: two feet per second.
Bed Composition: 6 to 12 inch cobble and one to three feet boulders.

River Banks

North Bank: Bank height: nine foot steep rise from floodplain to 200-foot-wide terrace, then five to one slope-40 foot rise. Rocky soil and very rocky shore. Minimal brush and vegetation. Abundant regrowth of trees on right-of-way.

South Bank: Bank height: steep four to one slope to 50 feet. Rocky bank. Brush and some trees.

Access to Crossings

North: County Road 34, then one-half mile south down right-of-way.

South: Forest Service road into Meadow Creek Campground.

Adjacent Ownership

North: Panhandle National Forest, United States Forest Service.

South: Panhandle National Forest, United States Forest Service.

B. CONSTRUCTION

Clearing

North: Clear trees along right-of-way and for temporary assembly area. Larger area (200 x 300 feet) required for Temporary Assembly Area due to steep slopes and boulders.

South: Clear regrowth trees along right-of-way.

Assembly

Standard Procedure.

Excavation

Boulders visible at crossing indicate potential for encountering large boulders during excavation. Some blasting may be required. A deeper trench will also be required for crossing section due to the steepness of the banks.

Installation

Standard Procedure.

Backfilling

Standard Procedure.

Bank Restoration and Recontouring

Standard Procedure.

C. MITIGATION AND RESTORATION

Fishery Enhancement

See Appendix B, Fishery Enhancement Conceptual Plan.

Revegetation

Seeding: The grassland along the shores will be reseeded with native seeds. In the uplands, native seeds and a commercial seed mix will be used to speed revegetation. (See Appendix A.)

Planting: Rocky Mountain Maple, Ceanothus, Douglas Fir, Lodgepole Pine, Willow. The number and species used depend on site conditions and availability at the time of construction.

Erosion Control

Boulders and cobble will be replaced along shores. Water checks will be installed on north bank. On the steep slopes of north and south banks, seed and hay mulch will be applied, then jute mesh will be installed over the seeded area.

V. APPENDICES

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APPENDIX A

MITIGATION AND RESTORATION OF THE MOYIE RIVER PIPELINE CROSSINGS

After completion of construction and the recontouring of the river bed and banks, the additional work described below will be performed to restore the right-of-way and enhance the environment.

ENHANCED FISHERIES HABITAT IN THE UPPER MOYIE RIVER

PGT-PG&E and Idaho Fish and Game have discussed protection and enhancement of the sensitive fishery in the upper Moyie River. During these discussions, three key issues emerged which will be addressed in the restoration process:

- o The river channel, which is currently stable, will be returned to its original gradient and configuration to maintain channel stability.
- o The cobble removed during excavation will be replaced to maintain the river habitat and to protect the river bottom from scour.
- o Clusters of large boulders, removed from the crossing excavations, will be placed into the river around Crossings 1 through 4. This will create improved habitat for rearing juvenile trout and more cover for adult trout.

A fishery enhancement plan is proposed to improve the degraded fishery that currently exists in the Moyie River and its tributaries. The plan will include improvements beyond mitigation of direct Project impacts and will produce a healthier trout fishery when completed. The enhancement program will most likely include construction of instream structures and boulder cluster placement to increase trout cover, and improvement of access to spawning tributaries (e.g., Meadow Creek) where upstream access is limited. A conceptual plan has been prepared by GEOMAX, Inc., a local consulting firm with extensive experience in instream enhancement in the Pacific Northwest (See Appendix B).

EROSION CONTROL MEASURES

<u>Mechanical Erosion Control Measures</u>

- o diversion ditches and berms;

- o water checks and trench plugs;
- o hay bales;
- o silt fences

These measures which proved effective in stabilizing slopes during the original construction, will be utilized during construction. At all crossings one or more of the vegetative erosion control measures listed below will be used (For the specific measures to be used at each of the crossings, please refer to Part IV).

Vegetative Erosion Control Measures

- o reseeding with native seeds and/or appropriate commercial mix approved by regulatory agencies;
- o reseeding with native seeds and applying straw mulch;
- o applying erosion control fabric over mulched, seeded area;
- o applying erosion control fabric and seeding a fast-establishing species to provide ground cover;
- o applying punched straw in erodible fill areas.

RESTORATION AND REVEGETATION PLAN

Restoration and Revegetation Plan Objectives

Based on the naturally occurring revegetation of the original pipeline right-of-way (1960), it is anticipated that the planned restoration of the right-of-way will be successful. The following Restoration and Revegetation Plan for the Moyie River has been developed to achieve two key objectives: to prevent erosion and establish vegetation as quickly as possible. The Plan has two key features:

1. Use of Native Seeds and Plants: Native vegetation will be re-established at all crossings to blend with the surrounding vegetation patterns. Native straw seeding will be performed in disturbed wetland and riparian areas. Native seeds and plant cuttings of woody plants will be collected prior to construction and grown for planting until construction of the pipeline is completed.

2. Timing: Seeding of herbaceous species will be initiated after final grading in late summer or early fall. If construction is completed earlier in the year, temporary erosion control measures will be applied as stipulated in FERC's Erosion Control, Revegetation and Maintenance Plan (Part V-B). In riparian and upland areas, woody plants will be planted in the fall after the soil has been moistened by the first rains.

SEEDING

At Crossings 1-8, seeds from the native vegetation in the riparian and wetland zones will be selectively harvested to collect the desirable native species. The seed mixes to be used have been developed in consultation with the US Forest Service and the USDA Soil Conservation Service. See matrix for recommended seeding mixes. Unless otherwise requested by local agencies, these seed mixes shall be used except where native straw seeding is used.

Harvesting Areas for Native Straw Seeding

A wetland/riparian delineation survey is presently being conducted by the PGT-PG&E Pipeline Expansion Project. Based in part on the results of this survey, PGT will locate seed harvesting areas for those wetland/riparian areas that are delineated in their survey. The crews will also inspect these areas for noxious weeds and report on their location so that harvesting crews will avoid collecting weeds. Essentially, native straw harvesting will occur in a suitable nearby vicinity where seeding is to take place at each stream crossing.

To supplement seed harvested at the stream crossing, permission is being sought of the US Forest Service to harvest the grassland on the west side of Crossing #4. This grass area contains species of grasses growing up to the edge of the Moyie River. It is anticipated that five to ten acres of prime straw/seed material could be harvested with a combine or mowed and baled for application at selected areas of all Moyie River Crossings.

Harvesting will be coordinated with local regulatory agencies. PGT will work with local seed collectors to collect, process, and store wild seed. Two seed crops will be harvested. The first crop will be collected in the summer of 1991, the year prior to construction. The second crop will be collected during the summer of 1992, the first year of construction.

At Crossings 7 and 8, native seeds will also be collected and used in the riparian and wetland zones. However, in the critical uplands with slopes of 2:1 and greater, the high erosion potential warrants using a commercially available seed mix in addition to wild collected native seed. The minimal seeding mix to be used will be that mix recommended by FERC in the EIS. Additional seed of species requested by local agencies as well as species commercially available in Idaho for erosion control will be used to fulfill site-specific conditions.

SEEDING METHODS

Native Straw Seeding in Wetland/Riparian Areas

Native straw seeding is a technique proposed for re-establishing vegetation in riparian areas to blend in precisely with the surrounding area.

- Straw is harvested in the vicinity of the pipeline right-of-way over an area equal in size to the area to be seeded;
- Native straw should be applied to the area to be revegetated at rate of up to 800 pounds per acre;
- Straw should be harvested at the time of seed maturation and applied;
- The area to be revegetated should be revegetated after the final grading of the right-of-way while the soil is loose and favorable to enhance seed germination;
- Fertilizer or lime will not be utilized in wetland/riparian areas unless required by jurisdictional agencies.

Broadcast Seeding in the Upland Areas Adjacent to the Riparian Zones

This method will be used in upland areas directly adjacent to the riparian zones at all river crossings. As with seeding in riparian zones, raking in seeds will depend on soil surface and soil texture. Depending on the size of the area to be reseeded and the accessibility of the area, the seed will be applied using cyclone seeders or, at Crossings 7 and 8, may be broadcast over steep slopes by helicopter.

At the river banks where there are erodible fill slopes up to 2:1, punched straw will be installed at a rate of 3000 to 4000 pounds per acre. A straw roller with 8-inch by 8-inch studded blades will be used to punch straw vertically into the soil. This process will be performed using equal application of straw to attain the desired concentration. Seed and fertilizer will then be applied uniformly over the mulched area.

To stabilize upland areas at Crossings 7 and 8 where there are steep cut slopes and/or highly erodible soil, the broadcast seeding method will be used in conjunction with straw mulching and/or erosion control fabric such as jute mesh. On gentle upland slopes, 3:1 or less, the area will be seeded, and then straw mulch spread uniformly over the graded area at the rate of 1000 to 1500 pounds per acre unless otherwise specified by regulatory agencies.

PLANTING

By the time construction is completed, plant seeds and cuttings will have been collected and propagated at a nursery. The propagated plants will be planted the year following construction or one year after erosion control seeding. If necessary, additional propagated plants will be planted during the second year if the survival rate of the first year's plantings is low.

In riparian zones where woody riparian species are to be re-established, cuttings of willow and black cottonwood will be collected and planted after construction. Cuttings will be planted only in areas where soil moisture is continuously present throughout the growing season. Adjacent to these riparian zones are drier areas where woody riparian plants can still be re-established. In these drier areas rooted cuttings grown in containers will be planted at the end of the first year after construction.

The number of plants per species that will be planted will depend on the density of woody species that occur at each crossing. The species that will actually be planted at the crossings will depend on seed crops and which of the species propagate successfully. Every attempt will be made to reintroduce the native species originally inhabiting the restoration site; however, strong consideration will be given to the most promising species. A list of these species is provided in the Revegetation Matrix at the end of this appendix.

PLANTING METHODS

The planting methods used will depend on plant species and site conditions including weed competition, animal depredation, and soil moisture conditions.

Direct Planting of Cuttings

Cuttings of willow will be planted directly into those riparian areas with consistent soil moisture. Cuttings will range in size from approximately 16 to 18 inches in length by 3/8-inch in diameter to cuttings that are 30 to 36 inches in length by 1 inch diameter. Cuttings will be collected and planted in the fall, after the plants become dormant.

Liner-stock Planting

In drier areas liner stock (plants grown in small containers) will be planted the year following seeding. Competing vegetation will be removed at selected planting locations, and liner plants will be planted using one of four methods depending on site conditions described below. Figures depicting the planting methods follow the text of this appendix.

- At favorable sites the simplest method will be used: a planting without a liner collar. (See Figure A-1.) This planting method is similar to that commonly used in reforestation plantings.

- At less favorable, or drier sites, liner planting with a planting collar will be used. (See Figure A-2.)

- Where depredation by deer, rodents, or insects may be a problem, liner planting with the planting collar and a protective screen will be used. (See Figure A-3.)

- In areas with heavy weed competition, liner planting with the planting collar, a protective screen, and a weed control fabric will be used. (See Figure A-4.)

For all of the liner stock planting PGT recommends applying approximately 0.3 ounces of Osmocote fertilizer (14-14-14) at the bottom of the planting hole.

MOYIE RIVER REVEGETATION MATRIX*

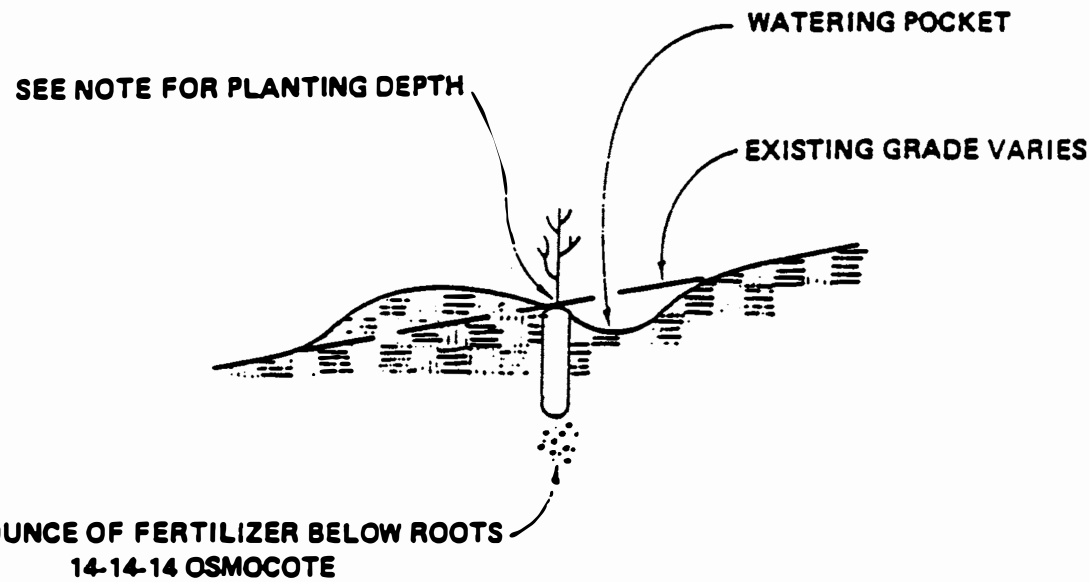
	SEEDING					PLANTING
Crossing Location	Native Seeding	Upland Seeding Mix	Gentle Slope Straw Mulch	Moderate Slope Jute Mesh	Steep Slope Straw and Jute	# and species used depends on site conditions and availability
Crossing 1	North South		North South			Wild Rose Rocky Mountain Maple Wild Plum Mountain Alder Black Cottonwood
Crossing 2	North South		South	North		Elderberry Wild Rose Wild Plum Black Cottonwood Redstem Dogwood Mountain Alder Snowberry Doug Fir
Crossing 3	North South		North South			Wild Plum Redstem Dogwood Mountain Alder Black Cottonwood Willows Kinnikinnick
Crossing 4	North South		North South	North South		Birch Wild Plum Hawthorn Kinnikinnick Thimbleberry White Fir Doug Fir Tamarack Lodgepole Pine Engelmann Spruce

*Identifies seeding and planting species and methods to be used to revegetate north and south banks. Tree species can only be planted at the edge of rights-of-way to prevent damage to the pipeline.

MOYIE RIVER REVEGETATION MATRIX*
(Continued)

Crossing Location	SEEDING					PLANTING
	Native Seeding	Upland Seeding Mix	Gentle Slope Straw Mulch	Moderate Slope Jute Mesh	Steep Slope Straw and Jute	# and species used depends on site conditions and availability
Crossing 5	North South		North	 South		Willow Wild Rose Wild Plum Mountain Alder Birch Snowberry Wild Raspberry Kinnikinnick Western Red Cedar Lodgepole Pine Engelmann Spruce
Crossing 6	North South		North South	 South		Willow Redstem Dogwood Mountain Alder Birch Snowberry Elderberry Spiraea White Fir Doug Fir Western Red Cedar Tamarack
Crossing 7	North South	 South	North		 South	Mountain Alder Birch Doug Fir Western Red Cedar Lodgepole Pine Willows
Crossing 8	North South	North South			North South	Rocky Mountain Maple Ceanothus Doug Fir Lodgepole Pine Willow

*Identifies seeding and planting species and methods to be used to revegetate north and south banks. Tree species can only be planted at the edge of rights-of-way to prevent damage to the pipeline.



