APPENDIX F.10

Plan of Development

Pacific Connector
GAS PIPELINE

Pacific Connector Gas Pipeline, LP

Plan of Development

Pacific Connector Gas Pipeline Project

January 2018

Table of Contents

List of Tables

List of Appendices

W Sanitation and Waste Management Plan
X Spill Prevention, Containment, and Countermeasures Plan
Y Transportation Management Plan
Z Unanticipated Discovery Plan (Cultural Resource Preservation)
AA Environmental Alignment Sheets
BB Wetland and Waterbody Crossing Plan

1.1 INTRODUCTION

Pacific Connector Gas Pipeline, LP (PCGP) proposes to construct and operate a new approximately 229-mile, 36-inch diameter intrastate natural gas transmission system and related facilities that will traverse parts of Coos, Douglas, Jackson and Klamath counties (Pipeline). The Pipeline will obtain gas from interconnections with the Ruby pipeline and the Gas Transmission Northwest pipeline near Malin, Oregon and transport the gas to a proposed liquefied natural gas terminal to be constructed by Jordan Cove Energy Project, L.P. (JCEP) that will be located on the North spit of Coos Bay in Coos Bay, Oregon.

This Plan of Development (POD) has been prepared to identify the conditions that will be specified in the Right-of-Way Grant for the construction and operation of the Pipeline on lands managed by the United States Department of the Interior (DOI) Bureau of Land Management (BLM) and Bureau of Reclamation (Reclamation), and the United States Department of Agriculture (USDA) Forest Service. The Pipeline will cross 46.9 miles of federal land managed by the BLM; 30.6 miles managed by the Forest Service, and 0.31 mile managed by Reclamation (see Table 1.1-1). The temporary and permanent acres of impact from the specific components are also provided in Table 1.1-1. Tables 1.1-2 and 1.1-3 show the breakout by National Forest and by BLM District of the miles crossed through the various Northwest Forest Plan (NWFP) and 2016 BLM Resource Management Plan (RMP) land allocations. Tables 1.1-4 and 1.1-5 provide the specific mileposts where the Pipeline crosses National Forests and BLM Districts. Finally, Table 1.1-6 lists the Reclamation jurisdictional facilities, with their milepost locations, easement widths, acres of impact, and townships, ranges, and sections.

Table 1.1-1
Federal Lands Affected by the Pipeline Project

Pipeline Facility/Component	Jurisdiction		
	BLM	**Forest Service**	**Reclamation**
Miles Crossed by Pipeline	46.9	30.6	0.31
Temporary Construction Acreage Requirements (acres)			
Construction Right-of-Way	535.02	349.75	3.69
TEWAs	166.26	102.76	0.46
UCSAs	183.75	123.17	0.00
Off-site Source/Disposal	6.99	9.26	0.00
Contractor and Pipe Storage Yards	0.00	0.00	0.00
Existing Roads Needing Improvements in Limited Locations [1]	4.71	1.00	0.00
Temporary Access Roads (TAR)	0.69	0.24	0.00
Total Temporary Impacts (acres)	**897.42**	**586.18**	**4.15**
Permanent Easement (50 feet)	284.00	185.35	1.90
Permanent Access Roads (PAR)	0.34	0.00	0.00
Aboveground Facilities	0.26 [2]	0.00	0.00
30-Foot Maintained	170.38	111.20	1.14

[1] Includes those existing roads requiring widening in specific locations; does not include limbing/brush clearing or blading/grading for potholes.
[2] BVA #4, #7, and #12 are located on BLM lands.

Table 1.1-2
Forest Service Federal Land Allocations – Miles Crossed by the Pipeline

Jurisdiction	Late Successional Reserves (miles)	Matrix (miles)	Total	Riparian Reserves [1] (miles)
Forest Service – Umpqua	5.03	5.78	**10.81**	0.78
Forest Service – Rogue River-Siskiyou	13.72	0.00	**13.72**	0.24
Forest Service – Fremont-Winema	0.00	6.05	**6.05**	0.38
Total	**18.75**	**11.83**	**30.58**	**1.40**

[1] Riparian Reserves overlay other land use allocations.

Table 1.1-3
BLM Federal Land Allocations – Miles Crossed by the Pipeline

Land Use Allocation	Coos Bay District	Roseburg District	Medford District	Lakeview District	Total
District-Designated Reserve (No Harvest)	0.04	0.47	5.04	0.00	**5.55**
District-Designated Reserve (Non-Forest)	0.69	1.65	2.32	0.04	**4.70**
Eastside Management Area	0.00	0.00	0.00	0.26	**0.26**
Harvest Land Base (Low Intensity Timber Area)	0.73	0.00	0.68	0.00	**1.41**
Harvest Land Base (Moderate Intensity Timber Area)	2.61	1.65	0.00	0.00	**4.26**
Harvest Land Base (Uneven-Aged Timber Area)	0.00	2.73	1.98	0.97	**5.68**
Late-Successional Reserve (Dry Forest)	0.00	5.06	4.21	0.00	**9.27**
Late-Successional Reserve (Moist Forest)	11.40	1.52	0.00	0.00	**12.92**
Riparian Reserve* (Dry Forest)	0.00	0.16	0.92	0.02	**1.10**
Riparian Reserve* (Moist Forest)	1.60	0.11	0.00	0.00	**1.71**
Totals	**17.07**	**13.35**	**15.15**	**1.29**	**46.86**

* Calculated using 2016 RMP DATA\RWO_ROD_SWO.gdb/RWO_ROD_SWO_LUA_poly and 2016 RMP DATA\RWO_ROD_NCO.gdb/RWO_ROD_NCO_LUA_poly.

Table 1.1-4
Forest Service Managed Lands by Milepost [1]

Begin MP	End MP	National Forest/	Length Crossed (miles)[1]
99.31	99.83	Umpqua NF	0.52
100.39	100.68	Umpqua NF	0.29
101.20	101.89	Umpqua NF	0.69
102.32	102.85	Umpqua NF	0.52
104.10	113.20	Umpqua NF	8.79
		Total	**10.81**
153.81	154.93	Rogue River-Siskiyou NF	1.12
155.45	168.01	Rogue River-Siskiyou NF	12.60
		Total	**13.72**
168.01	169.37	Fremont-Winema NF	1.45
170.04	171.39	Fremont-Winema NF	1.36
171.59	172.71	Fremont-Winema NF	1.11
173.11	174.81	Fremont-Winema NF	1.70
174.95	175.37	Fremont-Winema NF	0.43
		Total	**6.05**
		Grand Total	**30.58**

[1] Because equations have been inserted to prevent the mileposts from changing, it is no longer possible to use the distance between mileposts as an accurate length (e.g., the centerline is now 229.09 miles long but the ending MP is 228.81).

Table 1.1-5
BLM Managed Lands by Milepost [1]

Begin MP	End MP	BLM District	Length Crossed (miles)[1]
Coos County			
12.5BR	13.78BR	Coos Bay District	1.29
14.04BR	14.17BR	Coos Bay District	0.13
16.71BR	17.9BR	Coos Bay District	1.19
18.48BR	22.11BR	Coos Bay District	3.63
22.68BR	23.09BR	Coos Bay District	0.41
23.35BR	23.79BR	Coos Bay District	0.44
24.84BR	21.81	Coos Bay District	0.49
23.19	23.87	Coos Bay District	0.68
23.99	24.36	Coos Bay District	0.39
25.36	25.57	Coos Bay District	0.22
26.82	27.08	Coos Bay District	0.26
27.11	27.47	Coos Bay District	0.36
28.40	28.79	Coos Bay District	0.38
31.58	32.47	Coos Bay District	0.89
33.77	34.21	Coos Bay District	0.45
35.12	38.93	Coos Bay District	3.82
40.18	40.21	Coos Bay District	0.04
41.44	42.01	Coos Bay District	0.67
43.19	43.50	Coos Bay District	0.30
44.63	45.72	Coos Bay District	1.09
		Coos Bay District Total	**17.13**
Douglas County			
46.90	47.17	Roseburg District	0.27
48.27	49.20	Roseburg District	1.05
51.04	51.29	Roseburg District	0.25
52.61	52.95	Roseburg District	0.33
53.11	53.70	Roseburg District	0.60
54.38	54.43	Roseburg District	0.05
60.85	61.66	Roseburg District	0.81
64.38	64.50	Roseburg District	0.13
64.61	64.88	Roseburg District	0.27
73.94	74.43	Roseburg District	0.49
74.57	75.29	Roseburg District	0.72
75.55	75.67	Roseburg District	0.12
76.02	76.11	Roseburg District	0.09
78.18	78.79	Roseburg District	0.61
79.60	80.56	Roseburg District	0.98
82.71	83.32	Roseburg District	0.61
84.91	85.27	Roseburg District	0.36
86.14	87.49	Roseburg District	0.90
89.85	90.48	Roseburg District	0.64
91.26	91.93	Roseburg District	0.68
93.00	93.07	Roseburg District	0.06
93.62	93.92	Roseburg District	0.29
95.15	95.82	Roseburg District	0.66
97.07	98.47	Roseburg District	1.36
99.83	100.39	Roseburg District	0.55
101.89	102.32	Roseburg District	0.41
		Roseburg District Total	**13.29**
Jackson County			
115.11	115.39	Medford District	0.29
115.42	116.77	Medford District	1.35
116.84	117.80	Medford District	0.96

Begin MP	End MP	BLM District	Length Crossed (miles)[1]
118.91	119.90	Medford District	0.92
120.27	120.46	Medford District	0.19
121.26	121.55	Medford District	0.29
123.33	124.23	Medford District	0.90
124.38	125.54	Medford District	1.17
126.28	126.58	Medford District	0.31
126.86	127.11	Medford District	0.25
127.39	128.42	Medford District	1.02
128.73	129.45	Medford District	0.70
131.36	131.93	Medford District	0.57
133.20	133.45	Medford District	0.25
136.82	137.12	Medford District	0.30
139.88	140.57	Medford District	0.69
140.83	141.92	Medford District	1.09
148.27	149.90	Medford District	1.08
150.49	151.65	Medford District	1.18
152.19	153.81	Medford District	1.64
		Medford District Total	**15.15**
Klamath County			
176.15	177.04	Lakeview District	0.88
179.58	179.72	Lakeview District	0.15
216.49	216.75	Lakeview District	0.26
		Lakeview District Total	**1.29**
		Grand Total	**46.86**

[1] Because equations have been inserted to prevent the mileposts from changing, it is no longer possible to use the distance between mileposts as an accurate length (e.g., the centerline is now 229.09 miles long but the ending MP is 228.81).

Table 1.1-6
U.S Bureau of Reclamation Administered Lands and Canals

U.S Bureau of Reclamation (Reclamation) Jurisdictional Facilities (Easement Width) [1]	Approximate Pipeline Milepost	Length of Pipeline Crossing (feet)	Index No. Easement Width	Waterbody ID [2]	QQ	Township	Range	Section
C-4-E Lateral [3]	NA	Not Crossed [3]	KO-20-080 30-feet	ADX293	SWNE	39S	9E	20
Withdrawn Land	NA	Not Crossed	KO-20	N/A	SWNE	39S	9E	20
No. 1 Drain	200.54	14.59	KO-20-276 60-feet	ADX294	SWNE	39S	9E	20
C-4-E Lateral	201.63	15.49	KO-20-164 40-feet	ADX096	NENW	39S	9E	28
C-4 Lateral	204.12	48.18	KO-09-013 50-feet	ADX100	NWNE	40S	9E	3
C-4-F Lateral	204.33	12.91	KO-09-013 50-feet	ADX101	NWNE	40S	9E	3
No. 3 Drain	204.74	17.80	KO-09-14 60-feet	ADX105	NWNW	40S	9E	2
C-4-C Lateral	205.50	18.28	KO-09-018 60-feet	ADX109	SWNE	40S	9E	2
C Canal	205.96	54.90	KO-09-027 75-feet [4]	ADX111	NWSW	40S	9E	1
D-2 Lateral	206.51	23.76	KO-09-050 60-feet	ADX113	NWNE	40S	9E	12
5-A-1 Drain	207.11	4.00	KO-09-053 60-feet	AW-114	NESE	40S	9E	12
5-A Drain	207.26	28.61	KO-09-054 50-feet [4]	ADX115	NESE	40S	9E	12
C-4-7 Lateral	207.40	15.20	KO-10-031 60-feet	ADX116	NWSW	40S	10E	7
5-A Drain	207.42	16.84	KO-10-032 50-feet	ADX117	NWSW	40S	10E	7
5-A Drain	207.60	61.56	KO-10-032 50-feet	ADX118	SWSW	40S	10E	7
5-A Drain	207.99	25.26	KO-10-034 50-feet	ADX119	NENW	40S	10E	18
5-A Drain	208.18	19.94	KO-10-034	ADX123	SENW	40S	10E	18

U.S Bureau of Reclamation (Reclamation) Jurisdictional Facilities (Easement Width) [1]	Approximate Pipeline Milepost	Length of Pipeline Crossing (feet)	Index No. Easement Width	Waterbody ID [2]	QQ	Township	Range	Section
			50-feet					
5-K Drain	209.02	24.95	KO-10-048 30-feet [4]	ADX130	SESE	40S	10E	18
C-9 Lateral	209.15	16.03	KO-10-047 30-feet	ADX134	NWNW	40S	10E	20
No. 5 Drain	210.26	17.90	KO-10-061 50-feet	ADX143	SESE	40S	10E	20
5-H Drain	210.85	10.71	KO-10-074 20-feet	ADX260	SWNW	40S	10E	28
G Canal	213.87	43.90	KO-10-086 165-feet	ADX275	SESE	40S	10E	26
	Total	**490.81**						

[1] Reclamation Facility Name, (easement width) Reclamation ID, and Index No included as attributes in Bureau of Reclamation PCGP-Crossing Shapefile provided to PCGP - January 7, 2009. Easement widths determined from scanned easement plats provided by Reclamation.
[2] Waterbody ID from PCGP wetland and waterbody surveys as shown on the Environmental Alignment Sheets in Appendix AA to the POD.
[3] The C-4-E Lateral is not crossed by the centerline but the easement for the lateral is within the construction right-of-way for approximately 270 feet.
[4] Canal easement widths not provided on easement plats provided by Bureau of Reclamation; therefore crossing widths estimated based on photography and similar canal easements on adjacent canals.

1.2 SCHEDULE

PCGP anticipates starting right-of-way clearing (see Right-of-Way Clearing Plan – Appendix U) in the fourth quarter of the year prior to Year One prior to mainline construction, to minimize overall work space and temporary extra work area requirements. Construction for the Pipeline would commence in spring of Year One and continue through fall of Year Two with the in-service date scheduled for the last quarter of Year Two. Prior to the start of Year One or Year Two activities, road surfacing structural capacity assessments and placement of additional road surfacing, which can include brushing and limbing, will be performed as needed for the planned use (see Transportation Management Plan – Appendix Y). The construction periods in Year One and Year Two are scheduled to take advantage of the drier periods of the year and to minimize winter construction, which would reduce potential environmental impacts and construction safety risks. Restoration of construction disturbance is expected to begin in the fall of Year Two and be completed by the end of the winter season in the early part of Year Three when forest, wetland, and riparian revegetation – trees and shrubs – would be planted. Depending on site-specific conditions, it may be necessary to continue restoration and revegetation through the spring of Year Three.

During Year One, PCGP plans to horizontally directionally drill (HDD) five waterbodies (Coos Bay/two locations, Coos, Rogue and Klamath rivers) and initiate the Direct Pipe® crossing of the South Umpqua River (MP 71.30) to allow sufficient time to pursue permits for alternative crossing locations or methods in the unlikely event the proposed HDDs are unsuccessful. An alternate crossing method or an HDD at an alternate location would then be completed in Year Two during mainline construction. Additionally, PCGP anticipates starting pipeline construction in Year One for 1) the Klamath Basin area (MPs 188 to 228) to minimize agriculture impacts and to allow the crossing of most irrigation canals when they have been dewatered during the non-irrigation season (October 15 – March 15); 2) areas identified during biological surveys to have marbled murrelet (MAMU) presence or occupied stands and/or NSO activity to minimize disturbance to those federally-listed species; 3) some areas of severe slopes; and 4) construction of the second South Umpqua River crossing (MPs 95-96). The remaining pipeline mainline and aboveground facility construction is planned to begin in the spring of Year Two.

PCGP has determined that to efficiently construct the Pipeline construction will be divided into at least five construction spreads. The construction spreads will include timber clearing, construction, and restoration activities within the Right-of-Way Grant area and within specific milepost ranges along the Pipeline. The extent of each construction spread is provided in Table 1.2-1.

Table 1.2-1
PCGP Construction Spread Locations

Spread	Milepost Range [1]	Length (miles) [1]
1	0.00-51.60	52.95
2	51.60-94.67	43.41
3	94.67-132.47	37.42
4	132.47-169.50	37.07
5	169.50-228.81	58.24

[1] Equations have been inserted to prevent mileposts from changing throughout the NEPA process; Arithmetic distance between milepost values may not be an accurate indication of length.

The schedule for each spread for Year One and Year Two, will take into consideration seasonal construction constraints (timing windows) stipulated to protect biological resources including NSO, MAMU, instream construction/fisheries, and big game wintering habitats. The schedule allows for reasonable time requirements to remove timber and construct the Pipeline to reduce potential environmental impacts and construction safety risks associated with winter construction. If stipulated in-water work timing windows for two or more resources conflict with each other or cannot be considered for environmental and safety reasons, efforts have been taken to reduce the seasonal constraints near the ends of recommended in-water work windows (ODFW, 2000a) and/or NSO and MAMU breeding seasons. The use of access roads for construction and/or timber removal will adhere to the timing restrictions and wet weather access procedures as outlined in the Transportation Management Plan (see Appendix Y).

1.3 GENERAL LOCATION AND DESCRIPTION OF FACILITIES

In an effort to maintain milepost continuity while adjusting the route, milepost equations have been incorporated into the alignment. This allows the mileposts, for the most part, to remain unchanged. However, the ending milepost no longer reflects the actual length of the proposed Pipeline. The equation incorporation process results in two possible conditions near a milepost equation – the first being an overlap in or duplicate of milepost values (longer reroute) and the second being a gap in the milepost values (shorter reroute).

The Pipeline is comprised of a pipeline and aboveground facilities. Pipeline facilities include approximately 229.09 miles of 36-inch diameter pipeline requiring new pipeline right-of-way. The Pipeline will be co-located within a number of existing powerline, road, and pipeline corridors for approximately 97.74 miles or 42.7 percent of its length; the remaining 57.3 percent will be cross-country construction.

Aboveground facilities associated with the Pipeline include:

- the Klamath Compressor Station with two operating compressor units totaling
- approximately 61,200 ISO horsepower (with one additional standby unit of 31,100 ISO horsepower)at MP 228.81 (located on private land);
- three meter stations (Jordan Cove/MP 0.00; Klamath-Beaver Meter Station [GTN]/MP 228.81; and Klamath-Eagle Meter Station [Ruby]/MP 228.81 (located on private land);
- 5 pig launcher/receivers (co-located with other aboveground facilities on private land);
- 17 mainline block valves spaced along the pipeline according to Department of Transportation requirements (3 on BLM-managed lands); and
- 15 new communications towers and usage of existing communications towers (5 new towers on BLM-managed lands and 1 new tower on NFS lands).

Additionally, a Cathodic Protection (CP) system designed to protect the Pipeline will be installed within 1 year after completion of construction. CP prevents corrosion from forming on a pipeline by making the pipeline cathodic to the surrounding environment. The Corrosion Control Plan (see Appendix F) provides more detail as to the methods and placement of the CP system.

During routing analysis of the Pipeline, PCGP reviewed more than 1,000 miles of alternative alignments for development of the proposed route. The route was developed considering the construction requirements for a large-diameter, high-pressure natural gas transmission pipeline. Constructability/stability requirements were of primary consideration for routing the pipeline concurrent with minimizing potential impacts to sensitive resources such as minimizing the number of waterbody crossings and landowner encumbrances, where feasible. Avoidance of wilderness areas, known cultural resource areas, national parks and monuments as well as scenic waterways and byways was also a factor in development of the proposed alignment.

Where practicable, the alignment utilized existing pipeline and powerline corridors while providing a safe distance between these existing utilities. Although the alignment parallels existing roads and railroads in a number of areas, routing within existing transportation easements was avoided because of the potential impact to traffic flow during construction. Many roads are located in valleys or drainage bottoms adjacent to streams where it is not feasible to install a large-diameter, steel pipeline due to large temporary extra work area (TEWA) requirements, confining topographic conditions, and waterbodies running parallel to the alignment. Many forest roads are located on steep side slopes where it is impractical to route a pipeline because of constructability/stability requirements and concern with the long-term safety and integrity. To ensure the Pipeline is installed properly within consolidated (non-filled) materials and to provide the necessary equipment space, construction on steep side slopes requires significantly more TEWA to accommodate the necessary cuts or excavations. Long-term safety and the potential for third-party damage to the Pipeline must be considered. Future road expansions or improvement projects may require the Pipeline to be relocated where it has been constructed within road easements, which may create unforeseen environmental, landowner, and system impacts. An alternatives analysis was provided in PCGP's September 2017 application to the Federal Energy Regulatory Commission (FERC) for authorization under the Natural Gas Act to construct the Pipeline. The alternatives analysis is set out in Resource Report 10, which is part of the application.

1.3.1 Pipeline Facilities

Construction of the Pipeline will require acquisition of temporary construction rights-of-way, TEWAs, and uncleared storage areas (UCSAs), which are described in this section.

Construction Right-of-Way

Temporary Construction Right-of-Way. PCGP proposes to utilize a standardized 95-foot wide temporary construction right-of-way with a 50-foot Operational Right-of-Way easement. The 50-foot Operational Right-of-Way easement will be authorized under the terms of the Right-of-Way Grant, which is expected to be in effect for the life of the Pipeline (i.e., 50 years). Typically, large diameter pipeline projects (i.e., 30-inch diameter or greater) utilize at least a 100-foot or wider temporary construction right-of-way. The temporary construction right-of-way configuration is required to accommodate the necessary clearing and grading activities to prepare the right-of-way, temporarily store spoil materials for construction, and to provide a passing lane during construction for movement up and down the right-of-way. The temporary construction right-of-way will be used as the primary transportation corridor during construction. Eliminating the passing lane by narrowing the right-of-way width would significantly restrict traffic flow

along the right-of-way. Proper traffic flow minimizes project impacts by reducing the number of access roads that may need to be constructed and by minimizing construction duration. The proposed 95-foot right-of-way configuration will accommodate many of the necessary cuts and spoil storage area requirements along the proposed alignment, thereby reducing the number of additional TEWAs that will be required to safely construct the Pipeline and will minimize the total overall disturbance.

Where feasible (i.e., where topographic conditions allow), at palustrine forested and scrub shrub wetland crossings, the construction right-of-way will be reduced to 75 feet in width to minimize impacts to these resources. The neckdowns are shown on the Environmental Alignment Sheets (Appendix AA). Because TEWAs are typically required on either side of neckdowns, neckdowns within emergent wetlands were determined on a case-by-case basis depending on the quality of the wetland and the quality of the adjacent vegetation that would be disturbed by the TEWAs.

Steep slope or side slope areas will require the construction right-of-way to be greater than 95 feet in width. These conditions require unique construction techniques such as a "two-tone" right-of-way. Additional TEWAs are necessary for adequate spoil storage/staging and to ensure a safe working plane during construction. Sharp angles or points of intersection (PIs) along the alignment also require TEWAs on the working side of the right-of-way to provide adequate space to install pipeline field bends or "factory" bends and to ensure that stringing trucks (which will be greater than 100 feet in length) have the necessary turning radius to navigate the corner and stay within the "certificated construction limits." Areas where the construction right-of-way is greater than 95 feet in width are shown on the Environmental Alignment Sheets.

Temporary Extra Work Areas. In addition to the 95-foot wide construction right-of-way, site-specific characteristics of the right-of-way make it necessary to obtain TEWAs. Generally, these TEWAs are required for (but not limited to) the following:

- Steep slopes and side sloping areas to accommodate cuts and spoil storage requirements;
- Bore pits and spoil storage at road, canal, pipeline, and railroad crossings;
- Spoil storage, staging, and construction of drag sections such as at wetland crossings, residential/industrial areas, and road crossings, etc.;
- Waterbody and wetland crossings;
- Pipe and equipment staging;
- Areas where tie-ins require additional trench widths to allow workers to enter the trench and perform welds and to ensure Occupational Safety and Health Administration (OSHA) trench safety requirements are met;
- Sharp angles or PIs where additional area is required to account for the wide turning radius of stringing trucks (which can be greater than 100 feet in length);
- Topsoil segregation areas to ensure topsoil and subsoils are not mixed; and
- Timber staging/decking.

Road and stream crossings and tie-in locations are typically conducted with a separate construction crew to fabricate and install the pipeline across these features. To construct these crossings, additional work area is required to stage or accommodate the equipment, crew vehicles, pipeline materials, dig the trench, store the spoil and safely install the pipeline. Consequently additional TEWAs are required at these locations.

All of these areas are considered temporary disturbance and will be reclaimed in accordance with applicable regulations and any conditions of approval included in the right-of-way Grant.

Uncleared Storage Areas. During design of the construction footprint for the Pipeline, PCGP identified the need for additional work areas in various locations such as in dense, mature forested areas; in areas of steep slopes; and in areas where the route follows steep, narrow ridgelines. However, to minimize overall project disturbance, PCGP has specifically designated some areas as uncleared storage areas (UCSAs) rather than TEWAs. Unlike the TEWAs, the UCSAs will not be cleared of trees during construction. These areas will be used to store forest slash, stumps and dead and downed log materials that will be scattered across the right-of-way after construction. The amount of this type of material is expected to be large enough to hinder construction activities if it were stored on the right-of-way. Therefore, these UCSAs will be important construction footprint features.

In some locations, the UCSAs may be used to store spoil or to temporarily park equipment between the mature trees. However, storage and temporary parking of equipment/vehicles will not occur immediately adjacent to the tree so as to minimize potential impacts (soil compaction or tree damage). In extremely steep and side sloping topography, the UCSAs may be required as a contingency location to contain rock which rolls beyond the construction limits. Along extremely steep and narrow ridgeline areas, logs, slash, and dead and downed material may be used as cribbing to contain excavated materials during construction (right-of-way grading and trenching activities). During restoration, some of the materials that are pulled out of the cribbing may roll beyond the construction limits. In these areas, it would be infeasible and impractical to retrieve all of the overcast materials because additional tree clearing and grading would be required to reach the materials.

The UCSAs are considered temporary disturbance because they will not be cleared and the materials (i.e., slash, stumps and downed and dead material, etc.) stored within them will be removed during restoration activities (see Appendix P – Leave Tree Protection Plan).

1.3.2 Construction Access Roads

Existing egress and ingress points to and from the construction right-of-way have been identified. These points have been identified to allow for safe, efficient construction and movement of equipment and materials. Appendix Y provides the Transportation Management Plan.

1.3.3 Contractor and Pipe Storage Yards and Rock Source and Permanent Disposal Sites

Contractor and Pipe Storage Yards

PCGP has identified yards and rail ports that may be used during project construction to off-load and store pipe and stage contractor equipment. The yards would also be used to stage equipment and store materials used during construction. Stored materials may include but are not limited to: construction mats, fencing materials, fuel and lubricants

and stormwater control materials (straw bales, erosion control fabric, silt fence materials, etc.). The yards would also be used for contractor office trailers and employee parking facilities.

The priority locations for the off-site facilities that would be used for the Pipeline are existing industrial sites that have been previously paved, graded, and/or graveled; are proximate to the Pipeline route; and have rail service. The pipe storage yards and rail ports that will be used during construction will be secured during the easement acquisition phase and will depend on the availability of these sites at that time.

No contractor and pipe storage yards have been located on federally-managed lands.

Rock Source and Permanent Disposal Sites

Permanent disposal sites may be required to handle excess rock, spoil, or drilling mud that are generated during construction. Prime disposal sites for these materials include existing rock/gravel quarries and pits near the Pipeline route. Where existing quarries or pits are not available, PCGP has identified stable sites along the right-of-way as permanent disposal sites. The rock source and permanent disposal sites identified on federally-managed lands are listed in Attachment A to Appendix Q (Overburden and Excess Material Disposal Plan).

1.3.4 Aboveground Facilities

Aboveground facilities located on federally-managed lands include 3 mainline block valves and 6 communication towers and associated communications equipment buildings.

Launchers/Receivers and Mainline Block Valves

Mainline block valves will be located along the Pipeline according to DOT spacing requirements in 49 CFR §192.179. Generally, mainline block valves are manually operated. Each mainline block valve will occupy a site 50 x 50 feet (0.06 acre) located within the Operational Right-of-Way easement, and will be enclosed by a 7-foot high chain-link fence. PCGP has attempted to locate final placement of block valves adjacent to existing roads to minimize the length of new permanent access roads.

Permanent disturbance associated with the block valve assemblies located on federally-managed lands is summarized in Table 1.3-1.

Table 1.3-1
Summary of Disturbance Associated with Aboveground Facilities on Federally-Managed Lands

Facility	MP	Acres Disturbed [1, 2]	Jurisdiction
ABVA #4 (Deep Creek Spur) [5]	48.58	0.09	BLM
BVA #7 (Pack Saddle Road)	80.03	0.09	BLM
BVA #12 (Heppsie Mtn Quarry Spur)	150.70	0.09	BLM
	Total	**0.27**	

[1] Represents permanent/operation disturbance because construction disturbance associated with the aboveground facilities is included within the pipeline construction right-of-way.
[2] The mainline block valves will be located within areas disturbed by the construction right-of way or within associated aboveground facility footprints (i.e., meter stations and the Klamath Compressor Station); however, the acres provided will remain as permanent disturbance associated with these graded, graveled and fenced facilities.

Gas Control Communications

The meter stations and compressor station will require a communications link with the gas control monitoring system Therefore, radio towers will be required at each meter station and the compressor station. In order to communicate with these sites, PCGP plans to utilize space at existing mountaintop radio communications sites. Appendix D provides the Communication Facilities Plan for federally-managed lands. Table 1.3-2 provides the locations of the proposed communication system required for the Pipeline on federally-managed lands.

Table 1.3-2
Location of Existing Communication Towers on Federally-Managed Lands

Site Name	Location							Jurisdiction
	Latitude			Longitude			County	
Blue Ridge	43	16	16	124	5	9	Coos	BLM
Signal Tree (Kenyon Mtn.)	43	0	7.4	123	46	44.3	Coos	BLM
Flounce Rock	42	43	40.4	122	36	33.1	Jackson	BLM
Robinson Butte	42	21	51.4	122	22	54.1	Jackson	Forest Service
Stukel Mountain	42	5	46.0	121	38	1.0	Klamath	BLM

1.4 CONSTRUCTION PROCEDURES

The Pipeline will be designed, constructed, operated and maintained in accordance with DOT regulations in 49 CFR Part 192, *"Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards;"* 18 CFR § 380.15, "*Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Clearing, and Maintenance of Rights-of-Way and the Construction of Aboveground Facilities;*" and other applicable federal, state, and local regulations. In addition to the DOT requirements listed above, PCGP will construct and reclaim the Pipeline and aboveground facilities in accordance with this POD. Multiple plans, summarized below (see Table 1.4-1), have been developed in coordination with the BLM, Forest Service, and Reclamation. These plans detail the construction and protective methods/measures, which PCGP will implement on federally managed lands. (The Upper Rock Creek ACEC Plan – formerly Appendix AA – has been removed from the POD due to the revised boundary in the 2016 BLM RMP; the Pipeline route will not cross the ACEC.)

Table 1.4-1
Summary of POD Appendices

Appendix	Plan	Summary
A	Aesthetics Management Plan for Federal Lands	This Plan describes actions designed to protect and/or meet the visual resource management objectives.
B	Air, Noise and Fugitive Dust Control Plan	This Plan describes the practices that will be implemented during construction of the Pipeline to minimize or control the potential impacts to air quality or the impacts caused by noise or fugitive dust.
C	Blasting Plan	This Plan provides guidelines for the safe use and storage of blasting materials proposed for use during construction of the Pipeline. This Plan also includes the actions PCGP and the BLM will undertake prior to use and development of the Heppsie Mountain Quarry for construction of the Pipeline.
D	Communication Facilities Plan	This Plan describes the construction, modification, operation and maintenance of communication facilities necessary for the operation of the Pipeline.

Appendix	Plan	Summary
E	Contaminated Substances Discovery Plan	This Plan outlines practices to protect human health and worker safety; and, to prevent further contamination in the event of an unanticipated discovery of contaminated soil, water or groundwater during construction of the Pipeline
F	Corrosion Control Plan	This Plan illustrates methods used to identify the corrosion control needs for the Pipeline (external, internal, and atmospheric), as well as methods to provide the required protection and mitigation.
G	Environmental Briefings Plan	This Plan outlines the environmental reporting procedures, briefings, or notifications that PCGP will provide to the federal land-managing agencies prior to construction, during construction, post construction, and during operations of the Pipeline. This Plan describes the information that will be communicated to the federal land-managing agencies' appointed supervisory and field staff, who will be involved in the Pipeline, to keep them informed of status, construction schedule, and progress.
H	Emergency Response Plan	The Plan identifies the standards and criteria which PCGP will follow to minimize hazards.
I	Erosion Control and Revegetation Plan	This Plan outlines the erosion control and revegetation procedures that PCGP will utilize during construction (as well as pre and post construction) of the Pipeline Project to minimize erosion, sedimentation and enhance revegetation success.
J	Federally-Listed Plant Conservation Plan	This Plan describes the conservation measures that will be implemented to minimize the potential effects to federally-listed plants that occur within the Pipeline area.
K	Fire Prevention and Suppression Plan	This Plan describes the measures to be used by PCGP and its contractors to ensure that fire prevention and suppression techniques are carried out in accordance with federal, state and local regulations.
L	Fish Salvage Plan	This Plan describes the salvage methods that will be utilized to minimize adverse effects to ESA-listed salmonids.
M	Hydrostatic Test Plan	This Plan details the hydrostatic testing process and associated BMPs.
N	Integrated Pest Management Plan	This Plan provides PCGP's management and staff with the necessary BMPs and decision-making tools to address the control of noxious weeds, invasive plants, forest pathogens, and soil pests across the Pipeline Project.
O	Klamath Project Facilities Crossing Plan	This Plan identifies Reclamation facilities and the crossing methods for these facilities.
P	Leave Tree Protection Plan	This Plan describes the measures that will be implemented during construction of the Pipeline to identify, conserve, and protect selected trees within or along the edges of the certificated work limits (i.e., construction right-of-way, UCSAs, and TEWAs).
Q	Overburden and Excess Material Disposal Plan	This Plan identifies the proposed locations on federal lands that may be used for the permanent and temporary storage of excess rock, timber, and spoil generated during timber removal and construction of the Pipeline.
R	Prescribed Burning Plan	This Plan provides the applicable protocols and BMPs that would be implemented if it is necessary to burn excess forest slash generated from right-of-way clearing operations.
S	Recreation Management Plan	This Plan provides the protocols that will be followed to aid in maintaining recreation opportunities, limiting right-of-way access, and preventing user conflict on public lands and in the waterway within the Pipeline area,
T	Right-of-Way Marking Plan	This Plan identifies the survey standards and types of survey markings that will be used by PCGP on federal lands during the pre-construction, construction, and operational

Appendix	Plan	Summary
		phases of the Pipeline.
U	Right-of-Way Clearing Plan for Federal Lands	This Plan outlines the methods that PCGP will implement during timber removal within the construction right-of-way and TEWAs.
V	Safety & Security Plan	This Plan identifies measures to be taken by PCGP and its contractors to minimize hazards to persons working on and visiting the Pipeline during construction as well as to the general public and to comply with all applicable safety requirements and regulations.
W	Sanitation and Waste Management Plan	This Plan outlines the procedures that will be implemented by PCGP and its contractors to manage sanitation and waste materials during construction and operations of the Pipeline. The Plan is the principal source of direction for the management of solid and construction wastes that will be generated during construction.
X	Spill Prevention, Containment, and Countermeasures Plan	This Plan outlines the measures that will be implemented to minimize spill potential, contain any spillage, and protect areas of environmental concern from spills.
Y	Transportation Management Plan	This Plan covers all Pipeline transportation-related activities involving agency roads or rights-of-way. It also identifies ongoing cooperative procedures as well as Agency requirements for roads that are sub-standard and may be used for either timber haul or pipeline construction during the life of the Pipeline.
Z	Unanticipated Discovery Plan (Cultural Resource Preservation)	This Plan provides general guidelines for dealing with unanticipated cultural resource discoveries.
AA	Environmental Alignment Sheets	A set of photo-based maps depicting the centerline and construction right-of-way at a scale of 1":200' and the associated environmental features and requirements.
BB	Wetland and Waterbody Crossing Plan	This Plan outlines the construction methods, restoration procedures, and Best Management Practices (BMPs) that PCGP will utilize during construction of the Pipeline to avoid, minimize, and restore potential impacts associated with wetland and waterbody crossings, as well as to minimize potential effects to aquatic resources.