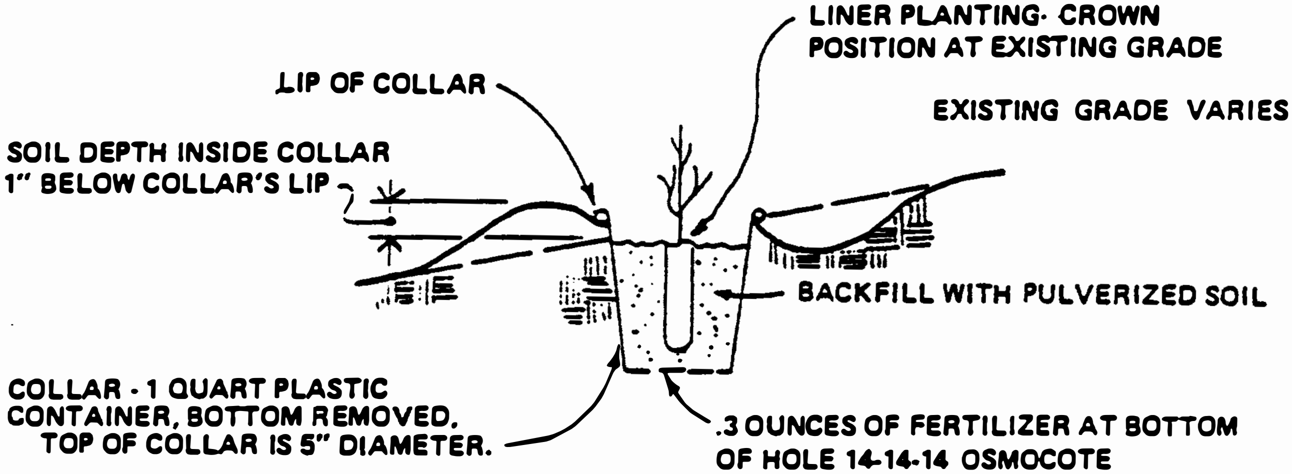
SECTION
N.T.S.

NOTE:
PLANTS SHALL BE PLANTED SO THE SOIL LEVEL IN THE CONTAINER IS:
a) 3/8-INCH BELOW GRADE IF THE SOIL TYPE IS SANDY
b) 3/16-INCH BELOW GRADE IF THE SOIL TYPE IS INTERMEDIATE BETWEEN CLAY AND SANDY SOIL
c) AT GRADE IF THE SOIL TYPE IS CLAY.

PGT - PG&E
PIPELINE EXPANSION PROJECT

Detail - Liner Planting

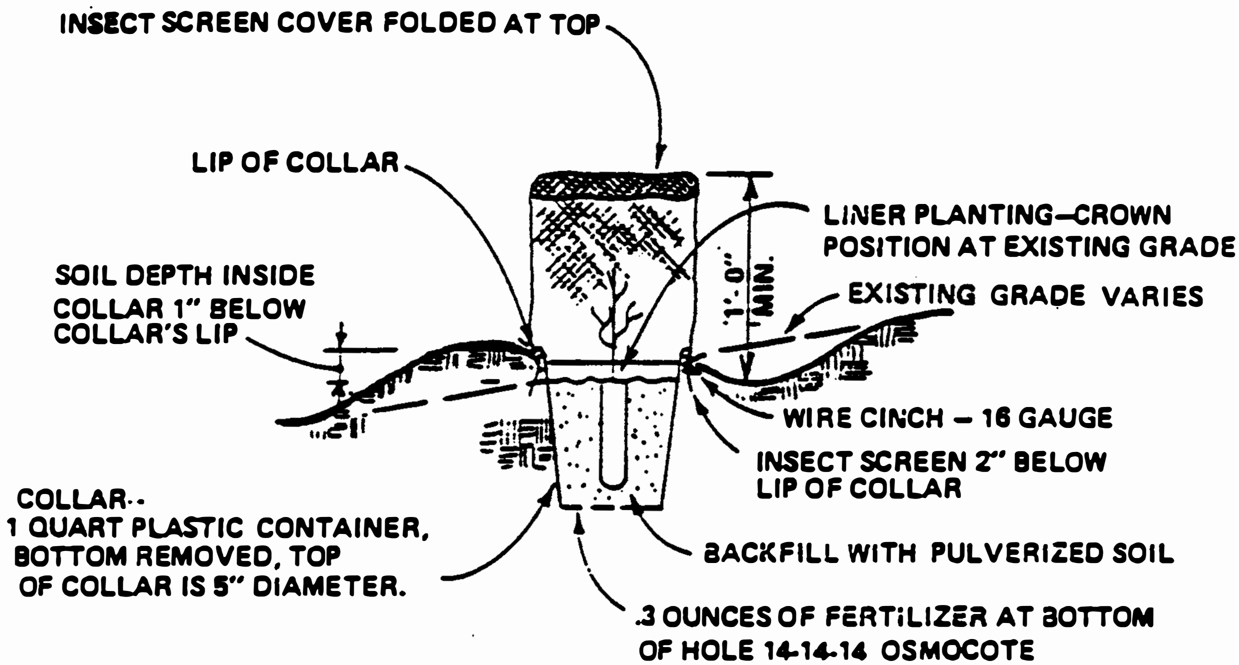
FIGURE A - 1



PGT - PG&E
PIPELINE EXPANSION PROJECT

Detail - Liner Planting wiith Collar

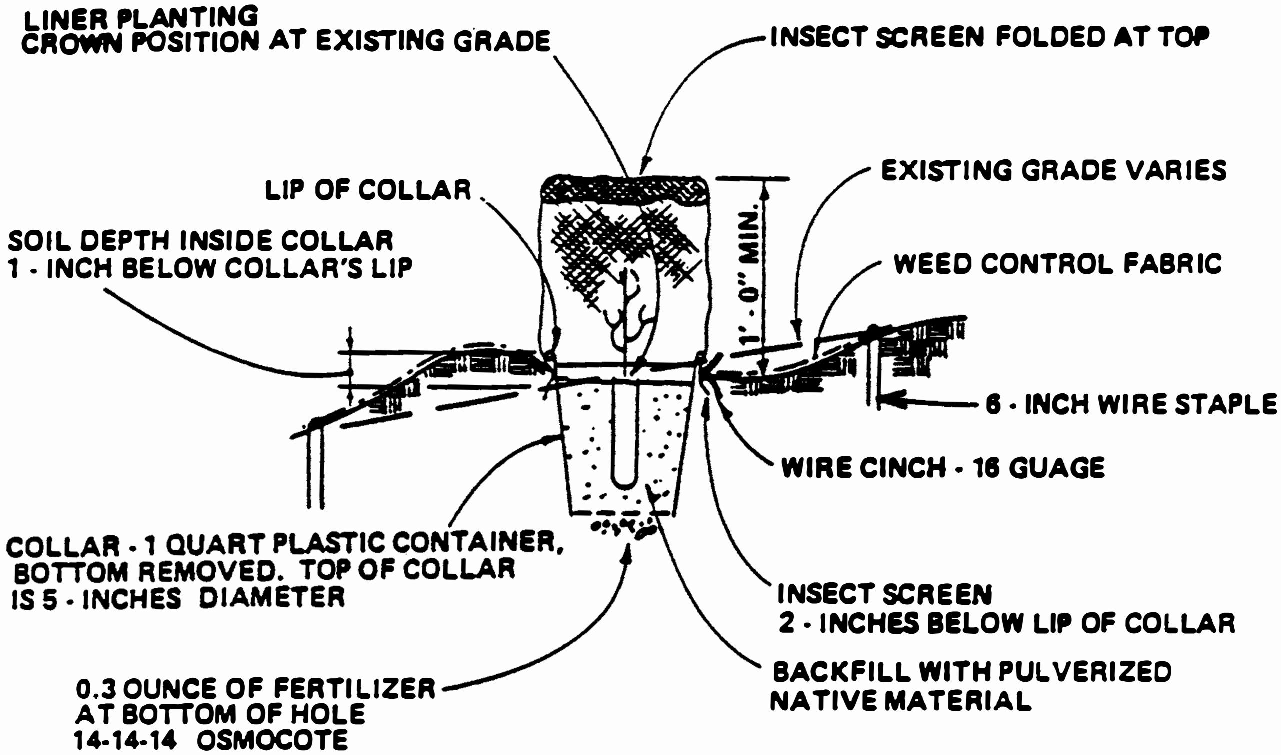
FIGURE A - 2



PGT - PG&E
PIPELINE EXPANSION PROJECT

Detail - Liner Planting with Collar and Screen

FIGURE A - 3



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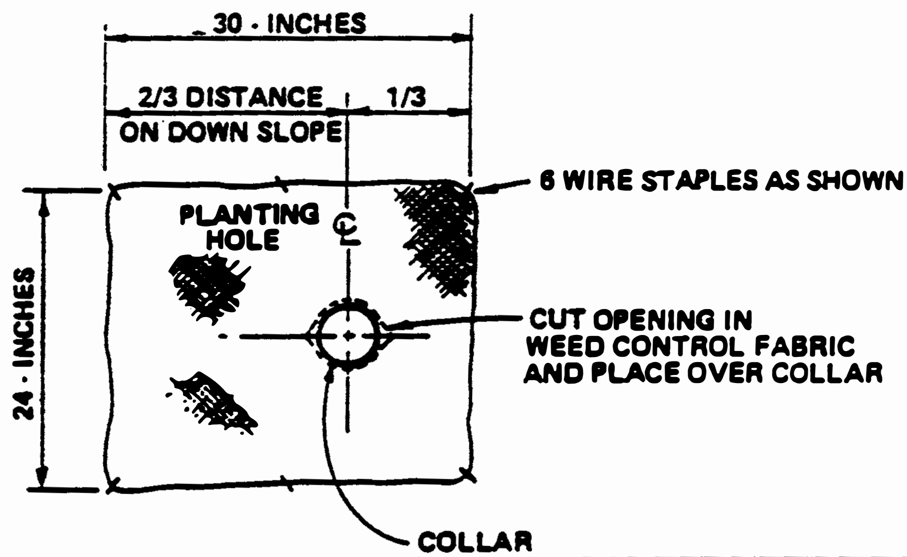

PLAN
N.T.S.

PGT - PG&E
PIPELINE EXPANSION PROJECT

Detail - Liner Planting with Collar, Fabric and Screen

FIGURE A - 4

APPENDIX B

FISHERY ENHANCEMENT CONCEPTUAL PLAN

FOR

PGT-PG&E

Prepared by:
Dr. Donald R. Reichmuth, PE/LS
Jack Matranga

January 22, 1991

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TABLE OF CONTENTS

INTRODUCTION

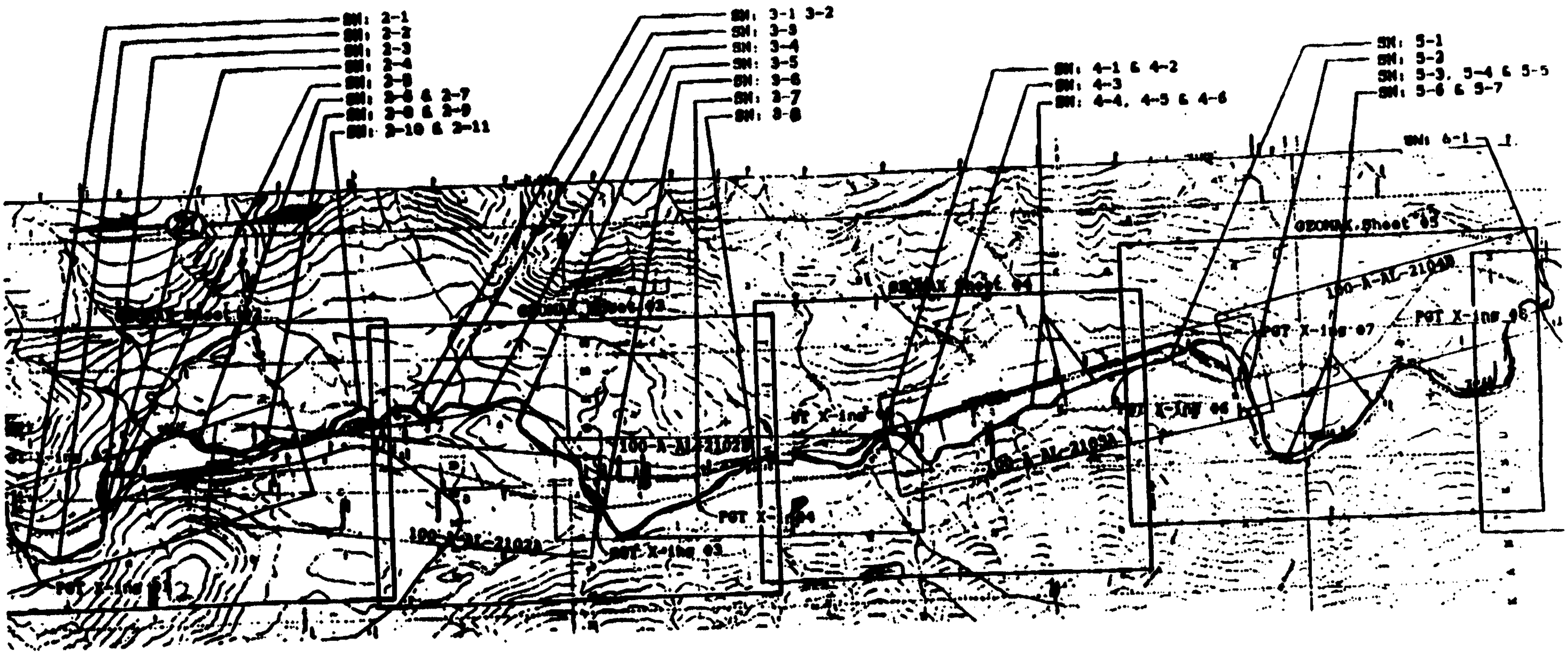
The proposed PGT-PG&E Pipeline Expansion Project retained GEOMAX, P.C. to develop a Fisheries Enhancement Conceptual Plan for a portion of the Moyie River and Meadow Creek in the Idaho panhandle. The area considered extends from the Canadian border to a point just downstream of the confluence of the Moyie River and Meadow Creek.

This segment of the Moyie generally has a uniformly flat gradient. The lack of variety in depth, width, water velocity and cover create poor fish habitat. Meadow Creek, which in the past was a prime spawning ground, is now inaccessible to fish migrating out of the Moyie due to a culvert under a railroad bed. This culvert limits fish passage for two reasons. Fish moving upstream must first make an eight foot high jump from the creek into the mouth of the culvert and then must swim approximately 100 feet through a swift current within the culvert. This high water velocity is due to the steep incline of the culvert and low friction of the culvert walls.

GEOMAX proposed the construction of in-steam structures that provide for fish habitat variety, control erosion, direct flows, and act to solve other stream problems. The structures are made of natural materials (mainly large rock and vegetation) which are long-lasting, low-maintenance, natural in appearance, and unobtrusive to fish and the public.

ROCK DROP STRUCTURES

Drop structures are constructed above the existing stream channel grade to raise the base elevation of the stream. Typically, rock drop structures are placed across the river, perpendicular to the flow. The structures planned the Moyie would be approximately



STRUCTURE LOCATION MAP

twenty feet wide. Typically they would be "V" shaped, and point upstream. At each bank, the structure will be partially exposed at low water. From the bank to mid-stream, the structure slopes downward slightly, and is approximately one-half foot lower than at the banks (Attachment A-1). The structures are keyed into each bank. The bank key areas are planted with willows as they are backfilled to promote binding of the soil by the willow root mass.