1.4.1 Construction Spreads

Each construction spread (see Table 1.2-1) will consist of all construction activities necessary to construct the Pipeline including:

- preconstruction survey, marking and staking (see Appendix T);
- forest/timber clearing (see Appendices U and P);
- grading (see Appendix I);
- installation of erosion control BMPs (see Appendix I);
- topsoiling (where required) (see Appendix I);
- trenching (see Appendix I);
- pipe stringing (see Appendix I);
- welding and coating pipe (see Appendix I);
- lowering pipe and backfilling (see Appendix I);
- hydrostatic testing (see Appendix M); and
- restoration (see Appendix I).

The construction spread activities will occur in sequence or in assembly-line fashion along the right-of-way with one crew following the next from clearing until final cleanup. As work proceeds, there are often periods between job tasks when work at a specific

location on the right-of-way is delayed such as between trenching and pipe stringing or pipe stringing and welding.

PCGP will confine project-related disturbance to those areas shown on the Environmental Alignment Sheets (see Appendix AA). No disturbance will be allowed to occur outside of these areas without appropriate surveys (cultural, threatened and endangered species, residential, etc.), other federal, state, or local permits and prior written approval from FERC.

Construction Right-of-Way Egress and Ingress/Equipment Mobilization

Access roads that will be used during construction or crossed by the Pipeline have been identified (see Appendix Y). Appendix Y lists roads which will be used to access the construction right-of-way and identifies roads which will require improvement (i.e., brush clearing, grading, widening, etc). All access roads/bridges that will require new construction and/or minor improvements such as widening, grading, sloping, and clearing, will be clearly staked and flagged prior to use as indicated in the Right-of-Way Marking Plan (see Appendix T). The construction contractors will not be allowed to use roads not previously identified for use without prior approval. The locations of egress and ingress points are shown on the Environmental Alignment Sheets (see Appendix AA).

Generally, equipment moved to the construction right-of-way will proceed down the right-of-way performing their job tasks and minimizing the need to transport the equipment to various areas along the right-of-way. PCGP has developed an Integrated Pest Management Plan (see Appendix N), which addresses measures (such as cleaning) that will be utilized to minimize the potential spread of noxious weeds, invasive plants, forest pathogens, and soil pests into and out of the construction right-of-way from equipment transport.

Off-Highway Vehicle Control

OHV traffic will be managed as provided in Appendices I (ECRP), S (Recreation Management Plan), and Y (Transportation Management Plan).

1.4.2 Road Crossings

Roads will be crossed in accordance with the Transportation Management Plan provided in Appendix Y.

1.4.3 Waterbody Crossings

In summary, 50 Riparian Reserve features, including 14 perennial streams, 29 intermittent streams and 7 intermittent ditches are affected by the alignment in 10 fifth field watersheds. Riparian Reserves on Forest Service lands include the Umpqua, National Forest (13); Rogue River-Siskiyou National Forest (2); and Fremont-Winema National Forest (3). Riparian Reserves on BLM-managed lands include Coos Bay District (14); Roseburg District (2); Medford District (14) and Lakeview District (2). See the Wetland and Waterbody Crossing Plan in Appendix BB to the POD for more detail on waterbody crossings.

Pipeline crossings of perennial waterbodies will be made nearly perpendicular to the axis of the waterbody channel, where feasible. The Pipeline route will avoid paralleling a

waterbody within 15 feet or less, where feasible. Where possible, PCGP has located TEWAs so that they are no closer than 50 feet from waterbody boundaries. PCGP has applied to the U.S. Army Corps of Engineers and the Oregon Department of Environmental Quality for the necessary permits/certifications under the Clean Water Act and will adhere to these permits, which will govern wetland and waterbody crossings. For the Reclamation facilities, PCGP will implement the Klamath Project Facilities Crossing Plan (see Attachment O).

If water is present in the streambed at the time of construction, PCGP will utilize a dry-ditch crossing method (flume or dam and pump) to cross all minor and intermediate waterbodies consistent with the requirements of Section V.B.6 of FERC's Wetland and Waterbody Procedures (see Attachment B to Appendix I).

Hazardous materials, chemicals, fuels, and lubricating oils will be stored in upland areas at least 150 feet from waterbodies and wetlands (see Appendix X) or in accordance with FERC's Wetland and Waterbody Procedures. Restricted areas for storage of these materials will be clearly marked in the field. Concrete coating, refueling, and equipment maintenance activities will be conducted according to FERC's Wetland and Waterbody Procedures. Concrete trucks will not be washed on the construction right-of-way except at designated wash stations. All hazardous materials will be handled in accordance with the SPCC Plan (see Appendix X). If any unanticipated spill occurs during construction, PCGP will implement the procedures outlined in the SPCC Plan.

If water is present in any streambeds at the time of construction, PCGP will utilize temporary construction bridges during all phases of construction to cross these waterbodies. Equipment bridges will not be installed on intermittent waterbodies which are dry at the time of construction. However, if a storm occurs which results in water in the streambed of the otherwise intermittent waterbody, no equipment will cross the waterbody until the streambed dries up or until a bridge is installed. PCGP will not allow clearing equipment to cross waterbodies prior to bridge placement. Further, where feasible, PCGP's contractors will attempt to lift, span, and set the bridges from the streambanks. However, where it is not feasible to install or safely set the temporary bridges from the streambanks, only the equipment necessary to install the bridge or temporary support pier will cross the waterbody. All stream crossings on National Forest System (NFS) lands (whether intermittent or perennial, wet or dry) will have either: 1) a bridge; 2) a temporary culvert with temporary road fill to be removed after work is completed; or 3) a low water ford with a rock mat.

These structures will be designed according to FERC's Wetland and Waterbody Procedures as well as according to the U.S. Army Corps of Engineers, Oregon Department of State Lands, Oregon Department of Environmental Quality and Oregon Department of Fish and Wildlife approvals. To provide equipment and material access up and down the construction right-of-way, it will be necessary to install equipment bridges outside the ODFW recommended in-water construction windows.

The temporary equipment bridges will be constructed to maintain unrestricted flow and to prevent soil from entering the waterbody. Soil will not be used to stabilize equipment bridges. Bridges will be designed according to FERC's Wetland and Waterbody Procedures (Section V.B.5.B) and will be maintained to withstand and pass the highest flow expected to occur while the bridge is in place. The highest flow expected will be determined during the season of construction and will take into account an evaluation of

regional climate and physical conditions as well as existing historic stream-flow data and peak discharge statistics from nearby USGS gauging stations.

Where feasible, bridges will be designed to span the entire Ordinary High Water Mark (OHWM) of the waterbody. If it is not possible to span the OHWM with a bridge, a temporary culvert or pier may be required. These culverts/piers would be installed to minimize flow restrictions that may deflect stream flow to banks to prevent streambank erosion or scour. The ECRP in Appendix I (see Drawing 3430.34-X-0010) provides additional details for temporary bridges.

Temporary bridges will be set during clearing operations in Year One as well as during mainline construction in Year Two. The temporary bridges set during clearing operations would be temporarily removed after clearing is complete and will not be left in place across a waterbody over the Year One/Year Two winter. During mainline construction in Year Two, the temporary bridges will be reset and will be removed as soon as possible after permanent seeding. If there will be more than one month between final cleanup and the beginning of permanent seeding and reasonable alternate access to the right-of-way is available, equipment bridges will be removed as soon as possible after final cleanup as required by FERC Wetland and Waterbody Procedures (Section V.B.5.f.).

Sediment barriers will be installed immediately after initial disturbance of the waterbody or adjacent upland as shown on Drawings 3430.34-X-0005 and 3430.34-X-0007 in the project-specific ECRP (see Appendix I). Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete.

All waterbodies supporting coldwater fisheries will be backfilled with material removed from the trench with the upper 1-foot of the trench backfilled with clean gravel or native cobbles.

Maintenance. During operation of the Pipeline, vegetation maintenance adjacent to waterbodies will be limited to allow for a riparian strip at least 100 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate across the entire right-of-way using native plant species. On BLM and NFS lands where Riparian Reserves are affected, a 100-foot riparian strip (or less if the preconstruction riparian vegetation did not extend to 100 feet) will be planted adjacent (see Note 4 on Drawing 3430.34-x-0016, in Appendix I) to the waterbody and on both sides of the waterbody. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the Pipeline and up to 10 feet wide will be maintained in an herbaceous state with no vegetation greater than 6 feet in height. Trees that are located within 15 feet of the pipeline will be cut and removed from the right-of-way. Drawings 3430.34-X-0016 and -0017 provided in the ECRP (see Appendix I) illustrate the maintenance corridor along streams described in this section. It should be noted that PCGP will only maintain 30 feet of the Operational Right-of-Way easement (15 feet either side of the pipeline centerline) which will significantly minimize the impacts to forested riparian areas (see Drawings 3430.34-X-0016 and -0017 in the ECRP, Appendix I). Herbicides will not be used in or within 100 feet of a waterbody's mean high water mark, unless allowed by the appropriate agency.

1.4.4 Wetland Crossings

Consistent with FERC's Wetland and Waterbody Procedures (see Attachment B to Appendix I), PCGP has attempted to limit the width of the construction right-of-way through jurisdictional wetlands to 75 feet or less, where feasible. Where topographic conditions or other features or constraints require additional construction right-of-way widths, PCGP has requested modifications as part of its FERC application. The wetlands crossed by the pipeline are shown on the Environmental Alignment Sheets (see Appendix AA). See the Wetland and Waterbody Crossing Plan in Appendix BB to the POD for more detail on wetland crossings.

All TEWAs have been located at least 50 feet away from wetland boundaries according to FERC's Wetland and Waterbody Procedures, except where site-specific conditions prevent the setback (see Wetland and Waterbody Crossing Plan Attachment 1 in Appendix BB).

During construction, clearing of vegetation will be limited to the certificated construction right-of-way. Where feasible, the only access roads that will be used in wetlands are those existing roads that can be used with no modifications and without impacting the wetlands. To minimize potential impacts associated with the Pipeline, PCGP will utilize the measures outlined in FERC's Wetland and Waterbody Procedures.

1.5 OPERATION AND MAINTENANCE

As required by the DOT, FERC's guidance at 18 CFR §380.15, and maintenance provisions of FERC's Upland Plan and FERC's Wetland and Waterbody Procedures (see Attachments A and B to Appendix I), PCGP will test, operate, and maintain the Pipeline and associated facilities in accordance with DOT regulations provided in 49 CFR Part 192, Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards. PCGP will follow procedures specified in the company's Operations and Maintenance (O&M) manual, which is reviewed and audited by the DOT Pipeline and Hazardous Material Safety Administration (PHMSA) to ensure compliance with DOT regulations.

The right-of-way will be clearly marked where it crosses public roads, waterbodies, fenced property lines, and other locations as necessary. All facilities will be marked and identified in accordance with applicable regulations and as described in the Right-of-Way Marking Plan (see Appendix T).

No herbicides will be used to control vegetation (i.e., brush and trees) on the Operational Right-of-Way easement unless approved or required by the land-managing agency (see Appendix N). Vegetation at aboveground facilities will be periodically maintained through mowing, cutting, trimming, and herbicides (selectively). Likewise, vegetation within the Operational Right-of-Way easement will be periodically maintained by mowing, cutting, and trimming (either by mechanical or hand methods). The Operational Right-of-Way easement will be maintained in a condition where trees or shrubs will be controlled (cut or trimmed) within 15 feet either side of the centerline (for a total of 30 cleared feet). A typical right-of-way cross section configuration for operation and maintenance is provided in the ECRP (see Figure 3430.34-X-0017 in Attachment C to Appendix I). Maintenance activities are expected to occur approximately every 3-5 years depending on the growth rate. During maintenance, vegetation will be cut/trimmed in 4- to 6-foot lengths and scattered across the Operational Right-of-Way easement to

naturally decompose and to discourage OHV traffic. Occasionally, where site conditions allow, chipping of this material may also occur. PCGP believes that the slash materials generated and scattered across the Operational Right-of-Way during maintenance activities would not exceed the fuel loading specifications provided in the ECRP in Attachment I.

A typical plan view of vegetation maintenance within the pipeline right-of-way at waterbody crossings is shown in Figure 3430.34-X-0016 in the ECRP (see Attachment C to Appendix I). On federally-managed lands where Riparian Reserves are affected, a 100-foot riparian strip (or less if the pre-construction riparian vegetation did not extend to 100 feet) would be planted adjacent (see Note 4 on Drawing 3430.34-x-0016 to the waterbody and on both sides of the waterbody. To facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide would be maintained in an herbaceous state in this riparian strip. Herbicides would not be used in or within 100 feet of a waterbody's mean high water mark. Herbicides would only be used on federal lands (Forest Service, BLM, or Reclamation) if needed to control invasive species in accordance with each land management agency's management plans (see Appendix N).

To prevent damage or erosion caused by OHV use within the Permanent Right-of-Way, PCGP will install or maintain OHV barriers or controls as specified in the Recreation Management Plan (see Appendix S). PCGP will allow timber removal from the Permanent Right-of-Way easement; however, to ensure safety, PCGP will require a work plan including notification and information regarding the location, proposed activities, type of equipment, and weight-loading. PCGP prohibits digging, blading, grading, or similar activities over the Permanent Right-of-Way easement unless prior written approval is obtained by the encroaching party. Excavation of any type by a landowner or third party requires utilization of the One-Call System prior to the above listed activities.

Generally, repair of erosion control structures, drain tiles, and the need for additional fill may be required in the first year or two following construction in areas where the trench may have settled. Depending on the location of the trench settlement, minor repairs of waterbars or drain tiles may be necessary because the settlement could affect the drainage or proper function of these features and regrading and/or addition of fill material may be necessary. Erosion control structures, drain tiles, and the need for additional fill will be assessed by either inspectors or operations personnel during routine inspections of the right-of-way. Areas susceptible to damage from large storm events will be inspected and repaired as appropriate depending on the nature of damage. Any disturbance associated with maintenance or repair activities would be appropriately revegetated as outlined in the ECRP in Appendix I. In addition, any areas of concern that are brought to the attention of either the inspector or pipeline operator will be assessed and repaired as necessary. Waterbody crossings will also be inspected periodically to ensure bank stabilization. A supply of emergency replacement pipe, leak repair clamps, sleeves, and related materials will be stored at the local district office for repair activities.

During operations, PCGP will implement a number of routine monitoring measures including:

- Performing land patrols which involve observing surface conditions on and near the right-of-way for indications of leaks, construction activity, and any other factors which might affect pipeline safety and operation. The term "patrolling" means the action of moving about over land or in the air or water for purposes of observing conditions on and adjacent to pipeline right-of-way for leaks, construction activity, facility marking, atmospheric corrosion, and other factors affecting safety and operations;
- Performing aerial patrols at least once per calendar year or after major flood events;
- Inspecting river crossings;
- Ensuring that class location survey is current; and,
- Conducting leak surveys at least once every calendar year as required by 49 CFR Part 192.

Surface travel along the right-of-way during operations will generally be limited to periodic valve inspections, corrosion and leak surveys, right-of-way maintenance including noxious weed control and any pipeline repairs that may be needed. In addition to routine monitoring, potentially affected portions of the pipeline will be inspected during or immediately following any major natural disturbance events, such as an earthquake, floods, wildfires, etc. PCGP may access the right-of-way by foot, truck, ATV, snow mobile, snow cat, or by helicopter depending on the accessibility of the area to be monitored. Precautions outlined in the Integrated Pest Management Plan (see Appendix N) will be taken to minimize the spread of noxious weeds and pathogens during operations and maintenance.

During inspections, PCGP employees will look for signs or indications of unusual activity on the right-of-way. Discoloration of plants or grasses may be indicative of a small leak. Any missing or damaged pipeline markers used to identify the location of the pipeline will be promptly replaced or repaired. Any evidence of unauthorized activity will be reported.

In addition to DOT-required surveys, PCGP will monitor the pipeline system using a supervisory control and data acquisition (SCADA) system. SCADA systems are used to monitor and control facilities or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining, and transportation. A SCADA system gathers information; transfers the information back to a control center; carries out necessary analysis and control; and displays the information in a logical and organized fashion 24 hours a day, 7 days per week. The Jordan Cove LNG Terminal in Coos Bay will have the ability to control the pipeline. Oregon. Local maintenance and operations personnel will be available 24 hours a day, 7 days per week.

PCGP would protect the Pipeline from corrosion over time through a cathodic protection system. This system would input a low voltage electrical charge into the pipeline underground. Monitoring and maintenance of the cathodic protection system will be accomplished in compliance with the appropriate DOT regulations at least once per calendar year but with intervals not to exceed 15 months. Problems detected through the monitoring program will be corrected promptly and checked in a follow-up survey no later than 12 months after the initial discovery. Recording and transmitting pressure and

temperature data will be controlled and/or monitored by PCGP's gas control monitoring system.

All of the information that PCGP gathers about its system will be used to tailor its safety and integrity management activities, so that parts of the system with the greatest need of attention receive greater scrutiny, such as residential areas or areas subject to growth and development. PCGP will decide where and when to internally inspect the Pipeline based on this information. Risk assessment of the Pipeline system determines what inspection criteria are required. This may include different types of assessment tools which provide specific types of information about the condition of the Pipeline.

1.6 TERMINATION AND ABANDONMENT

Prior to termination or abandonment of the Pipeline or aboveground facilities, PCGP would be required to file a new, separate application with FERC for that action. FERC would consider that action a new undertaking, and conduct an independent environmental review of the proposal, including consultations with other appropriate regulatory agencies. Only after documenting that review in an environmental document that meets the requirements of the NEPA, and public review and comment on that environmental document, as appropriate, would the FERC make a decision about whether or not to authorize the proposed abandonment actions.

The federal land-managing agencies would need to evaluate any proposed abandonment under the terms of the Right-of-Way Grant. The BLM must consider the final disposition of the Pipeline facilities in accordance with 43 CFR § 2886.

PCGP's abandonment or deactivation of the Pipeline and associated facilities would comply with applicable internal guidance documents and the applicable federal regulations, including those at 49 CFR §192.727, Abandonment or Deactivation of Facilities. The Pipeline would be abandoned in place, where necessary, and would be disconnected from all sources and supplies of gas, purged of gas, and have the ends sealed.

For aboveground facilities, once service is permanently discontinued, PCGP would complete one of the following activities:

- fit the valve closest to the abandoned portion of the pipeline with a locking device to prevent gas flow;
- install a mechanical device or fitting in the appropriate service line or meter assembly to prevent gas flow; or
- physically disconnect the piping to the customer from the gas supply source and seal the pipe ends.

Work necessary for abandonment or deactivation would be conducted within the Permanent Right-of-Way, where possible. For example, excavations may have to be constructed to seal pipe ends or remove block valves. PCGP would apply for the necessary authorizations from appropriate federal, state, or local government agencies for any activities related to abandonment that may occur outside of the Permanent Right-of-Way easement.

Appendix A

Aesthetics Management Plan for Federal Lands

Pacific Connector GAS PIPELINE

Pacific Connector Gas Pipeline, LP

Aesthetics Management Plan

Pacific Connector Gas Pipeline Project

January 2018

Table of Contents

List of Tables

List of Attachments

1.0 INTRODUCTION

The Pacific Connector Gas Pipeline Project (Pipeline or Pipeline Project) crosses portions of the Southern Coast, Klamath Mountains and Cascade Mountain Range in the southwest region of Oregon. Landscape characteristics in the area are influenced by varying geographic, topographic and vegetation types and human developments (i.e., industrial, timber, agricultural, rural, etc.). Where the Pipeline Project is located on federal lands managed by the U. S. Forest Service (Forest Service) and Bureau of Land Management (BLM), PCGP recognizes a shared responsibility in the management of visual resources. To aid in managing these resources in accordance with respective agency land and resource management plans, PCGP has prepared this Aesthetics Management Plan (Plan). The Plan is based on the analysis provided in PCGP's certificate application, specifically Resource Report 8, to the Federal Energy Regulatory Commission (FERC). A draft of this Plan was shared with the Forest Service and BLM in October of 2008 during the previous review. In January of 2009, the Forest Service responded to PCGP with a Scenery Management Analysis that provided recommendations for mitigation measures to improve the restoration and mitigation measures proposed in this Plan and determine what visual quality objectives (VQOs) would be met on Forest Service lands. PCGP subsequently met with the Forest Service and BLM in March of 2009 to discuss and clarify the Scenery Management Analysis and agreed on revisions and mitigation measures to be included in the Plan. The Federal Lands Scenery Management Analysis and Mitigation Recommendations is included as a part of this Plan (see Attachment 1). At that time, PCGP and the BLM agreed to implement appropriate mitigation recommendations outlined in Attachment 1 on BLM-managed lands crossed by the Pipeline near MP 123 east of Trail Post Office and Highway 62, in Jackson County and along Clover Creek Road between about MPs 176 and 177 in Klamath County.

1.1 Purpose

The purpose of this Plan is to outline methods that PCGP will implement to ensure compliance with agency land and resource management plans pertaining to visual and aesthetic resources within the Pipeline Project area. This Plan establishes goals for managing visual resources as they relate to construction, reclamation and management of the PCGP Project and describes actions to be taken by PCGP to minimize impacts to visual resources.

1.2 Goals

- Goal 1: Compliance with Aesthetic Management Objectives detailed in BLM's Resource Management Plans (RMPs) issued in 2016 and Forest Service's Land and Resource Management Plans (LRMPs). Throughout the construction phase and pipeline operation, PCGP will utilize the measures set out in this Plan to minimize impacts to the overall aesthetic/visual quality of the Pipeline right-of-way over time.

- Goal 2: Minimize Potential Adverse Project Effects on Aesthetic Resources. Minimize project-related adverse effects on aesthetic/visual resources visible from key observation points.

- Goal 3: Protect Areas of High Visual Sensitivity. Protect and minimize modifications to sensitive viewsheds located along Big Elk Road (NFS Road 37), the Pacific Crest National Scenic Trail, the Scenic Highway 62 corridor near Trail, Oregon, Highway 140, Clover Creek Road, and Dead Indian Memorial Highway.

1.3 Definition of Terms and Abbreviations

Table 1-1
Definition of Terms and Abbreviations

BLM Visual Resource Terminology	
Term/Abbreviation	**Definition/Objective**
Visual Resource Management (VRM)	Element of the BLM's aesthetic resource classification system.
VRM Class I	Preserve the existing character of the landscape. This class allows for natural ecological changes, but does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
VRM Class II	Retain the existing character of the landscape. The level of change to the landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
VRM Class III	Partially retain the existing character of the landscape. The level of change to the landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
VRM Class IV	Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.
Forest Service Visual Resource Terminology	
Term/Abbreviation	**Definition/Objective**
Visual Quality Objectives	Component of the Forest Service's aesthetic resource classification and management system. A management objective for a landscape based on human scenic quality concerns and the local physiographic character of the landscape.
FG	Foreground
MG	Middle Ground
Maximum Modification	Activities including vegetative and landform alterations may dominate the characteristic landscape. However, when viewed as background they must visually appear as natural occurrences within the surrounding landscapes.
Modification	Activities may visually dominate the characteristic landscape. Landform and vegetative alterations must borrow from naturally established form, line, color or texture so as to blend in.
Partial Retention (PR)	Activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color and texture must be reduced as soon after the project completion as possible.
Retention (R)	Activities should not be visually evident. Contrasts in form, line, color and texture must be reduced during or immediately after the management activity.

1.4 Consistency with Other Plans

This Aesthetics Management Plan has been developed to be used in concert with PCGP's Recreation Management Plan and Erosion Control and Revegetation Plan (ECRP) for the

Pipeline Project. Recreation resources may be impacted where the Pipeline crosses several trails and roads. Any barriers constructed to impede unauthorized off-highway vehicle (OHV), snowmobile and general dispersed recreation access should be designed in a manner that does not adversely impact the area's visual resources, where practicable and safe. Revegetation and mitigation efforts designed to achieve visual management objectives upon construction completion will also conform to methods detailed in the ECRP to meet water and soil quality standards.

2.0 VISUAL/AESTHETIC RESOURCES

Viewshed and scenic resource classifications established by the Forest Service and BLM were used to determine the visual/aesthetic resources found along the proposed pipeline alignment. These classifications categorize visually sensitive areas according to the agencies' visual impact criteria (see Table 1-1). The BLM VRM system consists of two stages – inventory and analysis. The inventory stage involves identifying the visual resources of an area and assigning them to inventory classes using BLM's visual resource inventory process. This process results in assigning VRM classes to visual resources within a BLM district and becomes an important component of the area's RMP. For the analysis stage, the BLM uses its *Manual 8431: Visual Resource Contrast Rating* as a guide to analyze and mitigate potential visual impacts from proposed developments. The rating system was devised to ensure that an earnest attempt is made to minimize potential visual impacts (USDI 2001).

The Forest Service uses the Scenery Management System (SMS) developed in *Landscape Aesthetics: A Handbook for Scenic Management, Agricultural Handbook 701* (1995). The SMS replaces the Visual Management System (VMS), which was developed in The National Forest Management, Vol.2, Agricultural Handbook 462 (1974). However, Forest Service LRMP covering visual management in the Pipeline Project area were written prior to 1995 and use terminology from the older Visual Management System; that terminology is also used here. A crosswalk between the two systems is described in *Landscape Aesthetics*.

2.1 BLM Sensitive Viewsheds

On BLM lands, all of the proposed alignment passes through lands designated as VRM Class IV. These are lands where major modification of the existing landscape character is allowed and the level of change can be high. General mitigation for Class IV areas is provided in Section 3.0 of this Plan.

A previous alternate pipeline crossing of Highway 42 in the Roseburg District would have been visible to motorists along a scenic forested stretch. However, the proposed alignment was relocated. Therefore, the KOP for this area was eliminated, as further noted in Section 2.3.

The BLM Medford District manages the State Highway 62 corridor from Shady Cove, Oregon on BLM lands to north of Lost Creek Reservoir as an area with higher sensitivity, even though this area is VRM Class IV. The right-of-way will cross this viewshed east of the town of Trail from approximately MP 123.33 to MP 124.23. The alignment in this area will follow a ridgeline up from the Rogue River crossing through a stand of mixed evergreen forest interspersed with shrub and brushlands. Past logging, roads, and residential areas comprise some of the land uses in the areas visible from Highway 62. Pipeline construction and the cleared right-of-way where it climbs the forested hill in the foreground/middleground will be visible from the Highway 62 corridor in the immediate vicinity of Trail (see the Trail Post Office KOP description below), and from the Tiller to Trail Highway for approximately one mile.

Other areas with viewshed concerns crossed by the right-of-way include two short BLM Lakeview District segments along Clover Creek Road (approximately MPs 176.15 to 177.04 and 179.58 to 179.72). Here, the alignment runs parallel and immediately adjacent to the road. PCGP's original proposed alignment in this area was rerouted along Clover Creek Road as recommended by the Forest Service and BLM land managers to avoid impacts to nearby Buck Lake resources. Pacific Connector's proposed realignment along Clover Creek Road ran parallel to the road but was off-set and would have remained hidden from road travelers by a buffer of trees. However, the Forest Service recommended that the route be realigned to be immediately adjacent to the road wherever possible to eliminate a forested strip between the Pipeline and Clover Creek Road. KOPs, discussed below, were also established in this area.

2.2 Forest Service Sensitive Viewsheds

Within the Rogue River-Siskiyou and Fremont-Winema National Forests, the Pipeline crosses viewsheds that are managed for Retention and Partial Retention VQOs (USDA 1989, 1990 and 1990a). Areas in these National Forests designated as having high visual sensitivity are clustered around the Cascade Crest in the Pipeline Project area south of Brown Mountain and Lake of the Woods where the Pipeline crosses Big Elk Road, the Pacific Crest National Scenic Trail, Clover Creek Road, and Dead Indian Memorial Highway. Construction, operation and maintenance are not compatible with the VQOs. Attachment 1 – Federal Lands Scenery Management Analysis provides recommendations for mitigation measures to improve the restoration and mitigation efforts of this Plan and determine what VQOs would be met on federal lands. The remaining National Forest System (NFS) lands in the Pipeline Project area are managed for Modification or Maximum Modification, and the Pipeline activities are compatible with these VQOs. Table 2-1 summarizes areas that have been identified as having the most sensitive viewshed characteristics for which the Forest Service and BLM visual impact criteria apply.

Table 2-1
Sensitive Viewsheds and Associated Mitigation within the PCGP Project

Milepost	Viewshed Area/KOP	Agency [1]	Visual Class or Objective	Sensitivity Level	Mitigation Methods[3]
24.37BR	Coos Bay Wagon Road	FERC		Moderate	2, 3, 4
161.07-161.64	Big Elk Road (NFS Road 37)	FS-RRS	FG,R	high	2, 4
167.49-167.93	Pacific Crest Scenic Trail	FS-RRS	FG, PR	high	2, 3, 4
167.49-167.92	Crest Trail/Highway Buffer	FS-FW	MG, PR	moderate	1, 3
168.40-169.00	Dead Indian Highway	FS-FW	FG, R	high	1, 3
169.00-175.4 [2]	Clover Cr. Road	FS-FW	FG, PR	moderate-high	1, 2, 4, 5

[1] FERC= Federal Energy Regulatory Commission; FS= Forest Service; RRS=Rogue River-Siskiyou; FW=Fremont-Winema
[2] MPs 169.37 to 170.04, 171.40 to 171.6, 172.72 to 173.1, and 174.8 to 174.95 are private lands and not subject to federal viewshed classification.
[3] Mitigation Methods are coded as follows: 1—Right-of-way Placement, 2—Revegetation, 3—Construction Practices, 4—Vegetative Screening, 5—Slash and Salvage Usage.

2.3 Key Observation Points

The FS and BLM identified eight Key Observation Points (KOPs), described below, in sensitive viewsheds along the Pipeline (this does not include KOPs specific to the Jordan Cove LNG facility). These are areas where residents, motorists, recreationists, and other visitors might see pipeline construction and the permanent easement (upon completion of construction). At FERC's request, PCGP installed another KOP at the crossing of Coos Bay Wagon Road corridor (MP 24.37BR), on private lands, to determine how much of the route would be visible from the Wagon Road. Other KOPs were chosen based on their proximity to federal lands with high scenic qualities, visual sensitivity, and management objectives. These KOPs also serve as locales from which to monitor mitigation implementation and success. Section 3.4 of this Plan addresses specific mitigation measures for each KOP.

Resource Report 8/Appendix H.8 (Visual Assessment Excerpt/2015 FERC FEIS) contains visual simulation photos for the vicinity of the KOPs listed below. In Appendix H.8, representations of visual impacts at the KOPs for short-and long-term are presented.

Coos Bay Wagon Road (MP 24.37BR). At MP 24.37, the Pipeline would cross the historic Coos Bay Wagon Road. At the request of FERC, a KOP was installed at the road crossing to determine the impacts to travelers on the Wagon Road (this KOP is not numbered, and does not appear in the FERC's 2015 FEIS, as the reroute was incorporated after publication of the FEIS). Based on an impact assessment and visual simulation (see Appendix H.8 and Appendix I.8 to Resource Report 8), pipeline construction and the construction right-of-way would be clearly visible in the short-term from this KOP in the foreground/middle ground where the Pipeline crosses the road. However, because the crossing area is within an area of rotational timber harvest, much of the surrounding area, including the perpendicular road crossing, is within younger age-class timber, and the cleared right-of-way would not significantly contrast with surrounding visuals and vegetation types (Appendix I.8 to Resource Report 8). The Coos Bay Wagon Road crossing is on private lands, and views of the pipeline on background area hillsides are on BLM lands which are managed as VRM Class IV. Modification of viewsheds in Class IV areas is allowed under the BLM's RMP.

Highway 42 (Quiet Mountain Road Intersection). This KOP was on a stretch of Oregon State Highway 42 above the Camas Valley, where the proposed alignment previously intersected a BLM VRM Class II viewshed. However, the proposed alignment has been relocated about 0.80 mile south along Highway 42 and does not cross VRM Class II lands. The alignment was relocated to avoid an occupied Marbled Murrelet stand (R3027), and would now only cross VRM Class IV lands more than 1,000 feet west of bored HWY 42 crossing (at approximately MP 51.00 to MP 51.30). This KOP is no longer necessary, and has been eliminated.