Enhancement Due To Rock Drop Structures:

1. Upstream of each structure, the water is raised and slowed. This backwater effect decreases the energy available for erosion of the channel bed and banks. Since the water is slowed it also tends to drop its sediment load upstream of the structure (Attachment A-1). Nursery areas are formed for juvenile trout, which prefer shallow, low velocity habitats.
2. Water passing over and through the rocks moves more quickly. This is in effect a man-made riffle which creates an excellent place for invertebrate production. These invertebrates serve as food for resident trout.
3. As the water leaves the drop structure, it flows perpendicular to the downstream face of the rocks. Therefore, if the structure is properly angled, the flow immediately downstream is focused toward mid-stream and causes the scour of a deep pool. The size of the scour hole is a function of flow depth, velocity, and streambed composition and as such must be tailored to each location (see Attachment A-2). This creates excellent habitat for adult trout.

Recreational Boat Passage

Recreational river traffic can be facilitated through the drop structures with the addition of a notch at center span. Rock that would be ordinarily used in the notch can be used to form an apron immediately downstream of the notch. Additionally, extra rock may be piled on the structure on either side of the notch as a navigation aid, providing a visual target for traffic approaching from upstream. At low flows, most of the water will move through the notch. However, on a river the size of the Moyie, it should be possible to maintain a minimum of one foot of water depth within the notch.

ROCK BARB STRUCTURES

A rock bank barb structure basically serves as a partial part of a drop structure. It extends from one bank across part of the channel width, is angled upstream, and slopes downward slightly towards mid-stream (see Attachments A-3 and A-4).

Enhancement Due to Rock Barb Structures:

1. Slower-moving backwater eddies upstream of each barb will minimize bank erosion and, under optimal conditions, may help the river to rebuild the eroded bank. This is due to deposition caused by the slowing of sediment laden water (see Attachments A-3, A-4, and A-5). The area created is well suited for trout rearing.
2. Water leaving the downstream face will be directed away from the adjacent downstream bank and towards mid-stream. This effect often creates a scoured pool near the end of the barb, and a slower back-eddy near the bank (see Attachment A-4). A feeding lane and cover for adult trout are also created.
3. Invertebrate colonization of the barb structures also increases food availability for trout.

Long-term Effectiveness

Unlike concrete structures, the rock drops and barbs offer other important features (other than low initial cost and low maintenance). Rock structures have a built-in flexibility which allows them literally to "go with the flow". They can settle and shift within their host environment with little or no loss to their performance and integrity. Because of the upstream V-shape, any settling which does occur will cause the structure to become more tightly interlocked as the individual components shift downstream. The structure can be viewed as an arch which is loaded from the upstream side, wherein the rocks act as compression members.

CULVERT APRON

The height of the jump which fish must make to access the mouth of the culvert could be decreased with the construction of a tiered rock apron. This would provide a stair-step and feature a pool midway up the apron, to provide a resting site for migrating trout.

Presently, there exists what amounts to an apron of two- to four-foot boulders but the grade is too steep for trout passage. The new apron would extend the base of this boulder pile downstream. The pool created within the apron would have a finer gravel bottom causing pooling of the slower moving water.

METAL FISHWAY FOR THE MEADOW CREEK CULVERT

The interior of the Meadow Creek culvert must be modified to allow upstream fish passage. Due to the smoothness of most culverts, fish have a difficult time negotiating the swift currents within. The purpose of the fishway is to provide a more natural, streambed-like condition with a variety of substrate sizes. This will create a variety of water depths and velocities, allowing fish some resting spots within the swift current on their passage into Meadow Creek.

The enclosed (see Attachment B) article describes one of these installations. The size of the fish ladder in the attached article is a smaller version of what is proposed for the Meadow Creek culvert. Note in the photograph, the difference in bed condition between the culvert on the right which has a fishway and the one on the left which does not.

We propose incorporating a such metal fishway at the Meadow Creek railroad crossing. However, permission must be obtained from the railroad prior to any culvert modifications.

CONSTRUCTION ACCESS

At each structure location it will be necessary for machinery to access the river from existing roads. The equipment for necessary construction includes a tracked backhoe, a rubber-tired front-end loader and dump trucks. It will be necessary to stockpile rock near each structure location. Sufficient rock should be stockpiled before construction of each structure begins. The largest drop structures proposed should take approximately one day to construct. If this time must be exceeded, structures should not be left half completed longer than overnight.

It is hoped that the landowners will be willing to accept the temporary inconvenience of the enhancement work once the long-term benefits created by the structures had been presented to them.

PRELIMINARY STRUCTURAL SPECIFICATIONS & PURPOSES

The following is a proposed list of structures, their locations and dimensions. More detailed profile and cross-sectional data must be gathered before the final design is completed.

For the purpose of this conceptual plan, PGT Pipeline crossings are numbered 1 through 8, number 1 being the most northerly (see page 2 for overall layout). Habitat enhancement structures are referenced using a sheet number, followed by a structure number on that sheet. The northernmost structure on each sheet is #1 and they are numbered consecutively moving south (i.e. 3-2 is the second structure south on sheet 3).

Because the Moyie River is generally flat and featureless, the proposed structures are designed to create diversity in flow velocity and depth which will help enhance the fisheries habitat. Each structure will directly affect the habitat by providing some of the following conditions:

1. Create a slower moving backwater upstream;
2. Create a faster moving riffle over, around, and through the structure, and;
3. Create faster moving water that will tend to dig a deeper pool downstream of each drop structure, and off of the end of each barb structure.

These conditions will occur in varying degrees at each structure and are a function of the variables at each site.

The accompanying drawings (see Attachment C) were made using USGS topo maps, photos supplied by PGT-PG&E, and photos and data gathered during November and December, 1990 by GEOMAX. The water surface elevation changes are based on normal summer flows.

Structure Number: 2-1

Purpose: Protect PGT Crossing #1, focus flow away from downstream right bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 0.5'

Structure Number: 2-2

Purpose: Slow the upstream water velocity along the right bank and direct the downstream flow away from the right bank to protect the railroad embankment from further erosion. Enhance habitat variety.

Length: 70' Width: 20' Rock Volume: 140 C.Y.

Structure Number: 2-3

Purpose: Protect the right bank from further erosion by slowing the upstream water velocity and directing the downstream flow away from the right bank. The right bank is the sediment source for the gravel bar which starts 1400' downstream. Eliminating this source will minimize further deposition downstream.

Length: 250' Width: 20' Rock Volume: 500 C.Y.

Upstream water surface elevation increase: 1.0'

Structure Number: 2-4

Purpose: Protect PGT Crossing #2, focus flow away from downstream right bank.
Length: 225' Width: 20' Rock Volume: 450 C.Y.

Structure Number: 2-5

Purpose: Slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion. Enhance habitat variety.

Length: 70' Width: 20' Rock Volume: 140 C.Y.

Structure Number: 2-6 & 2-7

Purpose: Balance the flow between each channel, minimize erosion of unconsolidated gravels during high flow periods, focus both downstream flows towards mid-channel and enhance habitat variety.

Length: 250' Width: 20' Rock Volume: 500 C.Y.

Upstream water surface elevation increase: 0.5'

Structure Number: 2-8 & 2-9

Purpose: Balance the flow between each channel, minimize erosion of unconsolidated gravels during high flow periods, focus both downstream flows towards mid-channel and enhance habitat variety.

Length: 250' total Width: 20' Rock Volume: 500 C.Y.

Upstream water surface elevation increase: 0.5'

Structure Number: 2-10 & 2-11

Purpose: The left bank is in the process of folding outward to the southeast due to differential deposition at the right bank. These barbs will slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion, and provide habitat variety.

Length: 250' total Width: 20' Rock Volume: 500 C.Y. total

Structure Number: 3-1 & 3-2

Purpose: Slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion. Enhance habitat variety.

Length: 250' total Width: 20' Rock Volume: 500 C.Y. total

Structure Number: 3-3

Purpose: The location of the new bridge could make it susceptible to scour at the base of each pier. The drop structure will direct most of the energy away from the sides of the channel (especially the right, or west pier). Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Structure Number: 3-4

Purpose: Protect the right bank from further erosion by slowing upstream water velocity and directing downstream flow away from the right bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 0.5'

Structure Number: 3-5

Purpose: The gravel slide on the steep right bank is adding significant sediment to the river. The barb will minimize the undercutting of this slide at the water's edge. Enhance habitat variety.

Length: 70' Width: 20' Rock Volume: 140 C.Y.

Structure Number: 3-6

Purpose: Protect PGT Crossing #3, focus flow away from downstream right bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 0.5'

Structure Number: 3-7

Purpose: Protect PGT Crossing #4, minimize erosion of the upstream right bank, and focus flow away from downstream right bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 1.0'

Structure Number: 3-8

Purpose: Slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion. Enhance habitat variety.

Length: 70' Width: 20' Rock Volume: 140 C.Y.

Structure Number: 4-1 & 4-2

Purpose: Balance the flow between each channel, minimize erosion of unconsolidated gravels during high flow periods, focus both downstream flows towards mid-channel and enhance habitat variety.

Length: 250' total Width: 20' Rock Volume: 500 C.Y. total

Upstream water surface elevation increase: 0.5'

Structure Number: 4-3

Purpose: Protect PGT Crossing #5 and focus flow away from downstream right bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 1.0'

Structure Number: 4-4, 4-5 & 4-6

Purpose: This stretch has fairly uniform width, depth, and water velocity. Barbs would break up this uniformity for greater habitat variety.

Length: 210' total Width: 20' Rock Volume: 420 C.Y.

Structure Number: 5-1

Purpose: Protect PGT Crossing #6, drown upstream headcut, and focus flow away from downstream right bank and bridge pier. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 1.5'

Structure Number: 5-2

Purpose: Protect PGT Crossing #7 and trap sediment which is presently creating gravel bars downstream right bank and left bank. Enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 1.5'

Structure Number: 5-3, 5-4 & 5-5

Purpose: This stretch has fairly uniform width, depth, and water velocity. Barbs would break up this uniformity for greater habitat variety and protect the right bank from erosion.

Length: 210' total Width: 20' Rock Volume: 420 C.Y.

Structure Number: 5-6 & 5-7

Purpose: Deposition on the left bank is forcing the flow against the right bank. Barbs would protect the right bank and focus the flow towards the left bank. Enhance habitat variety.

Length: 140' total Width: 20' Rock Volume: 280 C.Y.

Structure Number: 6-1

Purpose: Protect PGT Crossing #8 and enhance habitat variety.

Length: 225' Width: 20' Rock Volume: 450 C.Y.

Upstream water surface elevation increase: 1.5'

TOTAL STRUCTURAL ROCK VOLUMES

Total Structural Rock Volume Sheet 2:	2870 C.Y.
Total Structural Rock Volume Sheet 3:	2580 C.Y.
Total Structural Rock Volume Sheet 4:	1370 C.Y.
Total Structural Rock Volume Sheet 5:	1600 C.Y.
Total Structural Rock Volume Sheet 6:	450 C.Y.
Total Rock Volume in Apron, Sheet 6:	300 C.Y.
Total Rock, all sheets	9170 C.Y.

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ATTACHMENT A

ILLUSTRATIONS

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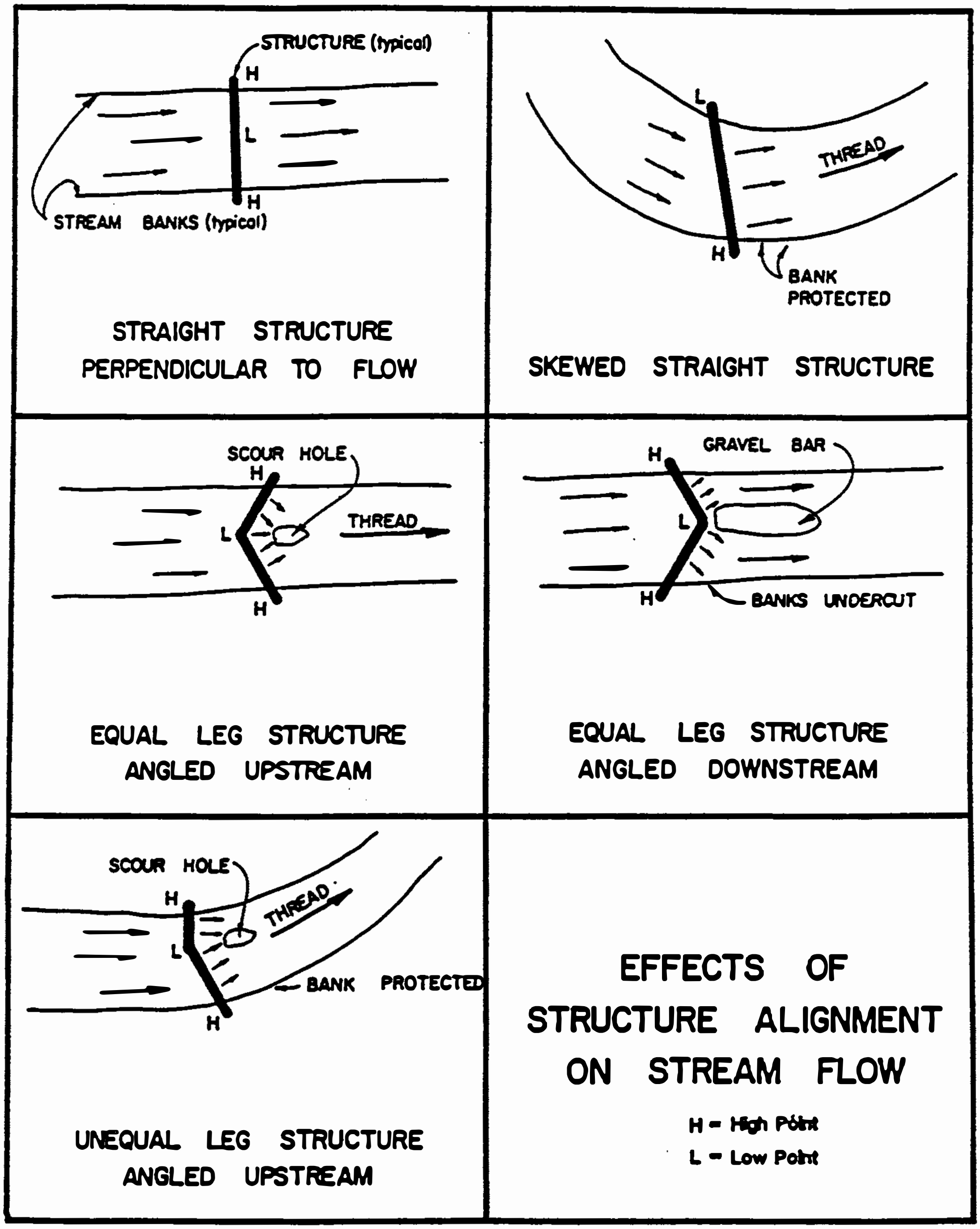
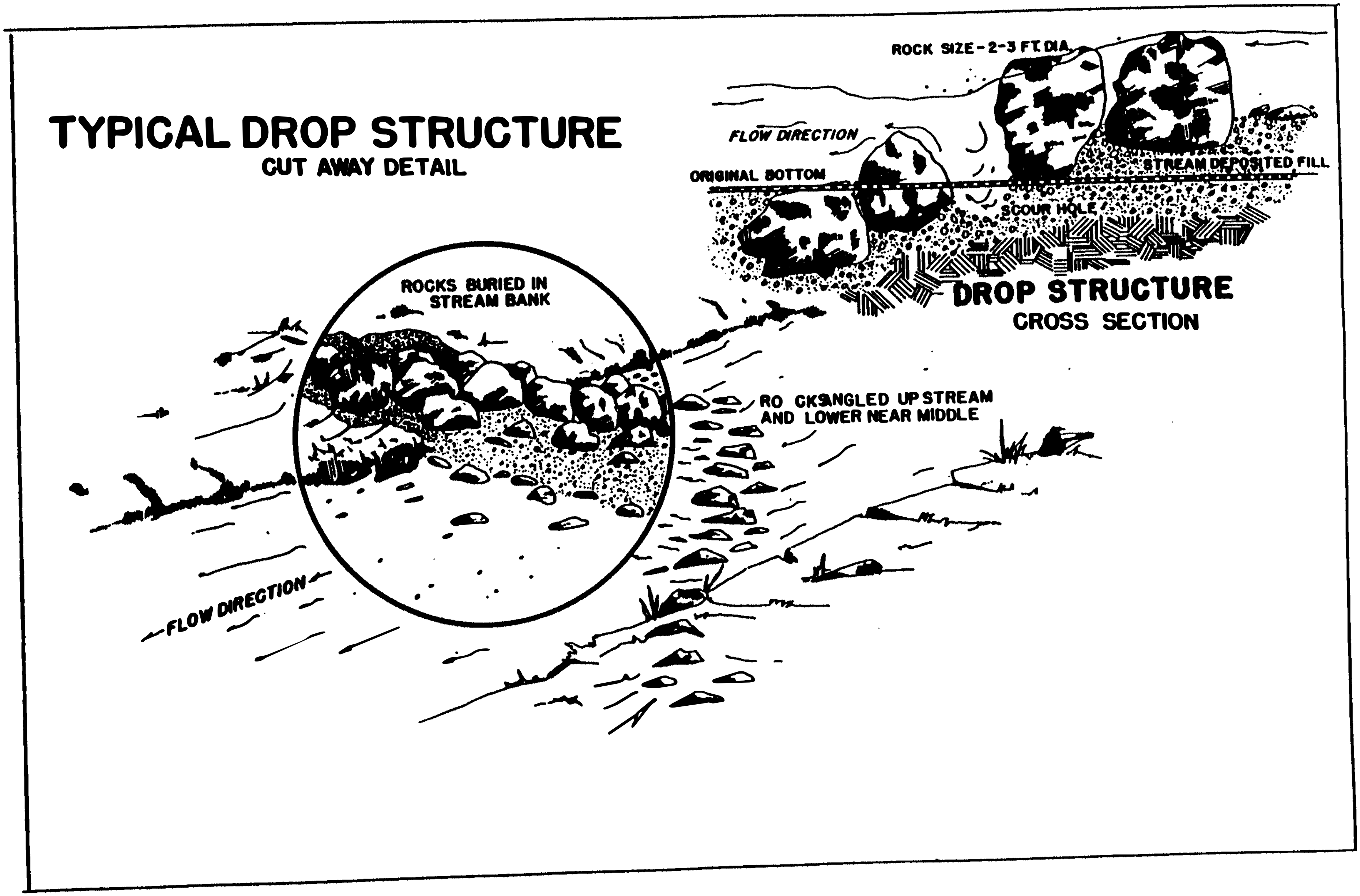
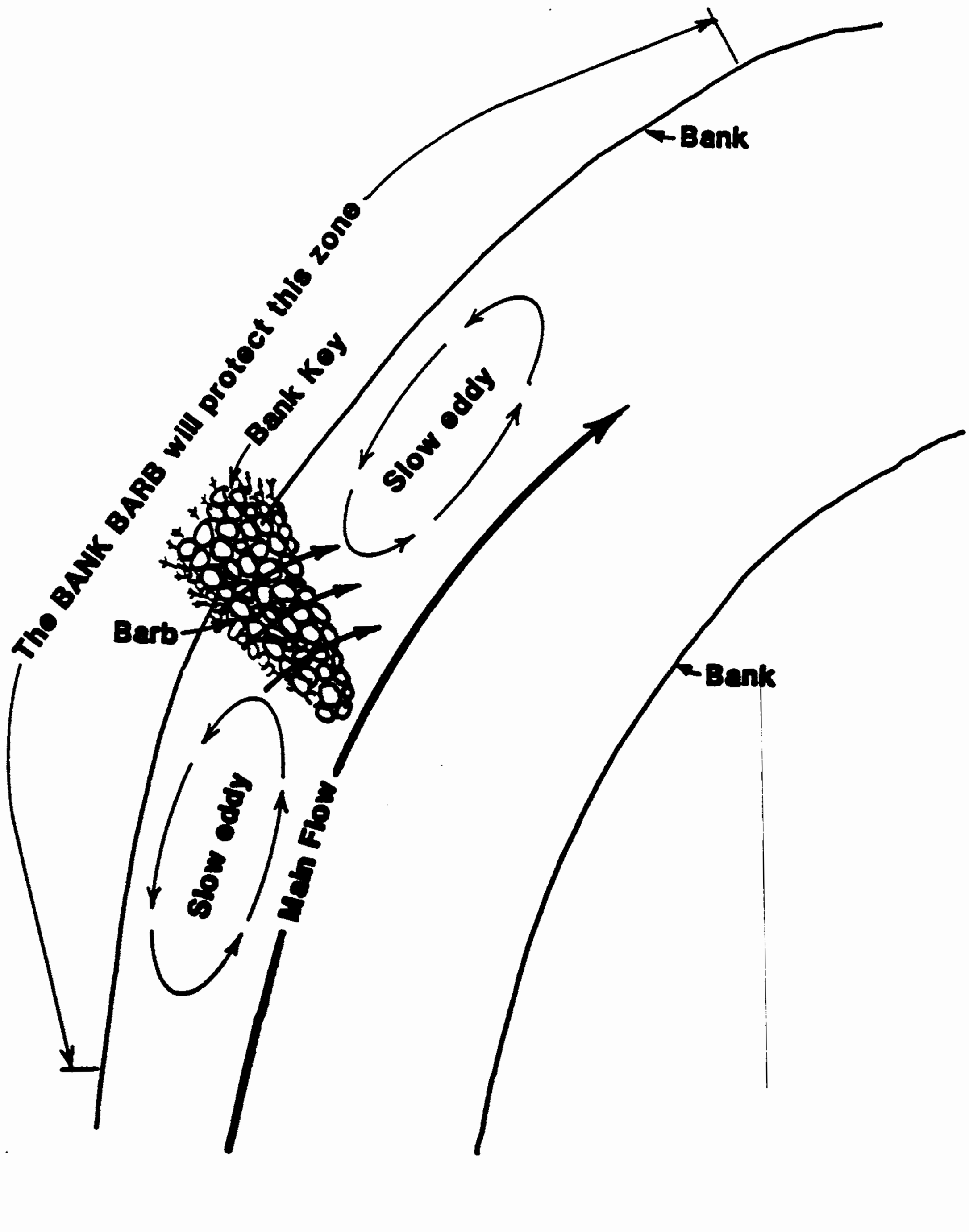

STRUCTURE (typical)
H
L
H
STREAM BANKS (typical)
STRAIGHT STRUCTURE PERPENDICULAR TO FLOW
L
THREAD
H
BANK PROTECTED
SKEWED STRAIGHT STRUCTURE
SCOUR HOLE
H
L
THREAD
H
EQUAL LEG STRUCTURE ANGLED UPSTREAM
H
GRAVEL BAR
L
H
BANKS UNDERCUT
EQUAL LEG STRUCTURE ANGLED DOWNSTREAM
SCOUR HOLE
H
L
THREAD
BANK PROTECTED
H
UNEQUAL LEG STRUCTURE ANGLED UPSTREAM
EFFECTS OF STRUCTURE ALIGNMENT ON STREAM FLOW
H = High Point
L = Low Point

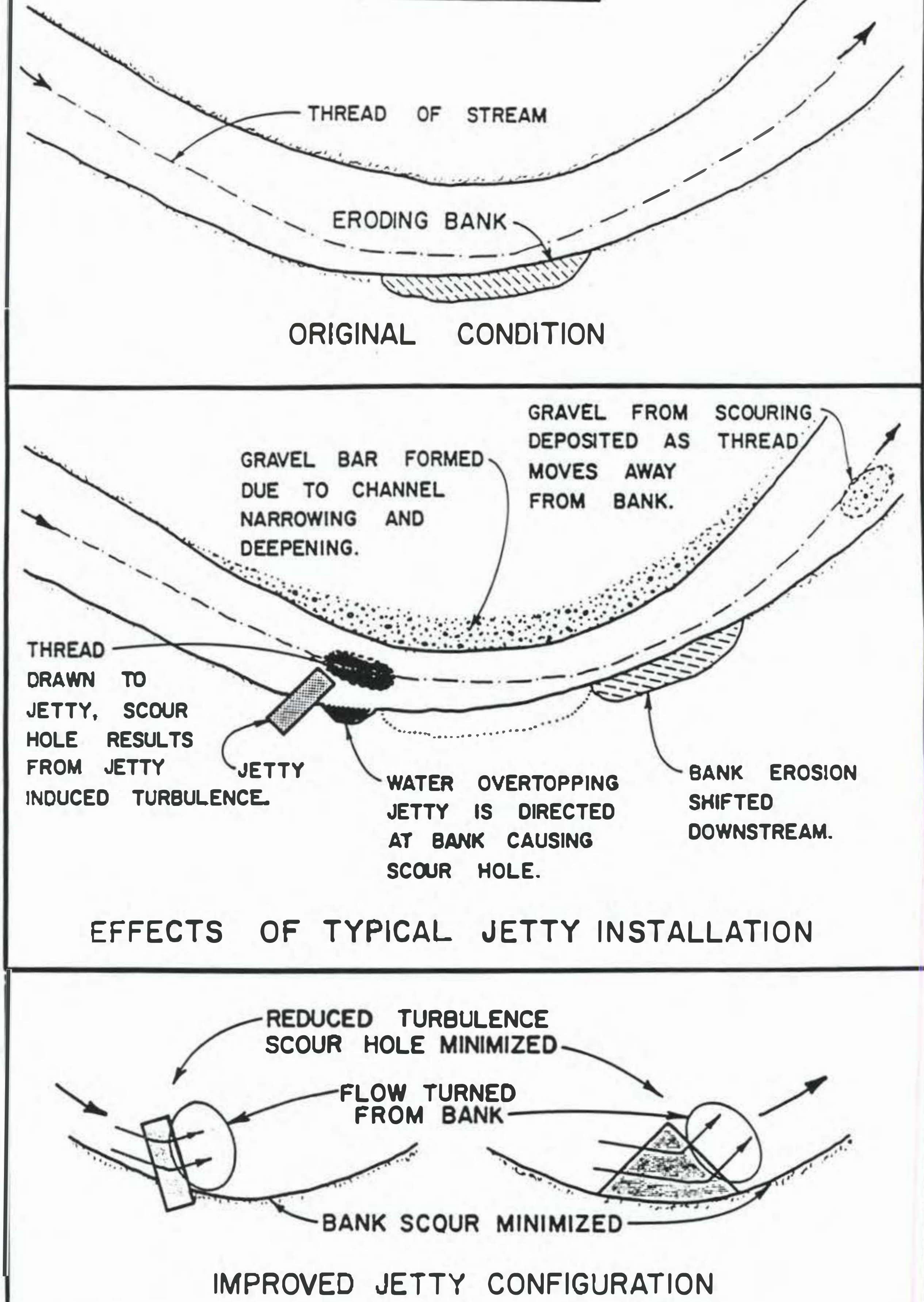

TYPICAL DROP STRUCTURE
CUT AWAY DETAIL
ROCK SIZE - 2-3 FT. DIA.
FLOW DIRECTION
ORIGINAL BOTTOM
STREAM DEPOSITED FILL
SCOUR HOLE
DROP STRUCTURE
CROSS SECTION
ROCKS BURIED IN
STREAM BANK
RO CKS ANGLED UP STREAM
AND LOWER NEAR MIDDLE
FLOW DIRECTION

NOTE: Flow is directed perpendicular to the downstream face of the barb.