Trail Post Office (near MP 123). The KOP (P2) at the Trail Post Office is northwest of where the Pipeline would cross Highway 62 and the Rogue River by a Horizontal Directional Drill. The KOP provides casual observers with foreground, middle, and background views of the forested hills that form the viewshed east of town. The surrounding hill and ridge tops are comprised of BLM Class III and IV viewsheds, but the Pipeline was rerouted to only occur within Class IV viewsheds. Construction and the permanent right-of-way would be partially visible from this KOP in the foreground/middleground where the Pipeline climbs the hill on private lands (and as its on private lands, there is not a VRM classification) and could present a moderate level of change in the short-term. Because the Pipeline right-of-way will clear a swath through what is now closed-canopy forest in the foreground/middleground, the contrast of texture, line, and color will be very apparent in the short term. Where the right-of-way is located along the ridgetop in

VRM Class IV, the right-of-way will be in the background and mostly screened by existing vegetation. It is expected to be a moderate to low modification and will not dominate the view.

Appendix H.8 to Resource Report 8 provides photo simulations of the background views of the proposed right-of-way from this KOP—from existing conditions through year 25 after right-of-way restoration. The alignment depicted in Appendix H.8 reveals the ridgeline placement with some forest screening from existing vegetation and subsequent revegetation and color blending over the period of restoration.

Highway 140 (MP 145.57). This KOP (P3) is located along Highway 140, on private lands, east of Medford near Little Butte Creek, and provides a middleground/background view onto BLM land, which is managed as VRM Class IV. From here, observers will see the right-of-way in the foreground as it crosses private lands next to Highway 140, then in the middleground/background as it climbs a hill onto BLM land.

Big Elk Road (MP 161.41). Big Elk Road (FS 37) provides access for snowmobilers as well as paved summer access to anglers, hikers and others traveling to Lake of the Woods. It is in an area with the Foreground Retention visual quality objective on the Rogue River-Siskiyou National Forest and provides observers with both foreground and middleground perspectives of the right-of-way.

Appendix H.8 of Resource Report 8 provides detailed photo simulations of the foreground views of the proposed right-of-way and road crossing from this KOP (P4), presenting existing conditions through year 25 after right-of-way restoration. The images depict how boulders and slash could be placed to deter OHV use.

Pacific Crest National Scenic Trail (MP 167.87). These KOPs (P8 and P9) are located on the PCT, where the proposed Pipeline intersects the trail. This area is in a Foreground Partial Retention area of the Rogue River-Siskiyou National Forest with mostly large trees immediately surrounding the trail, providing observers with only foreground views. Appendix H.8 to Resource Report 8 provides detailed photo simulations of the foreground views of the right-of-way and trail from these KOPs, presenting existing conditions through year 5 and year 25, after right-of-way restoration.

Clover Creek Road (intersection of Dead Indian Memorial Highway and Clover Creek Road (MPs 168.84, and 170.1, to 176.8). Located near a developing neighborhood of resort homes, three KOPs (P5, P6, and P7) provide observers with foreground, middleground and background distance zone perspectives along two scenic backcountry highways. Observers will see the right-of-way as it parallels Clover Creek Road heading east in the foreground, middleground and background.

The Forest Service suggested that the right-of-way be moved as close to Clover Creek Road as possible, based on site-specific conditions, to eliminate the strip of trees between the road and pipeline right-of-way. This puts the right-of-way immediately adjacent to the road, except in a few areas were physical (i.e., stream crossings) and topographic conditions prevented abutting the road. The placement will also potentially reduce impacts on land management for owners of the previously proposed buffer strip. Additionally, this “widening effect” as a result of the abutment along the Clover Creek Road corridor can provide travelers with more extensive views of the forested hills in the background.

Appendix H.8 to Resource Report 8 provides information on the KOPs for the Clover Creek Road area. Descriptions of KOP-P5, P6, and P7 in Appendix H.8 provide simulations of the right-of-way between MPs 170.1 and 176.8. KOP-P5 provides simulated views of the Pipeline-road abutment in the longview. Simulations from this point represent a view of the right-of-way looking east. This shows the extent of visual impacts of the Pipeline in the foreground and middleground. KOP-P6 provides potential views of the immediate foreground where the alignment would be immediately adjacent to Clover Creek Road in an area near the tributary to Spencer Creek. KOP-P7 provides another long-distance view of the right-of-way from the Clover Creek Road at MP 170.1. This series of three simulations in Appendix H.8 shows the typical visual effects that would occur in timbered landscapes along Clover Creek Road.

3.0 MITIGATION

Mitigation for aesthetic resources will be applied on a site-specific basis in areas classified as visually sensitive under agency resource management plans and per agency guidance (see Table 2-1), as well as areas of concern that may arise during and after construction. Generally, visual/aesthetic resource mitigation on all federal lands will be ongoing through all phases of construction. Descriptions of specific mitigation measures are detailed in the sections below. These measures are subject to change and could be expanded, replaced, or abandoned because of ongoing consultations with agency resource managers.

Mitigation measures taken to address other resource issues associated with the pipeline construction and right-of-way will reduce the visual impacts as well. These would include mitigation activities and standards and guidelines associated with wetland and waterbody crossing procedures, critical habitat, upland restoration, timber extraction, etc. These measures are identified in PCGP's other associated Management Plans for Federal Lands (e.g., ECRP, Recreation Management, Right-of-Way Clearing, etc.).

3.1 Project Design

During preliminary project design, PCGP identified visually sensitive areas based on information provided by the BLM and Forest Service. PCGP then designed the construction right-of-way and temporary extra work areas (TEWAs) to minimize impacts in these locations where possible. For example, in sensitive viewsheds at the Pacific Crest Trail and Dead Indian Road Memorial Highway, the construction right-of-way has been reduced to 75 feet in width and TEWAs have been set back from the roads and trail crossings. At the Big Elk Road crossing, the construction right-of-way has been necked down to 50 feet in width and tapers out to the full 95-foot right-of-way width at 100 feet from either side of the road. These elements will maximize the retention of existing vegetation cover, thereby easing visual contrast during and after construction. Mid-term impacts on sensitive viewsheds are expected in areas where forest vegetation cannot be shaped and blended to soften the linear pattern of the pipeline right-of-way and retain the existing character of the landscape. On a case-by-case basis, PCGP will utilize the BLM's "A Sample List of Design Techniques for Mitigating Visual Impacts" (BLM Manual 8431, Appendix 3). In some cases, PCGP has already incorporated design techniques to mitigate visual impacts as outlined in BLM Manual 8431 (USDI 2001). For example, the alignment is designed to cross some visually sensitive areas at right angles, to set block valves back from crossings, and to minimize viewing time for casual observers. Additionally, Section 3.4 also provides details of the specific mitigation measures to be implemented in sensitive viewsheds. The alignment along the Pacific Crest Trail has also been realigned to shorten the potential visual corridor from the trail down the right-of-way. The alignment of the Pipeline along Clover Creek Road has been dictated by the Forest Service and BLM who have requested that

the alignment parallel the road as closely as possible. PCGP has complied with this request, and FERC has previously selected the alternative alignment which abuts the road right-of-way where topographic conditions allow.

3.2 Construction Techniques

During construction and restoration in designated visually sensitive areas on federally-managed lands, PCGP and its contractors will strategically place construction debris (slash, boulders, stumps) and will shape and blend the right-of-way to the extent practicable to conform to preconstruction contours and the characteristic landscape to reduce contrast. In areas where the right-of-way creates openings adjacent to trails and roads, providing potential unauthorized access to OHV use, natural barriers will be used to prevent passage. In areas where natural barriers might prove ineffective, PCGP will construct and maintain fences and/or gates, using agency-approved materials and color schemes to better blend in with the characteristic landscape (see also the OHV control measures that are provided in the Recreation Management Plan in Appendix S of the Plan of Development for details on trail barriers and access issues).

Rock and boulder material that may be generated during construction could be used as trench backfill material where appropriate. PCGP has also selected disposal areas for excess rock and boulders. Excess rock could also be utilized to restrict OHV use on the right-of-way at selected road crossings or other potential openings. As described in the ECRP, large rock would also be used on the right-of-way as habitat diversity features where approved by the land management agency. PCGP will use these rock and boulder storage methods to ensure enhancement and mitigation of visual resources along the right-of-way to the extent they are practicable and safe.

Per land management agency direction, edges of the cleared right-of-way may have additional timber cutting to scallop and feather the edges, to reduce the hard line of forested lands adjacent to the right-of-way. In these areas, Forest Service or BLM, landscape architects will direct PCGP on which trees to specifically cut down. Additionally, during re-planting of the right-of-way, agency landscape architects will also assist in targeting areas to plant more, or larger trees to further help reduce the contrast between the cleared right-of-way and surrounding forest lands (see Section 8.7.2.1 in Resource Report 8).

On-site visual deviations from existing conditions will take place throughout the entire length of the right-of-way. The deviations will be more measurable and lasting in areas that are currently forested, since the right-of-way will be a linear development with 30 feet of the permanent easement (centered over the pipe) maintained in an herbaceous and shrub condition. The 30-foot width will be maintained periodically (approximately every three to five years) with removal of trees within 15 feet of the centerline. Cut and fill slopes will be a short-term impact, since remediation earthwork will return all terrain to its approximate original contours. Use of uncleared storage areas (UCSAs) will not require forest canopy removal, but it is probable that some trees will be damaged in these areas during construction. Where trees are damaged in UCSAs located on federal lands, PCGP will be required to purchase the damaged trees as discussed in the Right-of-Way Clearing Plan and Leave Tree Protection Plan (see Appendices U and P to the POD). Some damaged trees might die eventually, but it is impossible to determine where this might occur. Damaged and/or dead trees would only be visible in the immediate foreground of the observer and would most likely occur at isolated spots in the right-of-way. Overall, these assumed damaged trees will most likely comprise little or no visual deviation when factored in with the greater deviation caused by the linear nature of the pipeline

easement in forested areas. PCGP, along with the authorized agency representative on federal lands, will assess potential tree damage within the UCSAs from construction of the Pipeline to determine appropriate payment and to apply appropriate erosion control and restoration measures where determined necessary. Moreover, forest cleared within TEWAs and the right-of-way (except for the 30-foot maintained easement centered over the pipeline) will be allowed to regenerate to pre-construction conditions following restoration of the right-of-way as per the ECRP.

Off-site visual impacts created by construction practices are limited to road widening and upgrading. Depending on the site-specific terrain and existing visual resource conditions, PCGP will revegetate and reclaim these areas to eventually resemble pre-construction conditions.

3.3 Revegetation

In order to mitigate the linear pattern of the right-of-way on all lands, including federal lands, revegetation efforts will be initiated following construction (see the ECRP). These efforts are expected to provide short-term mitigation for visual contrast in color, line, and texture within two to five years. To the extent feasible, PCGP would use revegetation efforts to shape and blend the pipeline easement, enhance the setting, and mimic the natural features of the landscape. These measures would consist of revegetating all disturbed areas and replanting trees in TEWAs and any other areas of the temporary construction right-of-way that were forested prior to construction. On Forest Service and BLM forest lands (including forested areas classified as visually sensitive), PCGP will maintain a cleared 30-foot width centered over the pipe allowing the remainder of the permanent easement to be reforested (see Drawing 3430.34-X-0017 in Attachment 2). This could allow trees to naturally reestablish along the edges of the permanent easement at a staggered, more natural-looking interval. Replacing slash in forested areas of the right-of-way during restoration activities will immediately affect the visual contrast in color and texture of the disturbed right-of-way areas. Over time, as the right-of-way revegetates and narrows in width and changes in form, texture and color, potential visual impacts would diminish.

Additionally, a row, or if necessary, clusters of trees and/or shrubs will be planted across the right-of-way to provide visual screens at key road and trail crossings in sensitive viewsheds. For all revegetation practices, PCGP and/or its contractors will only use agency-approved tree and plant species, in compliance with management plan objectives and in consultation with agency specialists.

3.4 Specific Mitigation for Key Observation Points and Sensitive Viewsheds

3.4.1 Key Observation Points

These Key Observation Points will provide a baseline from which to monitor mitigation implementation and success. Mitigation techniques may vary from what is listed below, depending upon ongoing monitoring and consultation with agency land managers. Mitigation for KOPs will also include all general mitigation measures detailed in the above sections (3.1 through 3.3). On NFS lands, additional recommendations are presented (see Attachment 1).

Coos Bay Wagon Road (MP 24.37BR). Based on an impact assessment and visual simulation (see Appendix I.8 to Resource Report 8), construction activities and the construction right-of-way would be visible in the short-term from this KOP in the foreground/middleground where the Pipeline crosses the road. However, because the crossing area is within an area of rotational

timber harvest, much of the surrounding area, including the road crossing point, is within younger age-class timber, and the cleared right-of-way would not significantly contrast with surrounding visuals and vegetation types. The Wagon Road crossing is on private lands, and views of the Pipeline on area hillsides are on BLM lands which are managed as VRM Class IV. Modification of viewsheds in Class IV areas is allowed under the BLM's 2016 RMP.

As a starting point for reclamation and visual impact mitigation, PCGP will implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the ECRP to minimize potential visual effects in this area. In the middleground where the Pipeline climbs the hills, PCGP will seek to minimize contrast by slash placement and replanting immediately following construction with native trees, shrubs and restoration seed mixtures. During planning and construction, some trees on the edge of the right-of-way may be salvaged to aid in shaping the linear edges to blend in with the existing landscape and reduce contrast, where feasible, and per the direction of the BLM. This measure will be utilized where the Environmental Inspector and Chief Inspector determine it will be practical and safe. Within approximately 5 to 10 years after revegetation, the contrast, line and form of the right-of-way would be minimized in the middleground, although the 30-foot maintained permanent easement would still be noticeable.

Trail Post Office (near MP 123). The KOP at the Trail Post Office is northwest of where the Pipeline would cross Highway 62 and the Rogue River. The hills and ridge tops are comprised of BLM Class IV viewsheds. Revegetation, construction techniques, and slash and salvage usage will serve as essential mitigation measures at this KOP. For the Class IV viewshed in the background, existing tress would mostly mask both the construction and permanent easement because of the direct ridgetop placement of the pipeline. As a starting point for reclamation and visual impact mitigation, PCGP will implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the ECRP to minimize potential visual effects in this area. PCGP will also implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1); this would entail , measures to minimize soil color contrast in the foreground/middleground by regrading to approximate original contour, slash placement and replanting immediately following construction in this area with native grasses, shrubs and trees. Slash/chip redistribution and hydro-mulch will be utilized to dampen the color contrast. During planning and construction, some trees on the edge of the right-of-way would be salvaged to aid in shaping the linear edges to blend in with the existing landscape and reduce contrast, where feasible. Further, during restoration, tree planting along the 30-foot maintained easement on BLM lands, can also be shaped to ease the contrast in line, form, and color caused by the pipeline, as directed by the BLM.

These measures will be utilized where appropriate as determined by the BLM landscape architect, in consultation with the Environmental Inspector and Chief Inspector who will determine where it will be practicable and safe. Within approximately 5 to 10 years after revegetation, the contrast in line, form and color of the right-of-way effect would be minimized in the middleground, although the 30-foot maintained permanent easement would still be noticeable.

Highway 140 (MP 145.57). The KOP at the Highway 140 crossing is west of where the Pipeline would cross the highway and private lands in the foreground. The KOP provides casual observers with middle and background views of BLM land where the Pipeline climbs a hill onto a ridgetop. The hill and ridgetop are managed as VRM Class IV. Revegetation, construction techniques, and slash and salvage usage will serve as mitigation measures at this KOP. For the ridgetop in the background, existing trees would mostly mask both the construction and

permanent easement because of the ridgetop placement of the pipeline. PCGP will implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the ECRP to minimize potential visual effects in this area.

Additionally, in the middleground where the Pipeline climbs the hill, PCGP will seek to minimize contrast by slash placement and replanting immediately following construction using native trees, shrubs and plants. During planning and construction, some trees on the edge of the right-of-way may be salvaged to aid in shaping the linear edges to blend in with the existing landscape and reduce contrast, where feasible, and per the direction of the BLM. This measure will be utilized where the Environmental Inspector and Chief Inspector determine it will be practical and safe. Within approximately 5 to 10 years after revegetation, the contrast, line and form of the right-of-way would be minimized in the middleground, although the 30-foot maintained permanent easement would still be noticeable.

Big Elk Road (MP 161.41). Within the Rogue River-Siskiyou National Forest, the Pipeline crosses an area managed for Foreground Retention with high scenic integrity. In Foreground Retention areas, management activities should not be visually evident. The viewshed consists of a scenic buffer of large trees on both sides of the Big Elk Road (FR 37). The right-of-way would cross directly perpendicular to the road. PCGP consulted with Forest Service representatives and determined that the construction right-of-way could be necked down to a width of 50 feet immediately adjacent to either side of the Big Elk Road crossing. The construction right-of-way would then expand from 50 feet to the full 95-foot construction right-of-way width at 100 feet from either side of the road. To ensure that the appropriate large trees are conserved on either side of Big Elk Road, PCGP's Environmental Inspectors would verify the limits of the staked construction limits in conjunction with a Forest Service representative (see Leave Tree Protection Plan in Appendix P to the Plan of Development). PCGP will implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the ECRP to minimize potential visual effects at this road crossing, and a buffer of vegetation will mask the right-of-way on both sides of the road. PCGP will additionally revegetate the right-of-way using large native trees and shrubs to begin the mitigation process. All measures will be subject to agency approval. PCGP will also implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1), which would entail:

- Soil color contrast mitigation;
- Edge/form mitigation- scalloping and feathering edges;
- Revegetate for Reduction of Width and Improving Form- clustering of planted trees;
- Treatment of TEWAs in highly visible areas- planting clumps of trees and arranging boulders;
- Root wad and boulder placement in immediate foreground- specific placement, burying, and arrangement of root wads and boulders;
- Planting shrubs;
- Screening- selection of leave trees;
- Plant deciduous trees and shrubs for fall color- within the pipeline corridor as well as within ECRP.