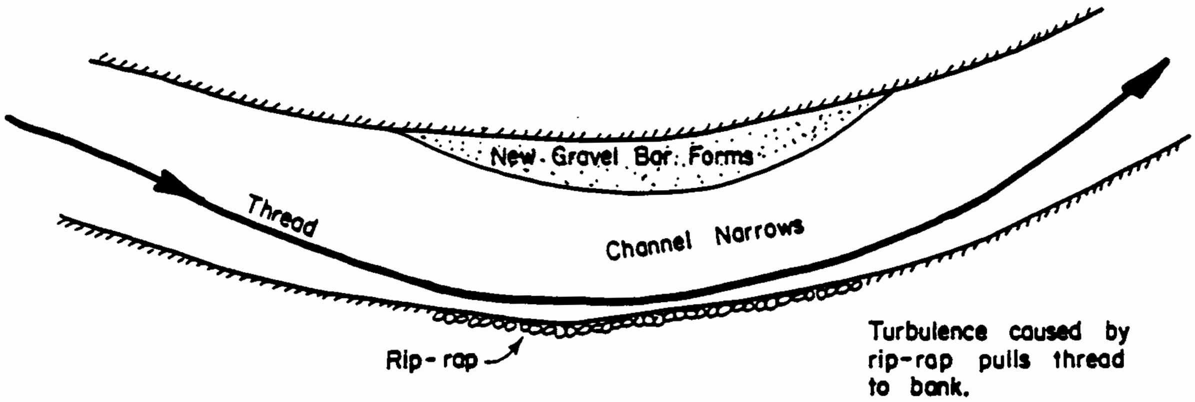


BANK BARB

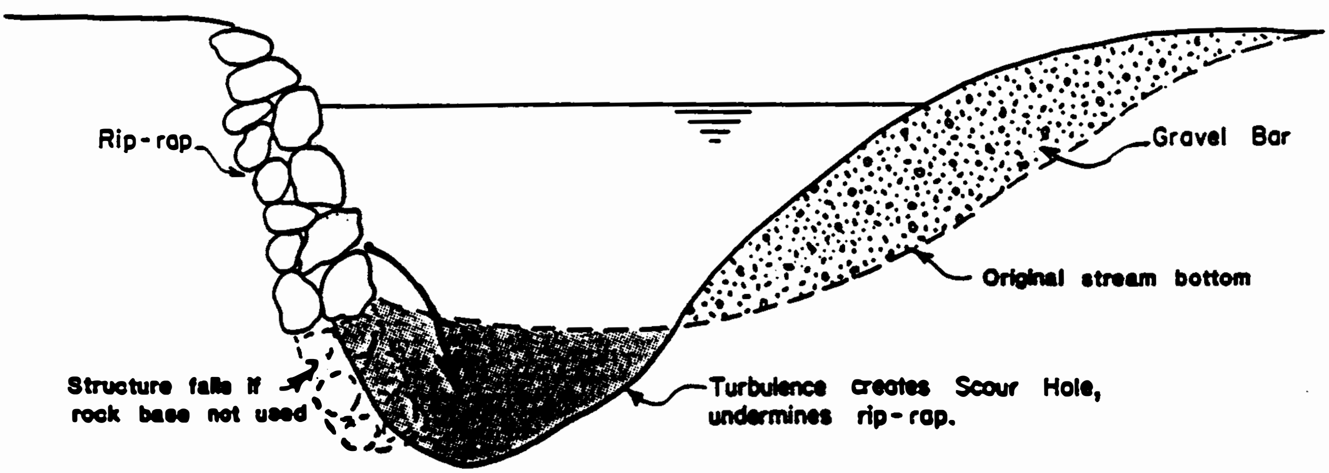
JETTY ACTION



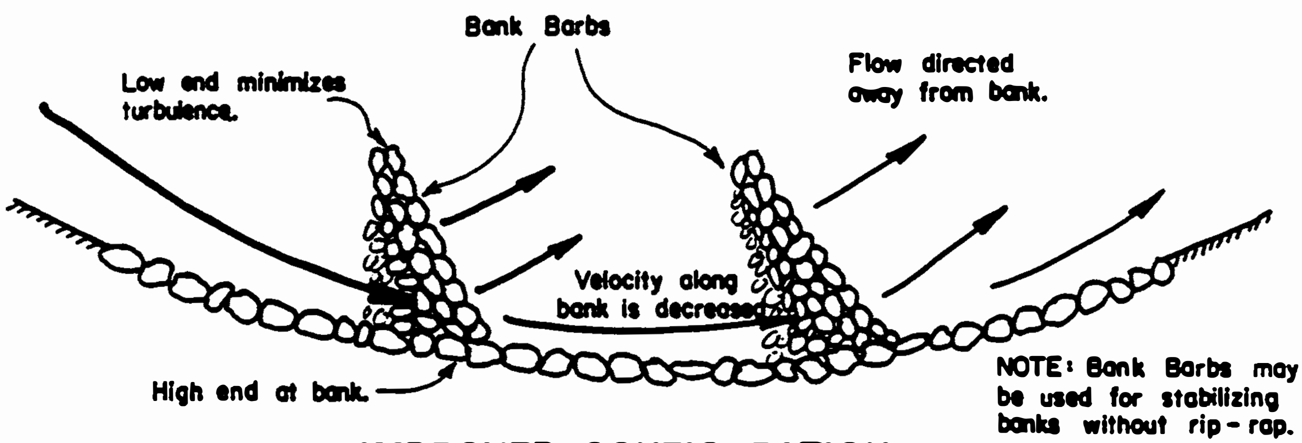
TYPICAL RIP-RAP BEHAVIOR



IMPACT ON THREAD



CROSS SECTION



IMPROVED CONFIGURATION

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ATTACHMENT B

A DETACHABLE FISHWAY

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North American Journal of Fisheries Management 10:244–246, 1990

A Detachable Fishway for Steep Culverts

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Abstract.—A fishway constructed of angle iron and reinforcing bar was installed in a high-gradient culvert to allow the passage of Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* to upstream spawning areas. The structure was detachable from the culvert, inexpensive, and portable. The fishway was still effective 8 years after installation.

Fish passage problems caused by highway culverts are common throughout the northwestern USA. Proper sizing and placement of culverts during design and construction is preferable to modification of the streambed or culvert once the work has been completed. However, many culverts are installed in a way that impedes fish passage. This occurred in Cedar Creek, a tributary of the Yellowstone River in southwestern Montana.

Twin culverts, placed side by side in Cedar Creek, were blocking upstream movement of Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* during their annual spawning migration in June and July (Berg 1975). Fish spawned in the 590-ft section of creek immediately downstream from the culverts, but excessive water velocities within the culverts blocked access to upstream spawning sites. Modification of the culverts to allow fish passage was desirable because the population of Yellowstone cutthroat trout in the Yellowstone River is limited by the production of recruits in spawning tributaries (Clancy 1988).

Each corrugated metal culvert was 148 ft long, had a diameter of 6.2 ft, and was placed on a gradient of 4.4%. The Montana Department of Highways permitted installation of a fishway in one culvert with the understanding that it would be easily removable, require no drilling of holes in the steel culvert, and would not accumulate debris.

During April 1981, a fishway composed of angle iron and reinforcing bar was designed, shop-fabricated, and transported in eight 20-ft-long sections to the site. The upstream end of the fishway was bolted to the concrete headwall at the culvert entrance, and the other sections were bolted together in a downstream direction (Figure 1). The rock holder–hold-downs were angled upstream so water pressure would hold the structure in place. Cross-members were placed every 4 ft. During installation, an average of three large rocks were hand-placed on the upstream side of each cross-member to act as velocity checks. These rocks provided the turbulence necessary to allow fish

ATTACHMENT B-2

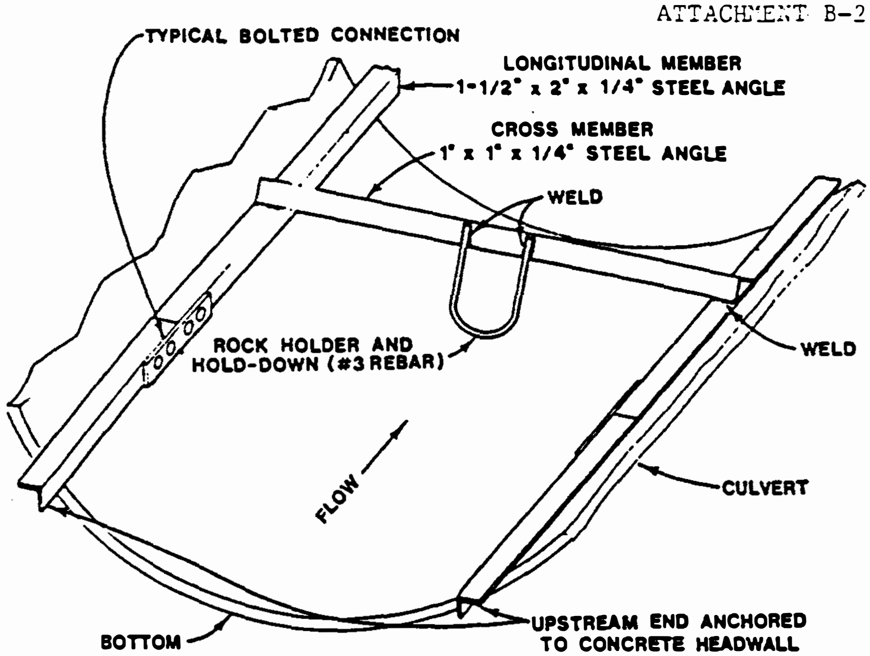

FIGURE 1.—Detail of a fishway for use in culverts (not to scale).

passage. Heavy pipe was used for the most downstream cross-member to allow for the attachment of a cable if removal of the structure was necessary. This would be accomplished by disconnecting the upstream anchorage and pulling the fishway out of the downstream end of the culvert with a tractor or other machine. Complete installation, including rock placement, was completed by two men in 4 h and required only hand tools. Costs associated with the fishway included those for materials, design, welding, transportation, and installation (Table 1).

Mean velocity through the culvert was 2.2 ft/s before and 0.7 ft/s after installation of the fishway. Critical velocity is defined as the maximum sustained speed a fish can maintain for 10 min (Jones et al. 1974), which is considered comparable to the passage velocity of fish through long culverts up to 328 ft long. Salmonids of a size comparable to Yellowstone cutthroat trout in Cedar Creek can sustain a critical velocity between 1.1 and 2.2 ft/s. Mean bottom velocity in the Cedar Creek culvert was 1.6–5.2 ft/s before and 1.5–5.6 ft/s after installation of the fishway. These measurements were made over a range of flows during the migration period. Maximum velocities were slightly higher in the improved culvert, but they occurred only in 1-ft-long sections as opposed to 115-ft-long sections in the unimproved culvert (Belford 1986). The shortening of the maximum-velocity distance was critical to the success of the fish ladder, but experiments showed that fish were able to pass longer maximum-velocity distances than those occurring in the improved culvert (Belford 1986). Therefore, cross-members could have been spaced farther apart than 4 ft.

Yellowstone cutthroat trout from the Yellowstone River were spawning in Cedar Creek upstream from the culverts 2 months after installation of the fishway. They ascended only the improved culvert (Belford 1986).

Eight years after installation, the fishway is functioning well. No long-term streamflow records exist for Cedar Creek, so the flood frequency that the structure has endured is unknown; however, several streamflow events have moved large amounts of bed load. The bottom of the culvert between the cross-members has filled with bed

TABLE 1.—Cost (1990 prices) of fishway installed in a culvert 148 ft long and 6.2 ft wide.

Item	Cost (US$)
Materials	
Longitudinal members: 295 ft of angle iron, 1.5 × 2 × 0.25 in	285.00
Cross-members: 161 ft of angle iron, 1 × 1 × 0.25 in	88.00
Rock holders: 108 ft of #3 reinforcement bar (rebar)	12.00
Bolts, connectors, etc.	30.00
Labor	
Design, welding, transportation, and field installation	1,785.00
Total	2,200.00

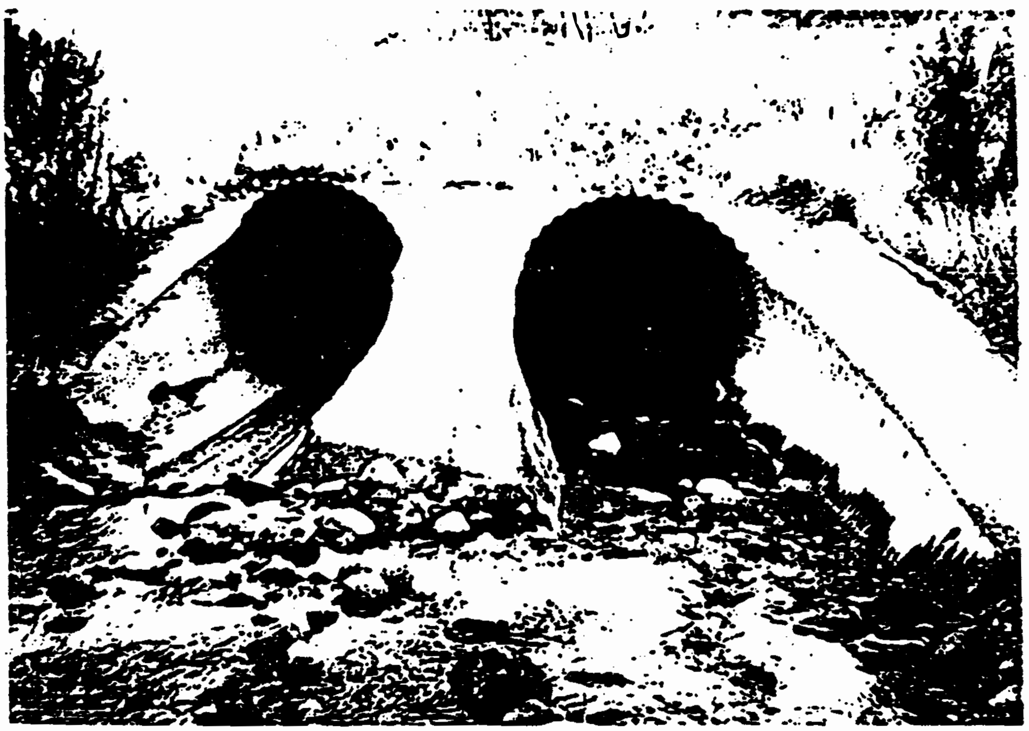

FIGURE 2.—Downstream view of the twin culverts in Cedar Creek. Note the accumulation of bed load in the culvert on the right, which contains the fishway.

load and now resembles natural streambottom (Figure 2). The bed-load accumulation has probably increased the life-span of the structure, but would create problems if quick removal of the structure was required. The conveyance capacity of the culvert was about 15% less after installation of the fishway. Little debris has accumulated in the culvert, although a few tree branches have become entangled in the farthest downstream cross-member, which extends outside of the culvert. Debris removal has not been necessary.

The low cost, ease of installation, and effectiveness of this fishway make it applicable to other culverts where high gradients are impeding fish passage.

Acknowledgments.—Our appreciation is extended to Fred Nelson and John Fraley for their critical reviews of the manuscript.

References

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Jones, D. R., J. W. Kiceniuk, and O. S. Bamford. 1974. Evaluation of the swimming performance of several fish species from the Mackenzie River. Journal of the Fisheries Research Board of Canada 31:1641–1647.

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ATTACHMENT C

FISHERY ENHANCEMENT MAPS

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FISHERY ENHANCEMENTCONCEPTUAL DESIGN

for

MOYIE RIVER, IDAHO

for

PGT - PG & E

CONTENTS

DONALD R. REICHMUTH, P.E
IDAHO REGISTRATION NO. 5597

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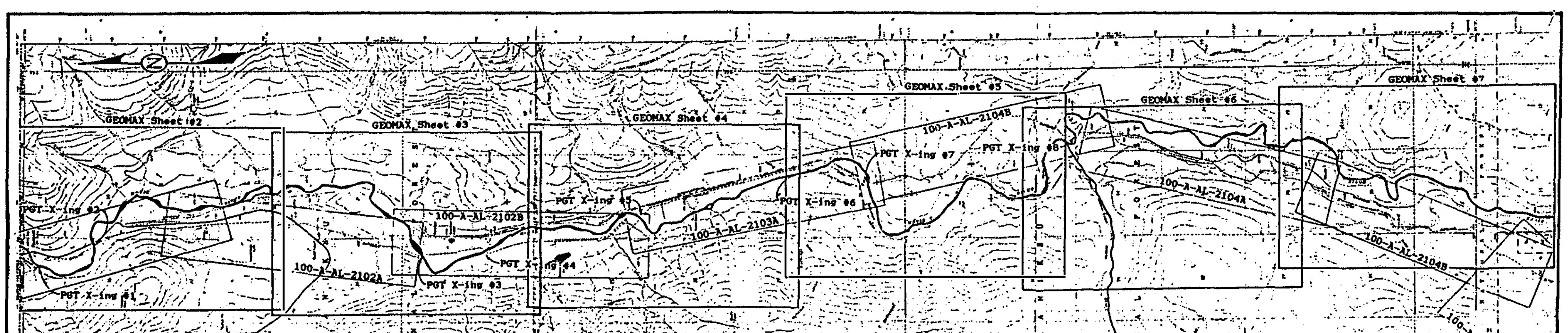

Total Rock Volume Sheet 2: 2870 C.Y.
Total Rock Volume Sheet 3: 2580 C.Y.
Total Rock Volume Sheet 4: 1370 C.Y.
Total Rock Volume Sheet 5: 1600 C.Y.
Total Rock Volume Sheet 6: 450 C.Y.
Total Rock, all Sheets 8870 C.Y.

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PROJECT VICINITY MAP
SCALE: 1" - 4000'
(SOURCE: USGS MOYIE SPRINGS, MEADOW CREEK, EASTPORT, IDAHO QUADS, 1965)

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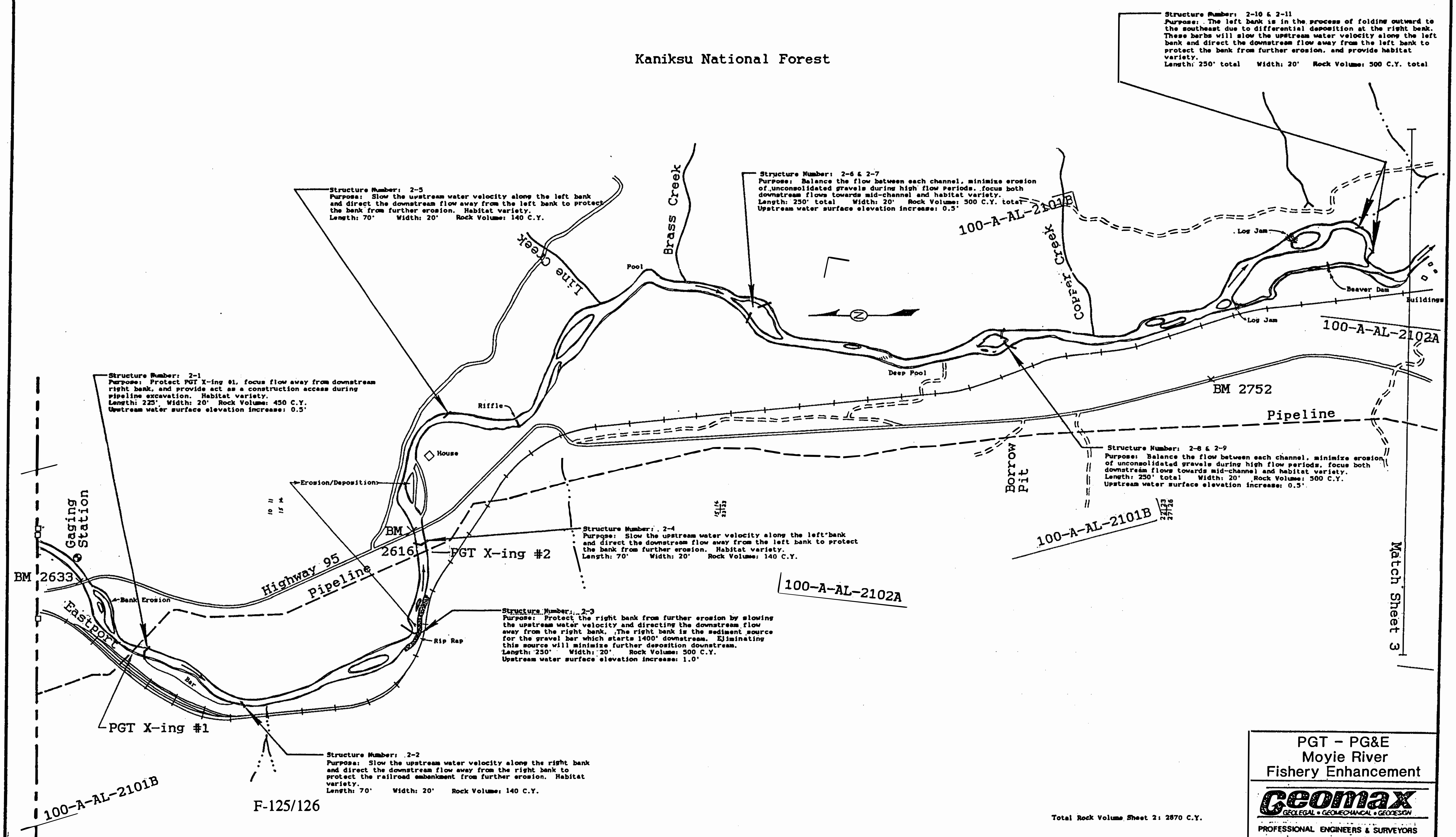

(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965
PGT – PG&E Aerial Photos, and GEOMAX Aerial Photos)

PGT – PG&E
Moyie River
Fishery Enhancement

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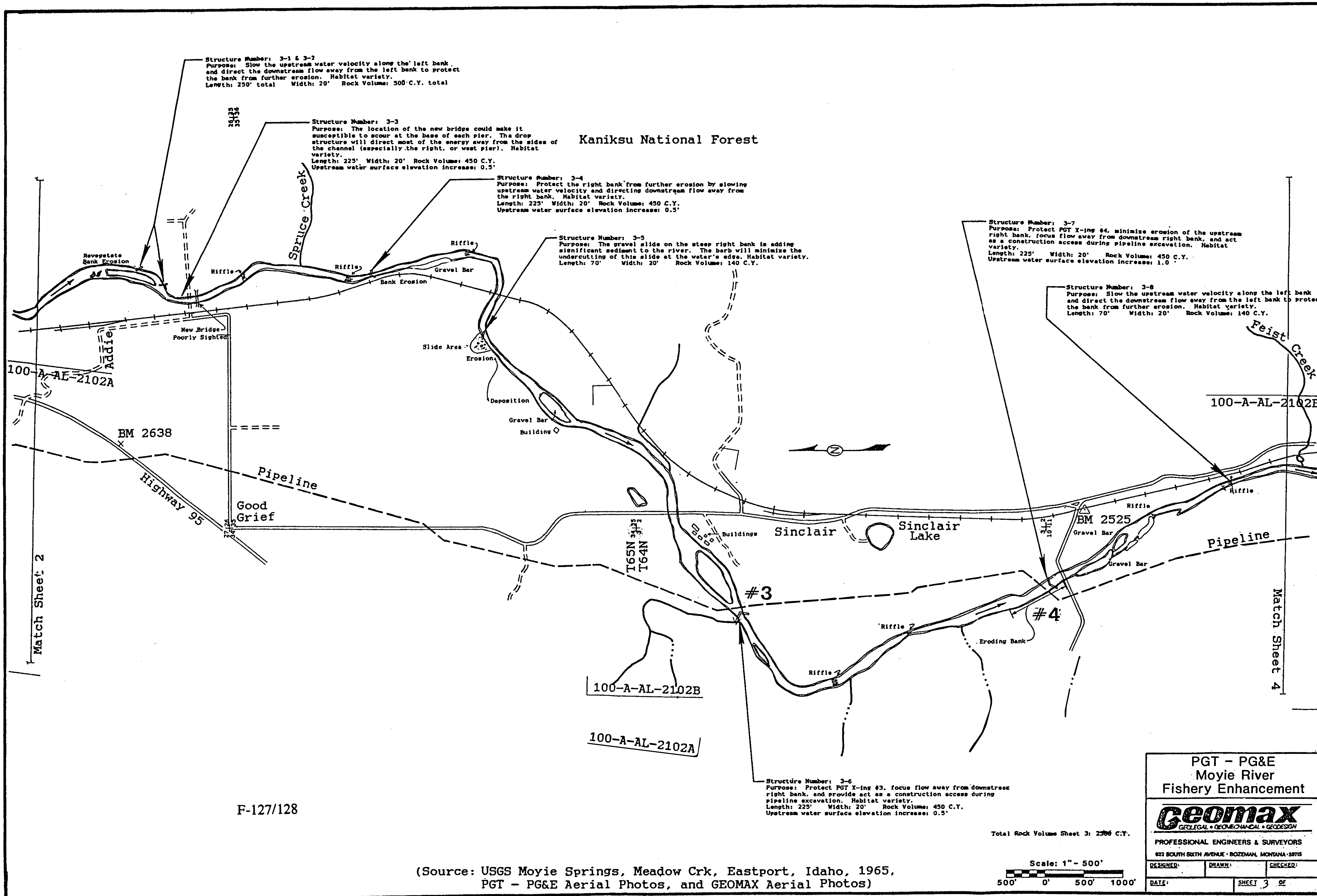

Structure Number: 3-1 & 3-2
Purpose: Slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion. Habitat variety.
Length: 250' total Width: 20' Rock Volume: 500 C.Y. total
Structure Number: 3-3
Purpose: The location of the new bridge could make it susceptible to scour at the base of each pier. The drop structure will direct most of the energy away from the sides of the channel (especially the right, or west pier). Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 0.5'
Kaniksu National Forest
Structure Number: 3-4
Purpose: Protect the right bank from further erosion by slowing upstream water velocity and directing downstream flow away from the right bank. Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 0.5'
Structure Number: 3-5
Purpose: The gravel slide on the steep right bank is adding significant sediment to the river. The barb will minimize the undercutting of this slide at the water's edge. Habitat variety.
Length: 70' Width: 20' Rock Volume: 140 C.Y.
Structure Number: 3-7
Purpose: Protect PGT X-ing #4, minimize erosion of the upstream right bank, focus flow away from downstream right bank, and act as a construction access during pipeline excavation. Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 1.0'
Structure Number: 3-8
Purpose: Slow the upstream water velocity along the left bank and direct the downstream flow away from the left bank to protect the bank from further erosion. Habitat variety.
Length: 70' Width: 20' Rock Volume: 140 C.Y.
Spruce Creek
Revegetate Bank Erosion
Riffle
Gravel Bar
Bank Erosion
New Bridge Poorly Sighted
Addie
Slide Area
Erosion
Deposition
Building
Buildings
100-A-AL-2102A
100-A-AL-2102B
BM 2638
Highway 95
Pipeline
Good Grief
T65N
T64N
#3
#4
Sinclair
Sinclair Lake
BM 2525
Eroding Bank
Feist Creek
Match Sheet 2
Match Sheet 4
Structure Number: 3-6
Purpose: Protect PGT X-ing #3, focus flow away from downstream right bank, and provide act as a construction access during pipeline excavation. Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 0.5'
Total Rock Volume Sheet 3: 2300 C.Y.
Scale: 1" - 500'
500' 0' 500' 1000'
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Moyie River
Fishery Enhancement
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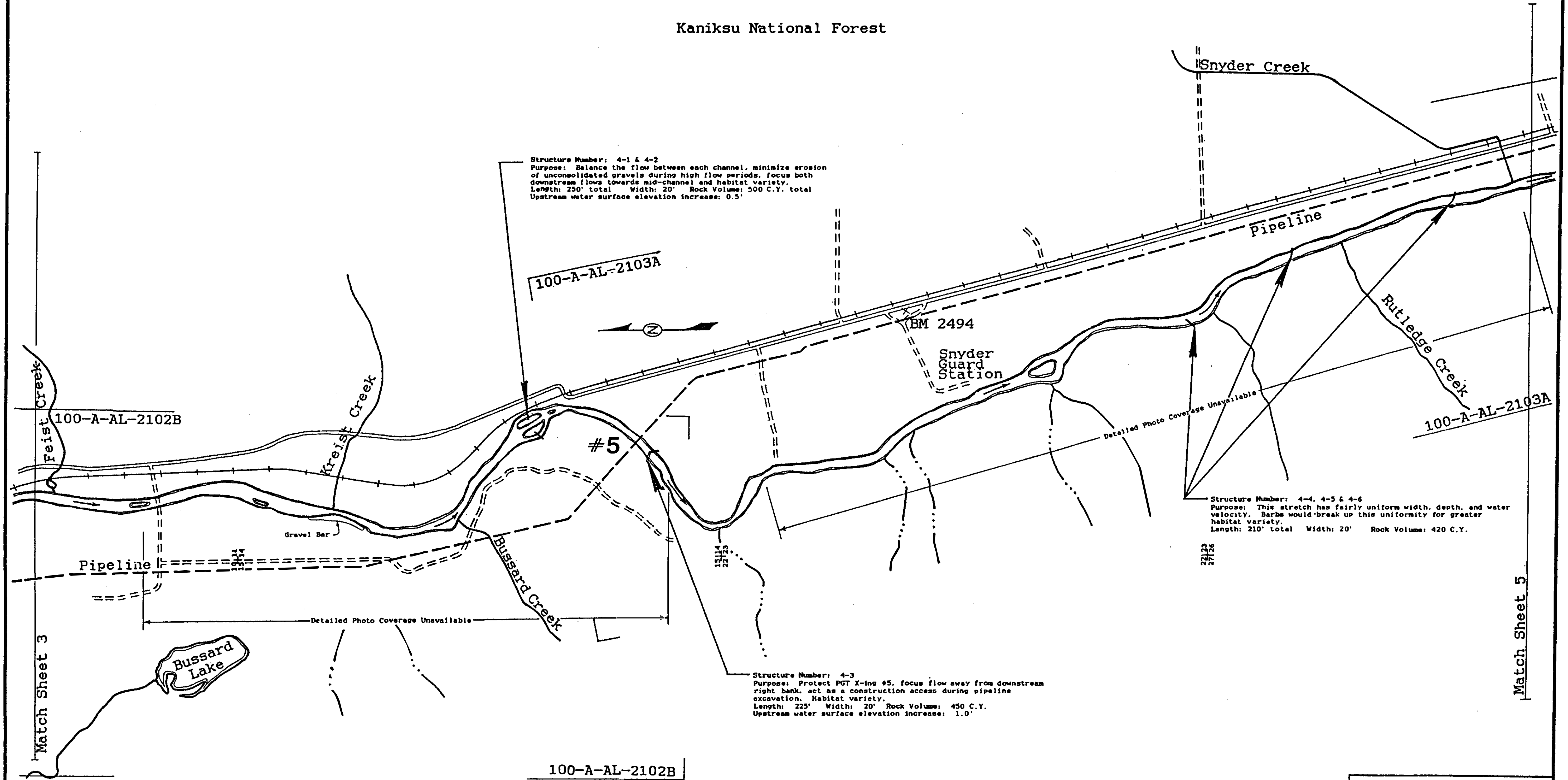
F-127/128
(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965, PGT - PG&E Aerial Photos, and GEOMAX Aerial Photos)



Total Rock Volume Sheet 4: 1370 C.Y.

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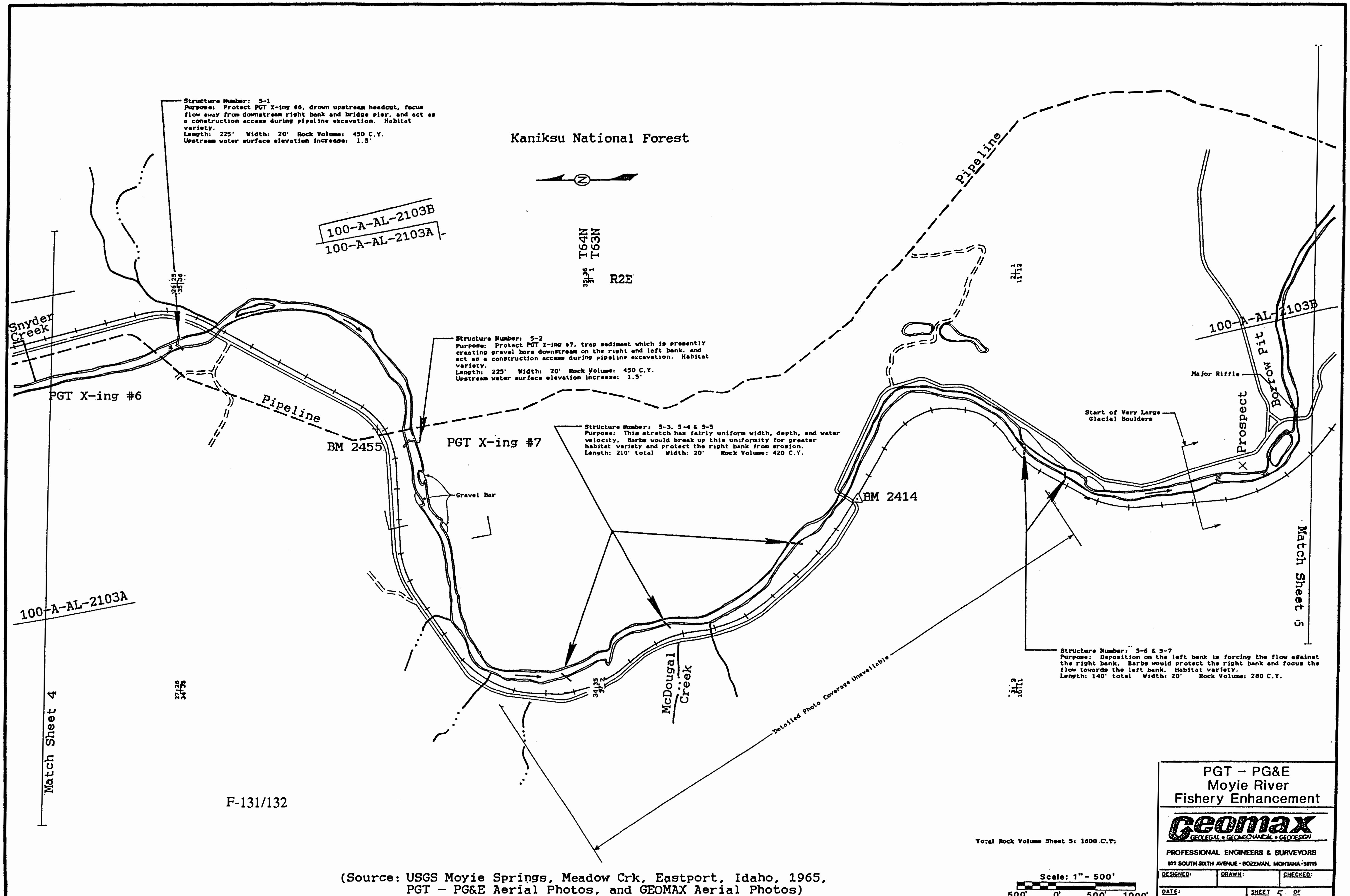
Scale: 1" - 500'
500' 0' 500' 1000'