Simulations (see Appendix H.8) of the Pipeline crossing of Big Elk Road show the long-term visual effects of the permanently cleared 30-foot right-of-way. Although motorists would not be traveling at high speeds in this area, exposure to the right-of-way from both directions is limited

to a few seconds, at most. This limited exposure minimizes any potential visual impacts associated with the Pipeline crossing. The densely forested foregrounds combined with the sharp angle of observation, length of time viewed, and relative size of the crossing's opening is such that the degree of contrast to the landscape is low and only briefly visually evident. However, motorists and year-round recreationists here could likely notice the contrast in landscape form, line, color and texture caused by the crossing. The Foreground Retention objective will not be met during the construction phase prior to successful revegetation. PCGP will revegetate the right-of-way using native trees and shrubs to begin the mitigation process. A buffer of vegetation will mask the right-of-way on both sides of the road and it is expected that within three to five years, Retention objectives can be achieved.

Pacific Crest National Scenic Trail. The area where the Pipeline intersects the PCT on the Rogue River-Siskiyou National Forest supports a stand of old-growth forest and is managed for Foreground Partial Retention to maintain the aesthetic forest appeal for trail users. The typical construction right-of-way width is 95 feet, which could devalue this trail crossing segment during construction. However, to minimize impacts to the scenic quality of the area, PCGP has "necked down" the construction right-of-way from 95 feet to 75 feet in width for a distance of more than 300 feet on either side of the trail. UCSAs (no tree clearing) have also been located behind these neck downs, outside of the immediate foreground visual area, to minimize disturbance. These UCSAs will be used to store slash and stumps during construction that will be redistributed across the right-of-way during restoration. To further minimize potential visual impacts at the PCT crossing, the route was realigned at the request of the Forest Service to shorten the potential visual corridor down the right-of-way. Additional impact minimization measures include:

- Identifying trees along the edge of the construction right-of-way that can be saved from clearing, based on hazard tree and construction safety.
- Scalloping adjacent edges of timber as directed by the Forest Service landscape architect.
- Salvaging topsoil (duff and A horizon) to a depth of 12-inches along the trench line, segregate from spoil material, and replace during restoration.
- Minimizing grading within the 75-foot construction right-of-way based on safety requirements. Stumps would be removed, or gridded as necessary to provide a safe equipment working plane.
- Replanting a 75-foot wide visual screen on either side of the trail with nursery trees and shrubs within 6 days of final grading, dependent on seasonal planting constraints (and not within the 30 foot-operational easement). Replanting would be with mixed conifer species of differing age class per the USFS landscape plan and would include hydro-mulch seeding.
- Revegetating the remaining right-of-way with nursery trees and shrubs planted along the edges of the right-of-way in scalloped arrangement.
- Hydro-mulch seeding all disturbed soils.
- Placing logs and LWD in the construction right-of-way as directed by the USFS landscape plan.
- Using a gravity drip irrigation system with a water source from the well at Brown Mountain Shelter, to improve replanting establishment.
- Replanting would occur if mortality exceeds 30 percent.

Placement of boulders, logs, root wads and planted vegetation would be guided by agency personnel during the reclamation process to further reduce visual impacts (see Attachment 1); these measures would also include:

- Soil color contrast mitigation;
- Edge/form mitigation- scalloping and feathering edges;
- Revegetate for Reduction of Width and Improving Form- clustering of planted trees;
- Treatment of TEWAs in highly visible areas- planting clumps of trees and arranging boulders;
- Root wad and boulder placement in immediate foreground- specific placement, burying, and arrangement of root wads and boulders;
- Planting shrubs.

The hikers along this trail are very observant and the speed at which they travel will allow them ample to time to view the right-of-way, so it is expected that they will notice more of the effects of the corridor, but the edges will soften by vegetative growth. The Scenery Management System does not specify a timeframe for meeting Retention or High Scenic Integrity, however, the Visual Management System requires that Retention VQO be met during or immediately after project completion. The Retention VQO will not be attainable during or immediately after Pipeline Project completion at the PCT crossing. However, PCGP plans to implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1) and it is expected that the visual quality level would meet the Modification VQO within 15 to 20 years. Within 3 to 5 years, the right-of-way is expected to be visually subordinate to casual trail users, although evidence of forest harvest and alteration will be evident to trail users for several more years.

Lakewoods Community and Clover Creek Road (intersection of Dead Indian Memorial Highway and Clover Creek Road). Viewsheds in this area are managed for Foreground and Middleground Retention and Partial Retention, but also contain areas of private lands with recently harvested timber and several clusters of rural residential homes. The proposed alignment would cross the Dead Indian Memorial Highway perpendicularly in a thick forest foreground setting (at MP 168.83). PCGP will implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the ECRP. These pipeline restoration efforts will include regrading to the approximate original contours, reseeding, scattering slash across the right-of-way, and replanting, which will minimize visual contrast of the right-of-way. During restoration, PCGP will plant trees within forested areas to within 15 feet of the Pipeline, which will allow a strip of trees to establish along the easement and between the Pipeline and the road in this area. Because the Pipeline was recommended to abut the road and to eliminate the strip of trees between the road and the Pipeline easement, the Forest Service and BLM would specify if tree planting would occur on federal lands between the centerline and Clover Creek Road (but not within 15 feet of the pipeline). PCGP will also implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1), which include:

- Soil color contrast mitigation;
- Edge/form mitigation- scalloping and feathering edges;
- Revegetate for Reduction of Width and Improving Form- clustering of planted trees;

- Treatment of TEWAs in highly visible areas- planting clumps of trees and arranging boulders;
- Root wad and boulder placement in immediate foreground- specific placement, burying, and arrangement of root wads and boulders;
- Planting shrubs;
- Screening- selection of leave trees;
- Plant deciduous trees and shrubs for fall color.

As shown on the post-construction simulation for these KOPs in Appendix H.8 to Resource Report 8, moderate amounts of woody debris (cull logs, slash, and root wads) would be left on the right-of-way to discourage OHV use, but this could create unacceptable visual contrasts (see Attachment 1). The Year 25 simulation shows pine reforestation on the right-of-way, and in this view, the permanently cleared and maintained area directly over the Pipeline would be partially to completely screened from view of the road. This shows the extent of visual Pipeline impacts, over time, in the immediate foreground and middleground of Clover Creek Road. The series of three simulations shows the typical visual effects that would occur in timbered landscapes along Clover Creek Road.

Motorists on the highway are traveling at high speeds. Therefore, exposure to the right-of-way from both directions at the Dead Indian Memorial Highway crossing is limited to less than a few seconds at most, which minimizes any potential visual impacts associated with the pipeline crossing. The densely forested foregrounds combined with the sharp angle of observation, length of time viewed, and relative size of the crossing's opening is such that the degree of contrast to the landscape is low and only briefly visually evident.

Because of the placement of the right-of-way in relation to the two roads, the multi-land owner setting of the area, and the revegetation methods used at the crossings, it is anticipated that the visual quality objectives can be met at least in the mid-term. Additionally, PCGP plans to incorporate mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1).

Where the proposed alignment parallels some sections of federally-regulated sensitive viewsheds along Clover Creek Road (MP 169.5 to MP 187.3; approximately 17.8 miles) within the Fremont-Winema National Forest and on BLM (and private) lands, the alignment will abut the current road easement where feasible, as requested by the Forest Service and BLM. The Forest Service and BLM recommended this alignment so that the right-of-way would create more clearing near the road, and "widen" the appearance of the Clover Creek Road corridor. This additional clearing would open northern views to the Mountain Lakes Wilderness and other areas. Potentially, the new views created by abutting the right-of-way to the road easement would mitigate some of the distraction caused by the adjacent clearing. PCGP also relocated Block Valve 13, which was previously located adjacent to the Dead Indian Memorial Highway, at MP 169.48 on private lands. The block valve has been set back from Clover Creek Road and accessed from an existing private road.

While the northern views would increase towards the Mountain Lakes Wilderness, the cleared right-of-way could dominate the foreground view, especially to customary road travelers that are familiar with the existing closed-canopy views along the road. The right-of-way would change the form, line, color and texture of the existing forested conditions along the road which would likely attract attention to the new easement. Project restoration efforts including regrading to the approximate original contour, reseeding, scattering slash across the right-of-way, and replanting

conifers would minimize visual contrast of the right-of-way. Trees planted within forested areas (to within 15 feet of the pipeline), would allow trees to establish along the easement and between the pipeline and the road in this area. Because the alignment was recommended to abut the road and to eliminate the strip of trees between the road and the pipeline easement, the Forest Service and BLM would specify if tree planting would occur on federal lands between the pipeline centerline and Clover Creek Road. However, even with these restoration efforts, the recommended alignment may not be consistent with the Forest Service's visual quality objectives for Partial Retention (the alignment is consistent with BLM VRM Class IV objectives). As indicated in Table 1-1, under the Forest Service's Partial Retention designation, activities must remain visually subordinate to the characteristic landscape. Associated visual impacts in form, line, color and texture must be reduced as soon after the project completion as possible. PCGP will also implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location (see Attachment 1), and per agency guidance.

3.4.2 BLM VRM Class IV Viewsheds

In addition to the sensitive areas described in the KOP section above, there are several areas where the right-of-way will cross various viewsheds. In sensitive viewsheds, the route has been confined to ridgelines where a minimal area of the right-of-way will be visible from surrounding lower elevations. The ridgetop placement in many areas also conforms to the line and form of the landscape. In other areas, the viewing distances from major roads are such that contrast to the landscape is minimized. Shaping and blending the right-of-way's often rigid linear shape is not practical for most of the right-of-way, considering that the construction footprint has been designed to construct the pipeline safely and effectively. Therefore, to shape, or feather the edges of the right-of-way, in many areas additional tree clearing would be required. In turn, this could cause additional impacts to other resources (i.e., wildlife habitat, watersheds).

To the extent feasible, PCGP will use revegetation efforts, in the long-term, to shape and blend the permanent easement with the natural features of the landscape and enhance the setting. The revegetation measures will consist of revegetating all disturbed areas and replanting trees in TEWAs and areas of the construction right-of-way that were forested prior to construction. The permanent easement, which is 50 feet wide on all lands, will be allowed to reforest up to 15 feet on either side of the pipeline. The 30-foot width will be maintained by removing trees and shrubs. This will allow trees to naturally reestablish along the edges of the permanent easement at a staggered interval, which will help soften the edge of the construction right-of-way and permanent easement over time.

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Attachment 1

(Federal Lands Scenery Management Analysis)

Pacific Connector Gas Pipeline
Scenery Management Analysis
and
Mitigation Recommendations

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March 25, 2009

The Pacific Connector Pipeline project traverses three National Forests and four BLM Districts along its route from Coos Bay to Klamath Falls. Pacific Connector and the BLM have agreed to adopt appropriate mitigation recommendations outlined in this plan along Clover Creek Road on about a mile of BLM lands between about MPs 176 and 177 in Klamath County, and near MP 123.3 to 124.2 east of Trail Post Office and Highway 62 in Jackson County. The National Forests use the Visual Management System, (VMS) to manage the visual resources and to analyze visual effects of proposed projects. The VMS uses a rating system known as Visual Quality Objectives, (VQO) to establish standards for scenery resource management.

The Visual Management System, Handbook 462 was published in 1974. Since then, Handbook 701 updates the most current Forest Service direction for scenery management. The Landscape Aesthetics, Scenery Management System utilizes a very similar rating system as the VMS that is used to evaluate project impacts to the visual quality. In addition, an appendix has been adopted to address the stability of scenic attributes as well as the direct visual effects of a project. Appendix J utilizes a scenic stability indicator to rate the stability of scenic attributes and how a project will affect that stability. The three Forests involved in the PCGP route have not formally adopted the Scenery Management System as Forest Plan standards. However, the direction to the Forest Service has been, since 1996, to incorporate the new system as we work on new projects. This analysis will utilize the existing visual quality objectives established in the forest plans of the Rogue River-Siskiyou, Fremont-Winema and Umpqua National Forests, as well as apply the scenic stability indicator of Appendix J to address the conditions and trends that may place the scenery attributes and the proposed and recommended restoration efforts at risk.

The proponent Aesthetics Management Plan proposes restoration efforts and some minimal mitigation measures that broadly address the effects to scenery. However, where the route is in areas where the Visual Quality Objective is partial retention or retention these measures will not meet these objectives within the target time frame. This analysis has examined these areas and the proposed mitigations within the proponents Aesthetics Management Plan and shows why the proponents AMP falls short of the Forest(s) objectives for visual resources.

This analysis looks at the proponents AMP, and then makes recommendations for mitigation measures recommended to improve the restoration and mitigation efforts and determines what VQO would be met.

The Pacific Connector Gas Pipeline route traverses National Forest lands in areas that have very rocky and porous soils. It is expected that restoration efforts related to revegetation may require lengthy periods of time to meet the visual quality objectives. This is particularly true on the eastern side of the Cascade Range where rainfall is significantly less, the temperatures are colder and the species selection for revegetation is more limited.

PCGP Aesthetics Management Plan
(Interpretations from the Proponents Plan to Mitigate Scenic Quality Effects)

Construction Effects
The construction of this gas pipeline will require a 95 to 75 foot construction zone. This construction zone will be clear cut and leveled from one side to the other for construction safety. At the edges of this construction zone, the uncleared storage areas will be used to store equipment during construction as well as excess boulders and root wads. Temporary extra work areas will also be cleared and leveled during the construction phase of this project beyond the construction zone. The clearing of the right-of-way will create a sharp edged linear feature across a contiguously forested landscape. The excavation will expose subgrade soils that will contrast with the color of the forest canopy. It is expected that the amount of boulders and root wads will be excessive in this landscape making it difficult to dispose of in a manner that will not affect scenery. Boulders scattered on top of the ground do not appear natural and root wads with cut stumps are very distracting if found in more than occasional amounts. The compaction of soils and loss of topsoil caused by construction equipment will affect the success of proposed revegetation.

Right-of-way Maintenance Effects
A thirty foot corridor centered directly above the pipeline shall be maintained for the fifty year life of the pipeline by removing trees greater than 15 feet and vegetation greater than 6 feet in height.
Depending on the methods of clearing, the effects could be similar to road brushing which uses a thrashing technique that leaves a rough brushed appearance immediately after clearing. The 30 foot corridor, once the construction zone is revegetated and allowed to rehabilitate; will appear as a linear feature that is incongruent with natural terrain or even typical corridors such as roads that gradually climb the side hill rather than rise directly up a slope.

The construction techniques proposed by the proponent in designated visually sensitive areas are as follows:

a. Strategically place construction debris (slash, boulders, stumps,

b. Shape and blend the right of way to the extent practicable to conform with preconstruction contours and the characteristic landscape
c. Rock and log barriers used to prevent passage of OHV's.
d. Utilize rock and boulder material generated during construction as trench backfill material where appropriate.
e. Unknown storage methods to ensure enhancement and mitigation of visual resources along the right of way to the extent they are practicable and safe.
f. Revegetate all disturbed areas and replant trees in temporary extra work areas (TEWAs) that were previously forested.
g. Plant a row or cluster of trees and/or shrubs across the right of way to provide visual screens at key road and trail crossings in sensitive viewsheds.

Specific Mitigation for Key Observation Points

Big Elk Road (MP 161.41)

a. "Neck-down" construction zone across road from 95' to 50'
b. Route shall cross directly perpendicular to the road
c. Revegetate with native trees, shrubs, and plants
d. Plant a row or cluster of trees and/or shrubs across the right of way to provide visual screens at key road and trail crossings in sensitive viewsheds.
e. Shorten the potential visual corridor by turning the corridor on both sides of the crossing
f. UCSA's eliminated within "necked-down" zones.

Pacific Crest Trail (PCT)

a. "Neck-down" construction zone from 95' to 75' across the trail
b. UCSA's eliminated within "necked-down" zones.
c. Shorten the potential visual corridor by turning the corridor on both ends of the crossing
d. Plant a row or cluster of trees and/or shrubs across the right of way to provide visual screens at trail crossing
e. Revegetate with native trees, shrubs, and plants

Dead Indian Memorial Road

a. "Neck-down" construction zone from 95' to 75' across the road
b. UCSA's eliminated within "necked-down" zones.
c. Shorten the potential visual corridor by turning the corridor on both ends of the crossing
d. Plant a row or cluster of trees and/or shrubs across the right of way to provide visual screens at road crossing
e. Revegetate with native trees, shrubs, and plants
f. Place barrier to discourage Off-highway vehicle use

Clover Creek Road

a. Relocate Block Valve 12
b. Regrade to approximate original contour

c. Reseed construction right-of-way (ROW) area
d. Scatter slash across the right of way
e. Replant with seedlings

Site Specific Analysis of Affects on Scenery Resources

Big Elk Road Crossing

Forest Plan Standards
VQO- Foreground Retention

Visibility
The pipeline crosses Big Elk Road (FS RD 37) in a west-east alignment which runs through a mixed conifer forest. The route would be viewed from a foreground distance; however, the duration of the view is very short for those traveling on the highway at an average speed of 50mph. The 50' construction swath perpendicular to the road will attract the eye because of the existing vegetation that creates a tunnel effect along the roadway. The visual effect of a cleared corridor will be similar to an intersecting road. The corridor will be the single deviation from the contiguous edge of the timber along the road.

Visual Absorption Capability
The heavy timber canopy is very contiguous, decreasing the visual absorption capability. The terrain is very flat in this area. The view of the ROW is limited by the width and depth to which the viewer can see down the ROW. The Visual absorption capability is not a factor in immediate foreground viewing situations.

Visual Effects
The immediate visual effects created by the ROW will be a strong linear feature with strong edges at each side. The color contrast of the exposed soils will be evident, and the scale of the opening will be uncharacteristic to the surrounding landscape. The berm, boulders, and root wads created to block OHV users from accessing the site will draw attention to the corridor as these negative elements detract from the natural appearing landscape.

Seasonal Changes
The ROW corridor will be most evident in the winter when the snow creates the strongest contrast to the coniferous forest. Spring, summer, and fall will be similar in effects other than the changing color of the seeded grasses and shrubs.

Expected Results of Proposed Mitigation
The immediate effects of the PCGP corridor to the visual resource are unacceptable modification. The 50' swath with the tall adjacent tree line edges will be uncharacteristic to the surrounding landscape. A small cluster of trees a height less than 40' in height will not screen the open swath created by the corridor. The logs and boulders proposed

to be strewn across the PCGP are unacceptable. Permanently placing root wads in the uncleared storage areas is an unacceptable practice in all areas that are visible, regardless of the sensitivity level. After the grasses and shrubs begin to grow, the soil color contrast will be reduced as the exposed soils are covered. Shrubs will add texture and color variation to the flat plane.

It is expected that creating openings in this area will create frost pockets and hamper revegetation efforts. Revegetation could take as long as 20-30 years if successful at all. This is seen in strip cut harvests in the area that have taken 30 years to revegetate. Once the PCGP corridor is revegetated the cleared width will be reduced to a minimum of 30 feet in width. The expected results of the proponents restoration efforts will eventually meet modification, but not within five years. It is expected that it could take 20 to 30 years to fully revegetate and at this time the project is expected to meet partial retention.

Forest Service Mitigation Measures

Potential/Recommended Forest Service Mitigation Measures

The following mitigation measures shall be done in the construction ROW and TEWAs from the edge of Big Elk Road to where the corridor makes the turn and is no longer visible from the Big Elk Road.

1.0 Soil Color Contrast Mitigation

1.1 Chip slash to: a. mulch ROW to manage slash production, b. reduce soil erosion, and, c. retain soil moisture to increase revegetation success.

1.2 Where using hydro-mulch to avoid erosion, use colorant (commercially available) dark brownish green to reduce color contrast.

2.0 Edge/Form Mitigation

2.1 Scallop edges by removing trees in areas designated by the forest service landscape architect in consultation with Pacific Connector's Environmental Inspector(s) to reduce the straight linear edge, and change shadow cast patterns.

2.2 Feather edges of ROW by cutting some tall trees (40'+) along the immediate edge, leaving trees of heights at 10-40' in height for a distance of 50-100'. Feathering shall be done in accordance to advisement of forest service landscape architect and in coordination with Pacific Connector's EI(s).

3.0 Revegetate for Reduction of Width and Improving Form

3.1 Transplant trees of 15' to 20' height into the ROW in clusters by using a tree spade to immediately reduce the sharp linear edge, and break up the wide barren swath. Transplant 15- 20 trees per 1/8th mile to blend the corridor into existing tree densities, in accordance to advisement of forest service landscape architect and in coordination with Pacific Connector's EI(s).

4.0 Treatment of TEWAS in highly visible areas

4.1 Transplant trees into the TEWAS in clusters by using a tree spade. Combine with partially buried (1/3-1/2 recess) boulders to create groupings for wildlife use and to appear more natural.

4.2 Treat compacted soils by sub soiling to aerate the soils where necessary as discussed in the ECRP, Section 10.

5.0 Root wad and Boulder Placement in Immediate Foreground

5.1 Every effort shall be made to bury all root wads and boulders within the ROW.

5.2 Root wads and boulders larger than one foot in diameter that are placed in the immediate foreground (300') shall be partially buried to approximately 1/3 the height of the boulder and 1/3 the height of the root wad. Cut faces should be directed away from the viewer platform, or concealed with soil or boulders. Root wads and boulders shall be placed in groupings of approximately 3 root wads and 2 boulders. There shall be no more than about one grouping per 1/8th mile within Retention areas or Class I areas. In partial retention areas/Class II areas there shall approximately 3 groupings per 1/8th mile. See Diagram C – Linear Guideline Template for typical construction. All mitigation measures shall be constructed under the on-site advisement of a scenery specialist in consultation with Pacific connector's EI(s) during the time of construction.

6.0 Treatment of Soil Compaction

6.1 Subsoiling and other soil compaction mitigations shall occur in areas determined necessary as per the ECRP Section 4.2.3 to reduce soil compaction and to improve success of revegetation efforts.

7.0 Planting Shrubs

7.1 Plant 1-2 gallon sized shrubs and protect with plant guards. This will reduce the soil contrast and the single plane of the open forest floor. Plant as designated on the site plan for the immediate foreground of the site.

8.0 Blocking from OHV use

8.1 Construct a berm with boulders to discourage access from OHV use.

9.0 Screening

9.1 Screen the corridor from the viewer by leaving specific trees near the roadway that can be worked around, and transplanting trees of 15-20ft height in groupings in the immediate foreground, as designated by the forest service landscape architect and in coordination with Pacific Connector's EI(s).

10.0 Plant deciduous trees and shrubs for fall color.

10.1 Plant willow, ceonothus, ribes, huckleberry, chinquapin as designated by the site plan.

11.0 Plant deciduous trees and shrubs for fall color.
11.1 Plant willow, ceonothus, ribes, huckleberry, chinquapin as specified in the ECRP.

Site Specific Design Mitigations

See section with diagrams.

Expected Results of Recommended Mitigation
The expected result of the recommended mitigations is that the visual quality level may be partial retention in 10 years if revegetation efforts and mitigations are successful. The Scenery Management System does not specify a timeframe for meeting Retention or High Scenic Integrity, however the Visual Management System requires that Retention VQO be met during or immediately after project completion.

Dead Indian Memorial Road Crossing

Forest Plan Standards
VQO- Foreground Retention

Visibility
The pipeline crosses Dead Indian Memorial Road (FS RD 37) in a west-east alignment which runs through a lodge pole ecotone vegetation type. The route would be viewed from a foreground distance; however, the duration of the view is very short. The broad 75' construction swath will attract the eye because the existing vegetation that creates a tunnel effect along the roadway. The northwest pipeline alignment bends approximately 600' from the edge of the road reducing the sight line distance down the corridor.

Visual Absorption Capability
The heavy timber canopy is very contiguous, decreasing the visual absorption capability. The terrain is very flat in this area. The view of the ROW is limited by the width and depth to which the viewer can see down the ROW.

Visual Effects
The immediate visual effects created by the ROW will be a strong linear feature with strong edges at each side. The color contrast of the exposed soils will be evident, and the scale of the opening will be uncharacteristic in the surrounding landscape. The proposed berm, boulders, and root wads created to block OHV users from accessing the site will draw attention to the corridor as these negative elements detract from the natural appearing landscape. This crossing will also likely create a 'daylight' cut into the cut bank along the edge of the road. This cut will also attract the eye to the corridor.

Seasonal Changes
The ROW corridor will be most evident in the winter when the snow creates the strongest contrast to the coniferous forest. Spring, summer, and fall will be similar in effects other than the changing color of the seeded grasses and shrubs.

Expected Results of Proposed Mitigation
The immediate effects of the ROW corridor are unacceptable modification. The 75' swath with the tall adjacent tree line edges will be uncharacteristic to the surrounding landscape. The proposed logs and boulders strewn across the ROW are unacceptable. Permanently placing root wads in the uncleared storage areas is an unacceptable practice in all areas that are visible. After the grasses and shrubs begin to grow, the soil color contrast will be reduced as the exposed soils are covered.

It is expected that creating openings in this area will create frost pockets and hamper revegetation efforts. Revegetation could take as long as 20-30 years if successful at all. This is seen in strip cut harvests in the area that have taken 30 years to revegetate. Once this occurs the cleared ROW will be reduced to a minimum of 30 feet width. These practices will eventually meet modification, but not within five years.

The Winema National Forest Visual Quality Objective in this area is foreground retention. This proposal does not meet this objective, and is never expected to meet it, although there will be a filling in of vegetation and softening of appearance overtime.

Forest Service Mitigation Measures

Recommended Forest Service Mitigation Measures
The following mitigation measures shall be done in the construction ROW and TEWA(s) from the edge of Dead Indian Memorial Road to 600 feet beyond the immediate foreground.

1.0 Soil Color Contrast Mitigation
1.1 Chip slash to mulch ROW to: a. manage slash production, b. reduce soil erosion, and, c. retain soil moisture to increase revegetation success.

1.2 Where using hydro-mulch to avoid erosion, use colorant (commercially available) dark brownish green to reduce color contrast.

2.0 Edge/Form Mitigation
2.1 Scallop edges by removing trees in designated areas to reduce the straight linear edge, and change shadow cast patterns.

2.2 Feather edges of ROW by cutting tall trees (40'+) along the immediate edge, leaving trees of heights at 10-40' in height for a distance of 50-100'. Feathering shall be done in accordance to advisement of forest service (FS) landscape architect and in coordination with Pacific Connector's EI(s).

3.0 Revegetation for Reduction of width and improving form

3.1 Transplant trees into the ROW in clusters by using a tree spade to immediately reduce the sharp linear edge, and break up the wide barren swath.

4.0 Treatment of TEWAS in Scenic Areas

4.1 Transplant trees that are root pruned a year in advance, into the TEWAS in clusters by using a tree spade. Combine with boulders to create groupings for wildlife use and to appear more natural.

5.0 Root wad and Boulder Placement in Immediate Foreground

5.1 Every effort shall be made to bury all root wads and boulders within the ROW.

5.2 Root wads and boulders placed in the immediate foreground (300') should be partially buried to approximately 1/3 the height of the boulder and 1/3 the height of the root wad. Cut faces should be directed away from the viewer platform, or concealed by boulders or berms. Root wads and boulders shall be placed in groupings of approximately 3 root wads and 2 boulders. There shall be about one grouping per 1/8th mile within Retention areas or Class I areas. In partial retention areas/Class II areas there shall be approximately 3 groupings per 1/8th mile. See Diagram C – Linear Guideline Template for typical construction. All mitigation measures shall be constructed under the on-site advisement of a scenery specialist and in coordination with Pacific Connector's EI(s) during the time of construction.

6.0 Treatment of Soil Compaction

6.1 Subsoiling and other soil compaction mitigations shall occur in areas determined necessary as per the ECRP Section 4.2.3 to reduce soil compaction and to improve success of revegetation efforts.

7.0 Planting Shrubs

7.1 Plant 1-2 gallon size shrubs and protect with plant guards, in order to decrease the amount of time needed to address soil contrast and the single plane of the open forest floor. Plant as directed by the FS Landscape Architect and in coordination with Pacific Connector's EI(s).

8.0 Blocking from OHV use

8.1 Construct a berm with partially recessed boulders to discourage the access from OHV use. Construct as designated by the FS Landscape Architect and in coordination with Pacific Connector's EI(s).

9.0 Screening

9.1 Screen the corridor from the viewer by leaving specific trees near the roadway that can be worked around, and transplanting trees of 15-20ft height in groupings in the immediate foreground, as designated by the FS Landscape Architect.

10.0 Plant deciduous trees and shrubs for fall color.
10.1 Plant willow, ceonothus, ribes, huckleberry, chinquapin as designated in the ECRP.

11.0 Reconstruct the cut bank
11.1 Recontour the cut bank to discourage OHV access, and to reduce the distractive effect of to the edge of the roadway as advised by FS Landscape Architect and in coordination with Pacific Connector's EI(s).

12.0 Scenic Stability
12.1 Develop a mitigation fund for National Forest project work related to design, NEPA, and implementation of thinning and a fuel break along the highway. This project would thin trees in a variable transition zone 50 to 500 feet in width along the highway, to reduce tree density, fuel loadings, and percent of canopy closure appropriate to the species. This project would open up the stands and reduce the risk of losing existing scenic attributes, and recommended mitigation efforts in the event of a large stand replacement fire.

Expected Results of Mitigation to Meet Partial Retention VQO
The expected result of the recommended mitigations is that the visual quality level may be Partial Retention in 10 years if revegetation and mitigations are successful. The Scenery Management System does not specify a timeframe for meeting Retention or High Scenic Integrity, however the Visual Management System requires that Retention VQO be met during or immediately after project completion.

Mitigations to Meet Retention VQO

The forest plan standard for this area is Foreground Retention.
This means that impacts are not visually evident from a foreground view.

The pipeline would have continued effects of a 30' overstory strip opening, meaning that for a distance of 600ft in one direction and 600ft in the other there will be an open sky strip. This is due to the removal of trees over 15ft and shrubs over 6ft. Because this strip is retained throughout the existence of the pipeline in this location, retention would not ever be met; given the recommended mitigation measures within and along the edge of the ROW.

Granted this strip would be seen from a moving car only for a short period of time, but the Visual Management system does not address duration of the view of an impact, other than to consider duration in the scenic class inventory. Due to the sensitivity level of this road, along with the scenic attractiveness and viewed distance, this area was assigned a Retention VQO in the Forest Plan standards and guidelines.

The recommended visual mitigation calls for softening the strip effect by scalloping and feathering the edges (2.1 and 2.2). This would soften the effect but would not make the strip "not visually evident".

In order to meet retention, the strip effect must be addressed. Address meaning make it "not visually evident". To do this the surrounding timbered area would need to be sufficiently "opened up" to allow the open sky to be visible to the viewer traveling along this route, so that when the viewer drives by the crossing the open sky is not differing from the visual experience provided on either side of the crossing. So, this would be a designed project that would create a gradual thinning that increased the open sky view as the viewer approached the crossing point until the opening sky view was no longer a strip within a contiguous forest, but just an open sky view afforded to the viewer that does not appear unnatural in form, line, color, and texture. This is a project that could occur beyond the ROW, probably a ¼ to ½ mile each direction of the crossing point, and for a 600ft on both sides of the road. This kind of project could mimic a natural occurrence such as an insect and disease opening that often occurs in this lodge pole vegetation type. (Please validate with a silviculturist, ecologist, or entomologist) Over time this type of thinning would have to be maintained or the contiguous forest would "come back", and the strip over the pipeline would once again become visually evident. This type of treatment could also be considered in the form of a fuel break, which would be considered, within SMS appendix J an action that could improve scenic stability by reducing the potential breadth of a stand replacement fire to a scale that is within the natural range of variability.

If this type of approach was included in the chosen alternative, then retention could be met as soon as soil color contrast mitigation was successful, and transplanted trees within the 75' corridor reached 20ft in height. The transplanted tree density would need to mimic the modified basal area of the surrounding area to blend the corridor into the landscape. Retention would not be met immediately nor within a year or one growing season, but it could eventually be met.

Pacific Crest Trail Crossing

Forest Plan Standards
VQO- Foreground Partial Retention

Visibility

The PCGP ROW crosses the Pacific Crest Trail within late successional reserve timber, where large trees are the prominent visual element. The perpendicular crossing will create a 75' clearing across the trail which is currently an 8-10' corridor. The ROW clearing is excessively out of scale in this landscape, especially when experienced on foot. The clearing will extend for approximately .8 miles in both directions.

Visual Absorption Capability
There is no absorption capability that will lessen the visibility of this proposed right of way and its effects.

Visual Effects
The immediate visual effects include soil color contrast to existing adjacent vegetation, excessive vegetative clearing uncharacteristic in width and breadth, hard, linear edges, proposed distribution of extensive root wads, and boulders in the uncleared storage areas.
The planned logs and boulders strewn across the ROW will be very unnatural appearing even when the grasses and shrubs grow up. As trees grow to a height of 20 feet, the edges will begin to soften as tree boughs will begin to blend with adjacent trees, and the width of the vegetatively cleared ROW will eventually be reduced to 30 feet.

Seasonal Changes
The ROW corridor will be most evident in the winter when the snow creates the strongest contrast to the coniferous forest. Spring, summer, and fall will be similar in effects other than the changing color of the seeded grasses and shrubs.

Expected Results of Proposed Mitigation Measures
The immediate effects of the cleared ROW corridor are unacceptable modification.

It is expected that the soil color contrast, the broad opening, and the strewn logs and boulders in addition to the root wads and boulders stored in the uncleared storage areas will create an excessive amount of visual disturbance. The effects proposed activity are visually unrelated to those in this characteristic landscape. Seeding and transplanting will not be successful in blending the proposed changes within the foreground view with the existing landscape until the ground vegetation is restored; the hard linear edges of the clearing are softened. It is expected that the proposed mitigation measures will not be successful in achieving modification for the first five years. Opening the forest canopy up like this may create a frost pocket that will be difficult to revegetate in a timely manner.

Proposed/Recommended forest Service Mitigation Measures
The following mitigation measures shall be done in the construction ROW and TEWA(s) from the edge of the PCT to where the corridor makes the turn and is no longer visible from the PCT.

1.0 Soil Color Contrast Mitigation
1.1 Chip slash to mulch the cleared ROW to: a. manage slash production, b. reduce soil erosion, and c. retain soil moisture to increase revegetation success.

1.2 Where using hydro-mulch to avoid erosion, use colorant (commercially available) dark brownish green to reduce color contrast.

2.0 Edge/Form Mitigation
2.1 Scallop edges by removing trees in designated uncleared storage areas to reduce the straight linear edge, and change shadow cast patterns.

2.2 Feather edges of ROW by cutting tall trees (40'+) along the immediate edge, leaving trees of heights at 10-40' in height for a distance of 50-100' to graduate the edge from mid-sized to full height. Feathering shall be done in accordance to advisement of forest service landscape architect and in coordination with Pacific Connector's EI(s).