F-129/130

(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965, PGT - PG&E Aerial Photos, and GEOMAX Aerial Photos)



Structure Number: 5-1
Purpose: Protect PGT X-ing #6, drown upstream headcut, focus flow away from downstream right bank and bridge pier, and act as a construction access during pipeline excavation. Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 1.5'
Kaniksu National Forest
100-A-AL-2103B
100-A-AL-2103A
T64N
T63N
R2E
Pipeline
Snyder Creek
PGT X-ing #6
Pipeline
BM 2455
Structure Number: 5-2
Purpose: Protect PGT X-ing #7, trap sediment which is presently creating gravel bars downstream on the right and left bank, and act as a construction access during pipeline excavation. Habitat variety.
Length: 225' Width: 20' Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 1.5'
PGT X-ing #7
Gravel Bar
Structure Number: 5-3, 5-4 & 5-5
Purpose: This stretch has fairly uniform width, depth, and water velocity. Barbs would break up this uniformity for greater habitat variety and protect the right bank from erosion.
Length: 210' total Width: 20' Rock Volume: 420 C.Y.
BM 2414
100-A-AL-2103B
Major Riffle
Start of Very Large Glacial Boulders
Prospect
Borrow Pit
Match Sheet 5
Structure Number: 5-6 & 5-7
Purpose: Deposition on the left bank is forcing the flow against the right bank. Barbs would protect the right bank and focus the flow towards the left bank. Habitat variety.
Length: 140' total Width: 20' Rock Volume: 280 C.Y.
McDougal Creek
Detailed Photo Coverage Unavailable
100-A-AL-2103A
Match Sheet 4
F-131/132
Total Rock Volume Sheet 5: 1600 C.Y.
Scale: 1" = 500'
500' 0' 500' 1000'
(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965,
PGT - PG&E Aerial Photos, and GEOMAX Aerial Photos)
PGT - PG&E
Moyie River
Fishery Enhancement
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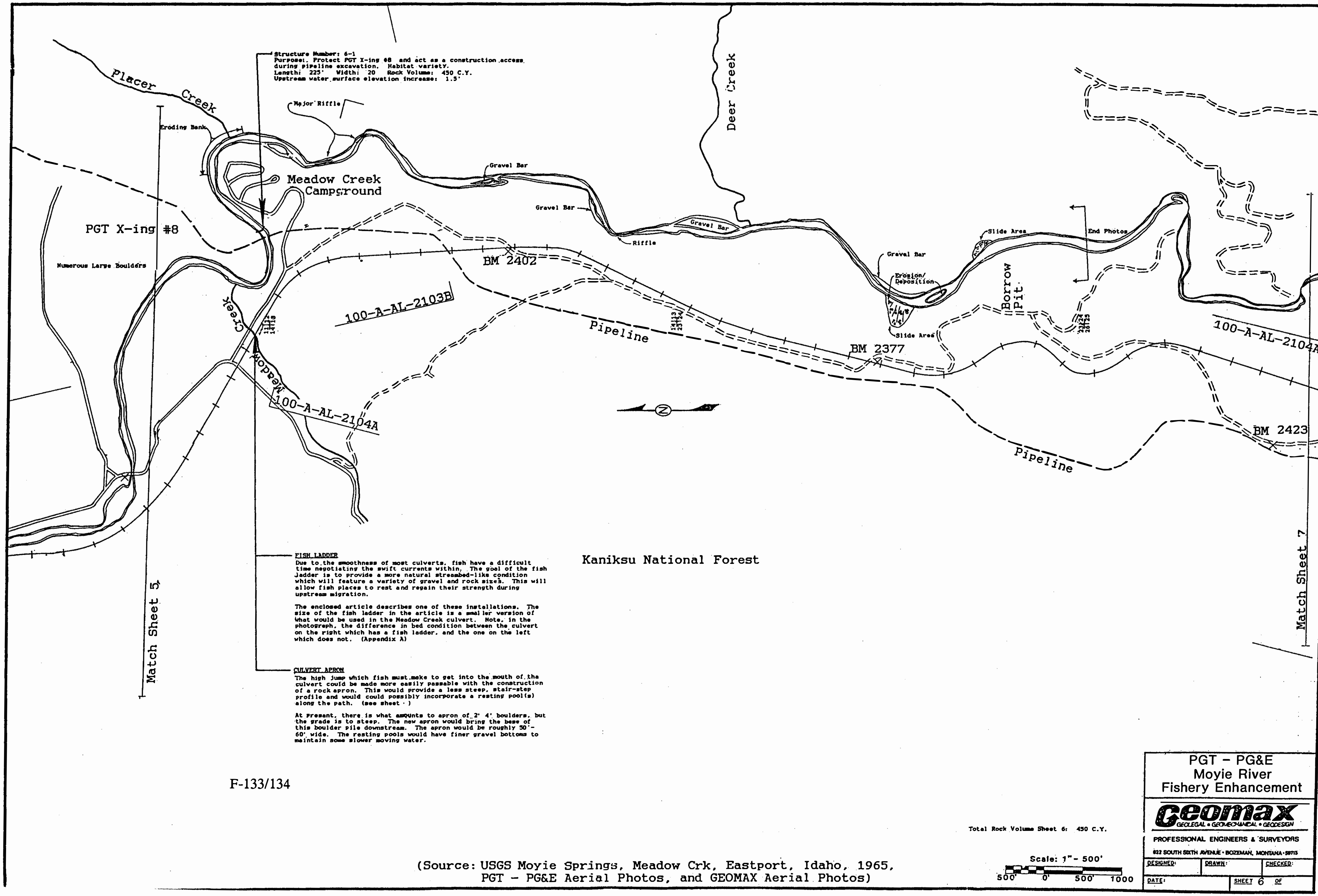

Structure Number: 6-1
Purpose: Protect PGT X-ing #8 and act as a construction access during pipeline excavation. Habitat variety.
Length: 225' Width: 20 Rock Volume: 450 C.Y.
Upstream water surface elevation increase: 1.5'
Placer Creek
Eroding Bank
Major Riffle
Meadow Creek Campground
PGT X-ing #8
Numerous Large Boulders
Gravel Bar
Gravel Bar
Gravel Bar
Riffle
Deer Creek
BM 2402
100-A-AL-2103B
Meadow Creek
100-A-AL-2104A
Pipeline
BM 2377
Gravel Bar
Erosion/Deposition
Slide Area
Slide Area
End Photos
Borrow Pit
100-A-AL-2104A
BM 2423
Pipeline
Kaniksu National Forest
Match Sheet 5
Match Sheet 7
FISH LADDER
Due to the smoothness of most culverts, fish have a difficult time negotiating the swift currents within. The goal of the fish ladder is to provide a more natural streambed-like condition which will feature a variety of gravel and rock sizes. This will allow fish places to rest and regain their strength during upstream migration.
The enclosed article describes one of these installations. The size of the fish ladder in the article is a smaller version of what would be used in the Meadow Creek culvert. Note, in the photograph, the difference in bed condition between the culvert on the right which has a fish ladder, and the one on the left which does not. (Appendix A)
CULVERT APRON
The high jump which fish must make to get into the mouth of the culvert could be made more easily passable with the construction of a rock apron. This would provide a less steep, stair-step profile and would could possibly incorporate a resting pool(s) along the path. (see sheet ·)
At present, there is what amounts to apron of 2' 4' boulders, but the grade is to steep. The new apron would bring the base of this boulder pile downstream. The apron would be roughly 50'-60' wide. The resting pools would have finer gravel bottoms to maintain some slower moving water.
Total Rock Volume Sheet 6: 450 C.Y.
Scale: 1" = 500'
500' 0' 500' 1000
(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965, PGT - PG&E Aerial Photos, and GEOMAX Aerial Photos)
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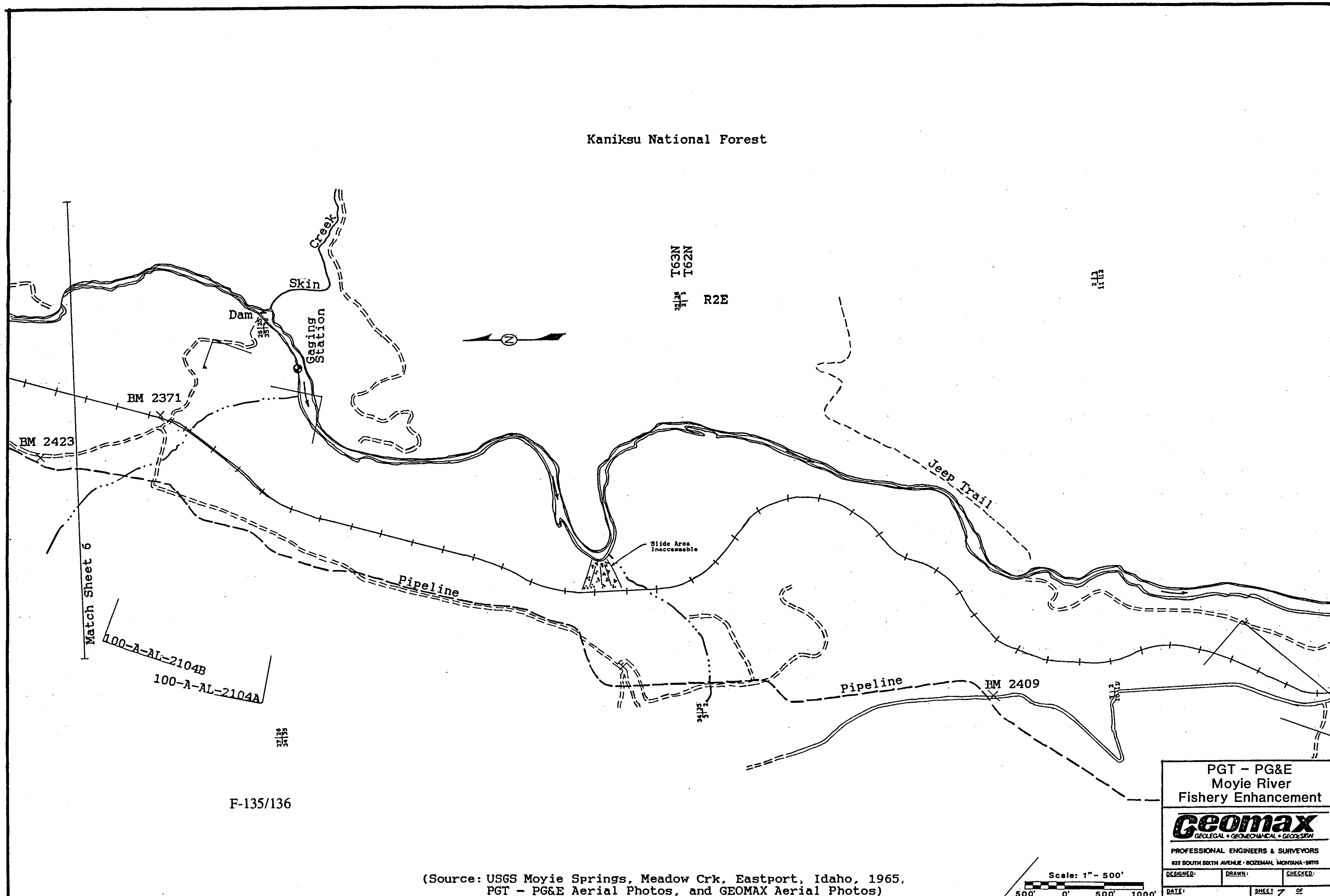

Kaniksu National Forest
Skin Creek
Dam
Gaging Station
T63N
T62N
R2E
BM 2371
BM 2423
BM 2409
Jeep Trail
Slide Area Inaccessable
Pipeline
Pipeline
Match Sheet 6
100-A-AL-2104B
100-A-AL-2104A
F-135/136
(Source: USGS Moyie Springs, Meadow Crk, Eastport, Idaho, 1965,
PGT - PG&E Aerial Photos, and GEOMAX Aerial Photos)
Scale: 1" - 500'
500' 0' 500' 1000'
PGT - PG&E
Moyie River
Fishery Enhancement
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CLASSIFICATION AND GRADATION OF ORDINARY STRUCTURAL ROCK

% Smaller Than Given Size By Weight	Intermediate Rock Dimension (Inches)	Approximate Min-Rock Weight (Pounds)
100	42	3642
40 - 60	33	1767
10 - 30	21	680
2 - 5	9	36

Based on Specific Gravity = 2.60

CONSTRUCTION

Rock Structures – Stone shall be individually placed. Each stone shall be set in place at essentially the final position by the use of a grapple device or other suitable equipment for handling material and, if necessary, the stone shall be picked up and repositioned. Excavation for placement of rock shall be limited by the size of stone being placed. The excavated hole shall be only large and deep enough to accept the stone and maintain surface grade. Where little excavation is required to place the stone, excavated material shall be sprinkled over the structure to form an interlocking network with the placed stones or gently cast upstream from the structure alignment, as directed by the GEOMAX Field Engineer. Where significant excavation is required (as in the construction of sills), all excavated material in excess of that which can be integrated with the structure shall be removed from the floodplain. Placing equipment shall always work on the upstream side of structure alignment. Dragline buckets and skips shall not be used for placement of structural rock.

Placement of rock in an active stream shall follow the construction sequence as follows:

1. Excavate keyway in bank farthest away from rock stockpile as shown on the design drawings.
2. Place structural rock in far key and backfill with suitable material that will promote vegetative growth.
3. Place rock along specified alignment beginning at far key and extend into stream no more than three-quarters of the stream width.
4. Excavate keyway in near bank as shown on the design drawings.
5. Place structural rock in near key and backfill with suitable material that will promote vegetative growth.
6. Place rock along specified alignment beginning at near key and extend across stream and integrate with previously placed rock in 3 above.

The elevation of drop structures shall be decreased 0.5 foot below the top elevation shown on the design plans as directed by the GEOMAX Field Engineer for approximately 10 feet along both the left and right legs adjoining the angle point of the structure. Sill structures shall match the existing grade unless otherwise directed by the GEOMAX Field Engineer.

Moving stone by drifting or manipulation down the slope will not be permitted. Stone shall not be dropped from a height of greater than one foot. Stones in their final position shall be oriented such that their maximum dimension is perpendicular to the stream flow with the flatter side located at the bottom. The largest stones to be used in the construction of the structure shall be placed along the downstream face of the structure. Adjacent stones shall be set in contact with each other so that the vacancies between adjacent stones shall be as small as the character of the stone will permit. It should be anticipated that rehandling of individual stones after initial placement may be required to achieve required slopes, grade, elevations, position and water surface profile. A tolerance of plus or minus 0.5 foot from the indicated top elevation shown on the design drawings will be allowed in the finished surface. After the stones have been placed and approved by the Field Engineer, additional smaller stones shall be placed in the voids between the larger stones.

Rock barb structures shall be constructed at the locations shown on the drawings or as directed by the GEOMAX Field Engineer. Barbs shall be keyed into the bank in a manner similar to that described in the preceding section for Rock Drop and Sill Structures. Barbs shall be constructed to the top elevation at the bank as shown on the drawings and shall uniformly taper down two feet vertically to the in-stream end over the specified structure length.

Construction Machinery – The contractor shall use a tracked backhoe with an opposable thumb feature to place the rock in the stream. A rubber tired front end loader shall be used to move material around on the site and supply the tracked backhoe.

MATERIAL AND CONSTRUCTION SPECIFICATIONS

ROCK DROP, SILL AND BARB STRUCTURES

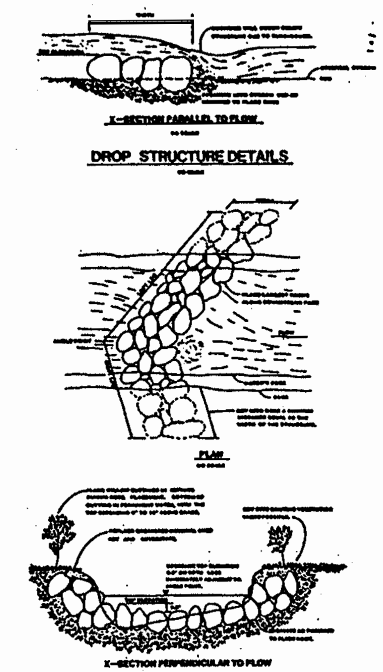
MATERIALS

Structural Rock – Quarry stone shall be used which is sound and durable against disintegration under conditions to be encountered during handling and placement. Rock shall be hard and tenacious and otherwise of a suitable quality to ensure permanency. Rock showing signs of deterioration, cracks, entrapped air, or other defects shall not be used in the construction.

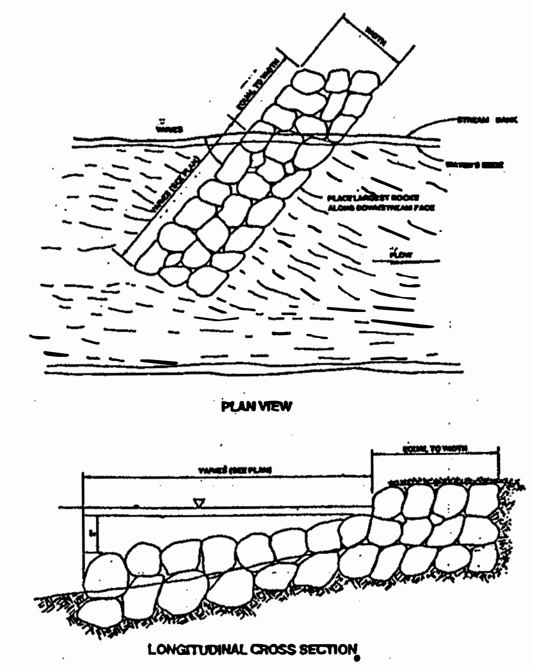
All stone shall be angular, each piece having its greatest dimension not greater than three times its least dimension, free from thin slabby pieces, and shall conform to the following test requirements of the American Society for Testing Materials Standards:

	Requirement	ASTM Standard
Apparent specific gravity, minimum	2.60	C-127-59
Abrasion, maximum percent	45	C-535-65
Freeze thaw loss, maximum percent after 12 cycles	10	AASHTO 103 Procedure A

Concrete masonry or concrete pavement may not be used for structural rock. The gradation requirements for ordinary structural rock shall be as follows (approximate weight assumes a spherical shape which most closely approximates the size of the individual stone):



DROP STRUCTURE DETAILS



BARB DETAILS

NO SCALE

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APPENDIX C
FERC STREAM AND WETLAND CONSTRUCTION AND MITIGATION PROCEDURES

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STREAM AND WETLAND CONSTRUCTION AND MITIGATION PROCEDURES

I. PERENNIAL STREAM CROSSINGS

A. STAGING AREAS/ADDITIONAL RIGHT-OF-WAY (ROW)

1. Locate at least 50 feet away from streambank, where topographic conditions permit.

2. Limit size to minimum needed for prefabrication of pipe segment for stream crossing.

3. Do not store hazardous materials, chemicals, fuels, and lubricating oils; refuel construction equipment; or perform concrete coating activities, within 100 feet of streambanks or within any municipal watershed area.

B. SPOIL PILE PLACEMENT/CONTROL

1. Trench spoil shall be placed at least 10 feet away from streambanks at all minor and major stream crossings.

2. Spoil piles located above streambanks shall be protected with silt fence and/or haybales.

3. Prevent flow of spoil off of ROW.

C. TIME WINDOW FOR CONSTRUCTION

1. June 1 through September 30 unless expressly permitted or further restricted by appropriate state agency on a site-specific basis.

2. Notify authorities responsible for potable water supplies located within 3 miles downstream at least 1 week prior to commencement of instream work.

D. CROSSING PROCEDURES

1. Provide notification to the U.S. Army Corps of Engineers (COE) concerning the proposed construction activities, and submit to FERC staff a copy of the COE's determination regarding the need for individual Section 404 and/or Section 10 permits.

2. Comply with nationwide Section 404 permit Nos. 12 and 14 conditions (33 CFR §330) at a minimum.

3. Apply for state-issued stream crossing permits and obtain Section 401 water quality certification or waiver.

4. Crossings shall be constructed as perpendicular to axis of stream channel as engineering and routing conditions permit.

5. Utilize clean gravel for upper 1 foot of fill over backfilled trench in all minor and major streams which contain coldwater fisheries.

6. Maintain downstream flow rates at all times.

7. Minor Streams ($\leq$ 10 feet wide and $\leq$ 2 feet average depth)

   a. For crossings of all coldwater and warmwater fisheries, construction equipment will cross the stream on a bridge consisting of one of the following:

      - equipment pads and culvert(s)
      - clean rockfill and culvert(s)
      - flexi-float or portable bridge

   b. For crossings of all coldwater fisheries, and warmwater fisheries considered significant by the state fish management agency, route stream across trench using flume pipe, and install pipeline using "dry-ditch" techniques as follows:

      - install flume after blasting, but prior to trenching
      - use sand bag/plastic dam structure
      - properly align flume pipe
      - do not remove flume during trenching or pipe-laying activities
      - dewater trench, as required, to prevent discharge of silt laden water into stream during construction and backfilling operations
      - remove all flumes and dams upon completion of construction

   c. For all other minor perennial stream crossings, complete instream construction within 24 hours.

8. Major Streams (> 10 feet wide or > 2 feet average depth, but $\leq$ 100 feet wide)

   a. Construction equipment crosses on bridge consisting of one of the following:

      - equipment pads and culvert(s)
      - clean rockfill and culvert(s)
      - flexi-float or portable bridge

   b. In-stream equipment limited to that needed to construct crossing.

c. Notify state authorities at least 48 hours prior to commencement of in-stream trenching or blasting.

d. Attempt to complete in-stream trenching and backfill work (not including blasting) within 48 hours; maximum of 72 hours allowed.

9. Rivers (> 100 feet wide)

   a. Submit site-specific construction procedures to FERC staff for review and approval prior to construction.

E. TEMPORARY EROSION AND SEDIMENT CONTROL

1. Perform daily inspection, and repair as needed.
2. Install and maintain sediment filter devices at all streambanks.
3. Use trench plugs at major stream and river crossings to prevent diversion of streamflow into upland portions of pipeline trench during construction.

F. BANK STABILIZATION AND REVEGETATION

1. All riprap activities must comply with nationwide Section 404 permit No. 13 conditions at a minimum.
2. Limit use of riprap to areas where flow conditions preempt vegetative stabilization, unless otherwise specifically required by state permit.
3. Restore topsoil to original horizon and revegetate with conservation grasses and legumes.
4. Allow 10-foot-wide riparian strip above streambank to permanently revegetate with native woody plant species across the entire ROW.
5. Maintain sediment filter devices at base of all slopes located adjacent to streams until ROW revegetation is complete.
6. Install permanent slope breakers at base of all slopes adjacent to streams.

G. TRENCH DEWATERING

1. Dewater into upland area in such a manner that no silt laden water flows into any perennial stream or river.

II. FEDERALLY DELINEATED WETLAND CROSSINGS [1]

A. STAGING AREAS

1. Locate at least 50 feet away from wetland edge, where topographic conditions permit.
2. Limit size to minimum needed for prefabrication of pipe segment for wetland crossing.
3. Do not store hazardous materials, chemicals, fuels, and lubricating oils; refuel construction equipment; or perform concrete coating activities, within 100 feet of wetland boundary.
4. Do not construct aboveground facilities in any federally delineated wetland.

B. SPOIL PILE PLACEMENT/CONTROL

1. Utilize sediment filter devices to prevent flow of spoil off of ROW.

C. CROSSING PROCEDURES

1. Provide notification to the COE concerning the proposed construction activities, and submit to FERC staff a copy of the COE's determination regarding the need for individual Section 404 permits prior to construction.
2. Comply with nationwide Section 404 permit conditions (33 CFR §330) at a minimum.
3. Apply for state-issued wetland crossing permit and obtain Section 401 water quality certification or waiver.
4. Pipeline should be routed to avoid wetland areas to the maximum extent practicable. If wetland cannot be avoided, or crossed by following an existing ROW, route new pipeline in a manner that minimizes disturbance to wetland. Where looping an existing pipeline, locate loop line no more than 25 feet away from existing pipeline.

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[1] These procedures must be utilized when crossing any wetland which satisfies the delineation requirements contained in the "Federal Manual for Identifying and Delineating Wetlands Using the Unified Federal Method" (Method). The Applicant must delineate all wetlands using this Method prior to construction.

5. Minimize width of construction right-of-way to ≤ 75 feet.

6. Cut vegetation off only at ground level, leaving existing root systems intact, and remove from wetland for disposal.

7. Limit pulling of tree stumps and grading activities to directly over trench; do not remove stumps or root systems from non-trenched portions of the ROW in wetlands. Where construction constraints require removal of stumps from under the workpad, develop and implement a plan to actively reestablish native woody vegetation and submit this plan to the FERC staff for review and approval prior to construction.

8. Segregate and replace the top 1 foot of topsoil from the area disturbed by trenching, except in areas with standing water or saturated soils.

9. Limit construction equipment operating in wetland to that needed to dig trench, install pipe, backfill trench, and restore ROW.

10. Do not use dirt, rockfill, tree stumps, or brush riprap to stabilize ROW.

11. Utilize wide-track or balloon-tire construction equipment, or operate normal equipment off of timber pads, prefabricated equipment pads, or geotextile fabric overlain with gravel fill, if standing water or saturated soils are present.

12. Do not cut trees located outside of ROW to obtain timber for equipment pads, and do not utilize more than two layers of timber or equipment pads to stabilize the ROW.

13. Remove all timber pads, prefabricated equipment pads, and geotextile fabric overlain with gravel fill upon completion of construction.

14. Assemble pipeline in upland area and utilize "push-pull" or "float" technique to place pipe in trench whenever water and other site conditions allow.

D. TEMPORARY EROSION AND SEDIMENT CONTROL

1. Perform daily inspection, and repair as needed.

2. Install and maintain sediment filter devices at edge of all wetlands until ROW revegetation is complete.

3. Install permanent slope breakers at base of all slopes adjacent to wetlands.

E. REVEGETATION TECHNIQUES

1. Do not use fertilizer or lime, unless required by appropriate state permitting agency.

2. Restore topsoil to original horizon and temporarily revegetate disturbed areas with annual ryegrass at a rate of 40 lbs per acre, unless standing water is present.

3. Ensure that all disturbed areas permanently revegetate with native herbaceous and woody plant species.

4. Develop specific procedures, in coordination with the appropriate state agency, to prevent the invasion or spread of undesirable exotic vegetation (e.g., purple loosestrife and phragmites).

F. TRENCH DEWATERING

1. Dewater in such a manner that no silt laden water flows into wetland areas off of construction ROW.

G. ROW MAINTENANCE PRACTICES

1. Mowing (and other vegetation maintenance practices) of the permanent ROW is prohibited, except for the selective cutting of trees that are located within 15 feet of the pipeline and are greater than 15 feet in height.

III. HYDROSTATIC TESTING

A. TIMING

1. Perform 100% radiographic inspection of pipeline section welds, or hydrotest pipeline section, prior to installation under stream or wetland.

B. INTAKE SOURCE AND RATE

1. Screen intake hose to prevent entrainment of fish.

2. Do not utilize state designated exceptional value waters, or streams designated as public water supplies, unless appropriate state and/or local permitting agencies grant permission.

3. Notify state water quality and fishery management agencies of intent to use specific sources at least 48 hours prior to testing activities.

4. Adequate flow rates shall be maintained to protect aquatic life, provide for all in-stream uses, and provide for downstream withdrawals of water by existing users.

5. Apply for state-issued withdrawal permit, as required.

C. DISCHARGE LOCATION, METHOD, RATE

1. Regulate discharge rate and utilize energy dissipation device(s) in order to prevent erosion of upland areas, streambottom scour, suspension of sediments, or excessive stream flow.

2. Discharge test water from existing pipelines, using velocity dispersion device, into haybale/silt fence containment structure.

3. Obtain National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permit, as required.

4. Sample test water during discharge in accordance with any NPDES or state-issued discharge permit requirements; provide a copy of the results to FERC.

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APPENDIX D
PERMITS AND CONSULTATIONS

PERMITS

Jurisdiction Type	Permit
Corps of Engineers	Section 404
Department of Water Resources	Stream Channel Alteration
Department of Lands	Easement Over State-Owned Submerged Land

AGENCIES CONSULTED IN IDAHO

- U. S. Forest Service - Panhandle National Forest
- Panhandle National Forest - Bonners Ferry Ranger District
- U. S. Corps of Engineers - Walla Walla Office
- U. S. Corps of Engineers - Coeur D'Alene Office
- U. S. Fish and Wildlife Service - Idaho State Office
- U. S. Department of Agriculture - Soil Conservation Service
- State of Idaho - Department of Lands
- State of Idaho - Department of Water Resources
- Department of Water Resources - Northern District
- Department of Water Resources - Water Resources Board
- State of Idaho - Department of Fish and Game
- State of Idaho - Department of Fish and Game Region I
- State of Idaho - Office of Historic Preservation (SHPO)
- State of Idaho - Department of Environmental Quality
- State of Idaho - Department of Health and Welfare
- Bonner County - Public Works Department
- Boundary County - Planning and Zoning Department
- Kootenai County - Engineering and Technical Services Division
- Kootenai County - Noxious Weed District