3.0 Revegetate for Reduction of width and improving form

3.1 Transplant trees of 15' to 20' height into the ROW in clusters by using a tree spade to immediately reduce the sharp linear edge, and break up the wide barren swath. Root prune selected native vegetation a year in advance of transplant to increase success rate.

4.0 Treatment of TEWAS in highly visible areas

4.1 Transplant trees into the TEWAS in clusters by using a tree spade. Combine with groupings of boulders to create clumps for wildlife use and to appear more natural. Treat compacted soils by sub soiling to aerate the soils.

5.0 Root wad and Boulder Placement in Immediate Foreground

5.1 Every effort shall be made to bury all root wads and boulders within the pipeline ROW.

5.2 Root wads and boulders placed in the immediate foreground (300') should be partially buried to approximately 1/3 the height of the boulder and 1/3 the height of the root wad. Cut faces should be directed away from the viewer and cut ends concealed with soil and boulder placement. Root wads and boulders shall be placed in groupings of approximately 2 root wads and 3 boulders. There shall be about one grouping per 1/8th mile within Retention areas or Class I areas. In partial retention areas/Class II areas there shall be approximately 3 groupings per 1/8th mile. See Diagram C – Linear Guideline Template for typical construction. All mitigation measures shall be constructed under the on-site advisement of a scenery specialist during the time of construction.

6.0 Treatment of Soil Compaction

6.1 Subsoiling and other soil compaction mitigations shall occur in areas determined necessary as per the ECRP Section 4.2.3 to reduce soil compaction and to improve success of revegetation efforts.

10.0 Planting Shrubs

10.1 Plant 1-2 gallon size shrubs and protect with plant guards to decrease the amount of time needed to address soil color contrast and the single plane of the open forest floor. Plant as designated on the site plan for the immediate foreground of the site.

Site Specific Designed Mitigation

Diagrams in a following section.

Expected Results of Recommended Mitigation

The expected result of the recommended mitigations is that the visual quality level would be Modification within 15-20 years. The hikers along this trail are very observant and the speed at which they travel will allow them ample to time to view the ROW, so it is expected that they will notice more of the effects of the corridor, but the edges will soften by vegetative growth.

The Scenery Management System does not specify a timeframe for meeting Retention or High Scenic Integrity, however the Visual Management System requires that Retention VQO be met during or immediately after project completion. This will not be the case with the proposed action.

Clover Creek Road

Forest Plan Standards
VQO- Foreground Partial Retention

Visibility
The PCGP ROW is located directly adjacent to the Clover Creek Road for over 16.9 miles. Approximately 4.6 miles of these are federal lands (i.e., 3.6 miles of FS lands and 1.0 miles of BLM lands). The adjacent alignment will increase the apparent roadway corridor width from 54' to 149', almost tripling the existing width. This 95' additional width for the ROW is fully visible in an immediate foreground view. The cumulative effect of the project area across all jurisdictions will dominate the view for the entire 16.9 miles.

Visual Absorption Capability
There is no absorption capability that will lessen the visibility of this proposed right of way and its effects.

Visual Effects
The immediate visual effects include soil color contrast to existing adjacent vegetation, grossly uncharacteristic scaled opening in width and breadth; hard, linear edge, extensive number root wads, and boulders strewn in the uncleared storage areas.

The logs and boulders strewn across the ROW are unacceptable on federal lands. Permanently placing root wads in the uncleared storage on federal lands areas is an unacceptable practice in all areas that are visible. (Pg. 39, National Forest Landscape Management, Vol. 2.) After the grasses and shrubs beginning to grow the soil color contrast will be reduced as the exposed soils are covered. Shrubs will add texture and color variation to the flat plane. As trees grow to a height of 20 feet, the ROW edges will be softened, and the width of the ROW will eventually be reduced to 30 feet. Where adjacent to the 54' roadway, the full opening will be 84'.

Seasonal Changes
The ROW corridor will be most evident in the winter when the snow creates the strongest contrast to the coniferous forest. Spring, summer, and fall will be similar in effects other than the changing color of the seeded grasses and shrubs. Seasonal changes will not make enough difference to note in the foreground, because the scale of the opening and the adjacency to the road makes the effects undifferentiated by seasonal change.

Expected Results of Proposed Mitigation Measures
The immediate effects of the ROW corridor are unacceptable modification. The 95' swath with the tall adjacent tree line edges will be uncharacteristic to the surrounding landscape. The extensive number of logs and boulders strewn across the ROW is unacceptable. Permanently placing root wads in the uncleared storage areas is an unacceptable practice in all areas that are visible. After the grasses and shrubs beginning to grow the soil color contrast will be reduced as the exposed soils are covered. Revegetation could take as long as 20-30 years. Once this occurs the cleared ROW will be reduced to a minimum of 30 feet width. These practices will result in unacceptable modification.

Recommended Mitigation Measures to be implemented on Forest Service and BLM Lands
The extensive project activities within immediate foreground of this road require site specific designed mitigation. See the Clover Creek mitigation measures by zone, and the template diagrams. Pacific Connector has also committed to applying the appropriate visual mitigation measures outlined in this Section to the BLM lands (Visual Resource Class II), that are crossed by the Project between about MP 123.3 to 124.2 east of the Trail Post Office and Highway 62 in Jackson County.

1.0 Soil Color Contrast Mitigation
1.1 Chip slash to mulch cleared ROW to: a. manage slash production, b. reduce soil erosion, and c. retain soil moisture to increase revegetation success.

1.2 Where using hydro-mulch to avoid erosion, use colorant (commercially available) dark brownish green to reduce color contrast.

2.0 Edge/Form Mitigation
2.1 Scallop edges by removing trees in designated areas to reduce the straight linear edge, and change shadow cast patterns.

2.2 Feather edges of ROW by cutting tall trees (40'+) along the immediate edge, leaving trees of heights at 10-40' in height for a distance of 50-100'. Feathering shall be done in accordance to advisement of forest service landscape architect and in coordination with Pacific Connector's EI(s).

3.0 Revegetate for Reduction of Width and Improving Form

3.1 Transplant trees into the cleared ROW in clusters by using a tree spade to immediately reduce the sharp linear edge, and break up the wide barren swath.

4.0 Treatment of TEWA(s) in highly visible areas

4.1 Transplant trees into the TEWA(s) in clusters by using a tree spade. Combine with groupings of recessed boulders to create clumps for wildlife use and to appear more natural.

5.0 Root wad and Boulder Placement in Immediate Foreground

5.1 Every effort shall be made to bury all root wads and boulders within Row clearing.

5.2 Root wads and boulders placed in the immediate foreground (300') should be partially buried to approximately1/3 the height of the boulder and 1/3 the height of the root wad. Cut faces should be directed away from the viewer and cut ends concealed with soil and or boulders. Root wads and boulders shall be placed in groupings of approximately 3 root wads and 2 boulders. There shall be about one grouping per 1/8th mile within Retention areas or Class I areas. In partial retention areas/Class II areas there shall be approximately 3 groupings per 1/8th mile. See Diagram C – Linear Guideline Template for typical construction. All mitigation measures shall be constructed under the on-site advisement of a scenery specialist and in coordination with Pacific Connector's EI(s) during the time of construction.

6.0 Treatment of Soil Compaction

6.1 Subsoiling and other soil compaction mitigations shall occur in areas determined necessary as per the ECRP Section 4.2.3 to reduce soil compaction and to improve success of revegetation efforts.

7.0 Planting Shrubs

7.1 Plant 1-2 gallon size shrubs and protect with plant guards to decrease the amount of time needed to address soil contrast and the single plane of the open forest floor. Plant as designated by the FS Landscape Architect and in coordination with Pacific Connector's EI(s).

8.0 Screening

8.1 Screen the corridor from the view by leaving specific trees near the roadway that can be worked around. Transplant trees 15-20ft in height. Construct groupings in the immediate foreground, as designated by the FS Landscape Architect.

11.0 Plant deciduous trees and shrubs for fall color.

11.1 Plant willow, ceonothus, ribes, huckleberry, chinquapin as designated by the ECRP.

Specific Site Designed Mitigations by Zone and Topography

These zones are shown on the template diagrams.

Zone A – Uncleared Storage Areas

This zone is an area that is not cleared for construction but used for storage of equipment, construction materials and root wads and boulders. This zone is near the edge of the construction corridor where vegetation remains, and where thick forest creates a strong edge or wall. This edge needs to be "feathered" by thinning the trees, leaving larger, fire resistant species. After construction this zone shall only be used for storing root wads and boulders in areas that are not visible from the road. The root wad and boulder storage should be fully screened by existing topography, or transplanted vegetation. Root wads and boulders can be buried under earthen berms that are designed as gentle rises in scale with other topographic variation in the area to blend with the existing natural environment. All berms shall be seeded/hydro mulched with native seed mix, mulched with chips generated from on-site slash and fertilized to promote rapid revegetation. Transplanted trees and shrubs planted to screen storage areas shall be an average height of 15-20 feet in height. See transplanted berm diagram.

Zone B – Offside Topsoil and Subsoil Storage Area
This zone is an area across the pipeline trench that is utilized during construction to store topsoil and excavated soils from the pipeline trench. After construction this area shall be seeded/hydro mulched with native seed mix, mulched with chips generated from on-site slash and fertilized to promote rapid revegetation. This zone shall have a minimum of 10 -15 transplanted trees depending on the density of trees in Zone A to immediately soften the edge of the clearing, and/or screen boulders and root wads. This zone may be used for burying boulders and root wads. See transplanted berm diagram.

Zone C – 30' Corridor Directly above Pipeline
This zone is centered directly over the pipeline, and will remain open via clearing of trees greater than 15' in height, and shrubs greater than 6' in height. Within this 30' span root wads and boulders can be buried. After construction this area shall be seeded/hydro mulch with native seed mix, mulched with chips generated from on site slash and fertilized to promote rapid revegetation. Boulder and root wad groupings may be designed into this corridor. See Boulder and Root wad Grouping Diagram. A maximum of about three groupings per quarter mile shall be placed within the entire block of zones. Groupings can be used to break up the open plan of the 30' corridor.

Zone D – Working Zone
This zone is between the existing road and the pipeline trench. During construction this area will receive the greatest level of equipment and truck traffic; therefore, soil compaction will be highest in this area. This area shall be wing subsoil treated to restore the soil aeration and improve the success of the restoration efforts. After construction this area shall be seeded/hydro mulched with native seed mix, mulched with chips generated from on site slash and fertilized to promote rapid revegetation. Boulder and root wad groupings may be designed into this zone. Berms shall be designed to break up the flat plane of the construction working surface, and to bury boulders and root wads. Logs and slash shall be placed behind berm

Zone E – The Road Side Edge
The road side edge is the zone that is between the construction zone, and the edge of the existing road. This zone is the equivalent of an uncleared storage area in other areas, but adjacent to the Clover Creek Road, this area shall vary in width, usage and treatment depending on the existing topography and vegetation.

Where this zone is level, or within 5-10 feet of the roadway elevation, a minimum of 25% of the existing shrubs and trees shall be retained in clumps to provide diverse form, color and texture to the roadside edge. All areas that are impacted by construction shall be seeded/hydro mulched with native seed mix, mulched with chips generated from on site slash and fertilized to promote rapid revegetation. There shall be no root wads, boulders or logs or slash placed in this zone.

Where this zone is sloping downward and away from the road at 30% or greater, vegetation high enough to screen the 30' corridor opening shall be retained. Root wads and boulders can be stored at the base of the slope meets the graded construction zone surface, where retained vegetation provides screening.
Where this zone is sloping upward, and away from the road at 30% or greater, retained vegetation will provide diversity in form, color and texture. It is expected that where the road route is adjacent to a cut bank along the road that is greater than 10' in height, the PCGP ROW will be pulled back away from the cut bank by 20-30 feet. All areas that are impacted by construction shall be seeded/hydro mulched with native seed mix, mulched with chips generated from on site slash and fertilized to promote rapid revegetation. There shall be no root wads, boulders or logs or slash placed in this zone.

Template Diagrams
The following template diagrams specify mitigation measures to be used based on the topography. The diagrams are to be used in conjunction with the linear guidelines. The diagrams are typical templates to be used under the advisement of the FS Landscape Architect and in coordination with Pacific Connector's EI(s) that is available on site at the time of construction.

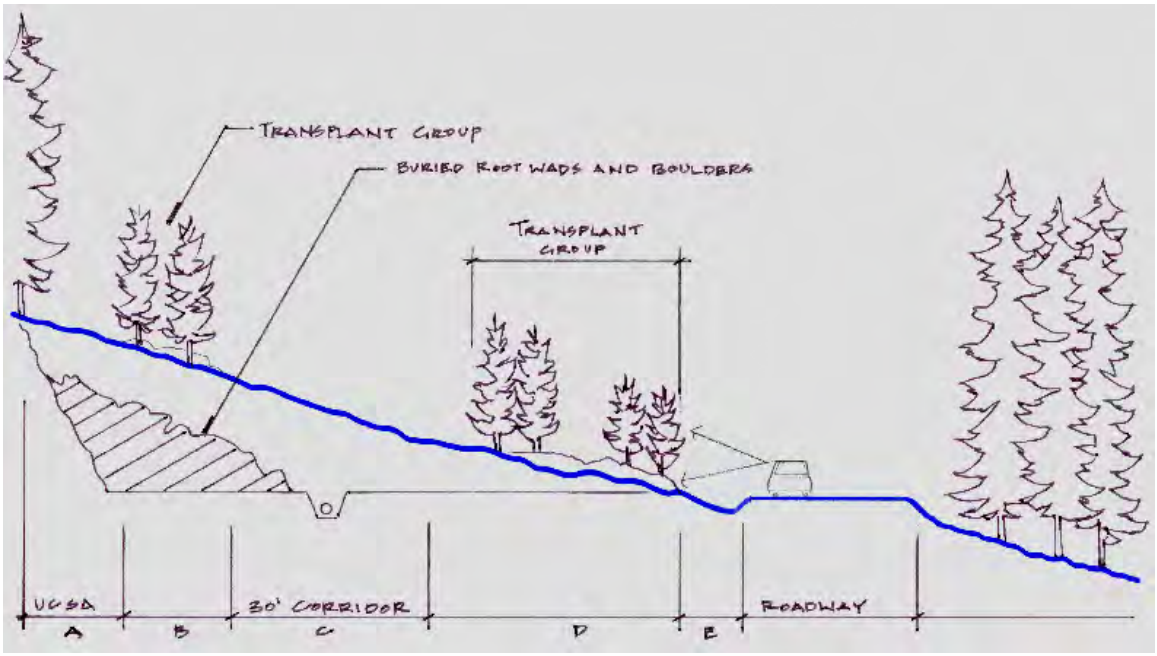


Diagram A –PCGP Above the Roadway
Bury root wads and boulders under the soil used to recontour the excavation zone. Construct transplant groupings as shown in the linear guideline diagram.

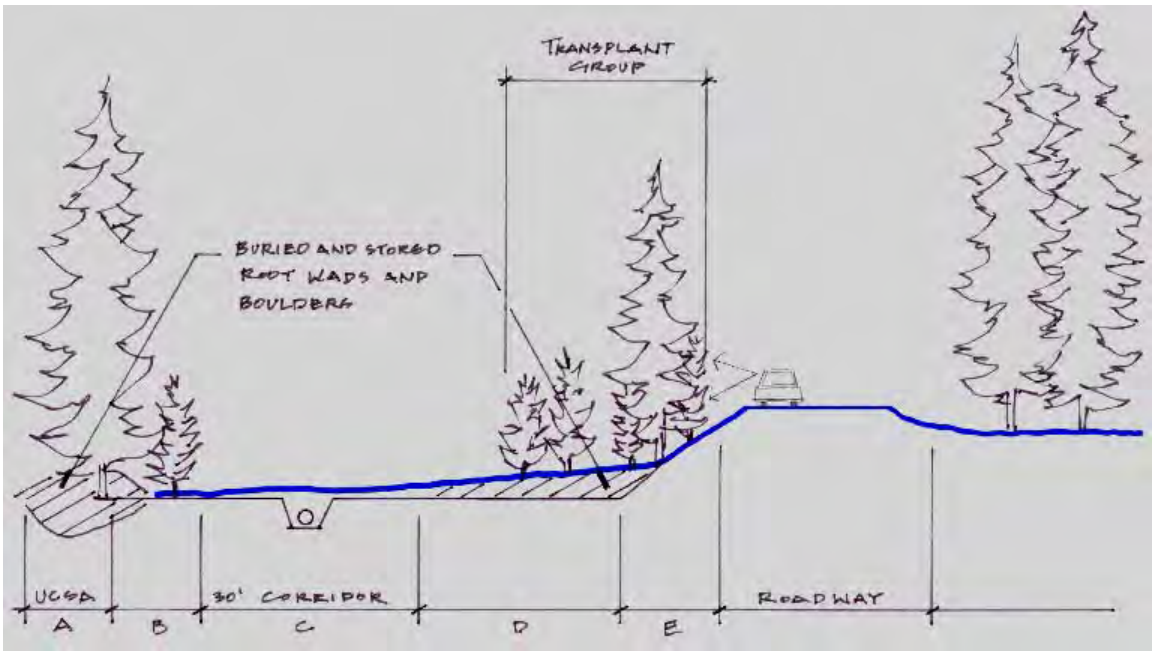


Diagram B –PCGP is below the roadway

Bury and store root wads and boulders on federal lands where screened from the view of the viewer on the Clover Creek Road. On federal lands transplant trees and shrubs in groupings to create diverse spatial patterns, and to break up the strong linear form of the retained vegetation. Retain vegetation on the bank of the roadway.

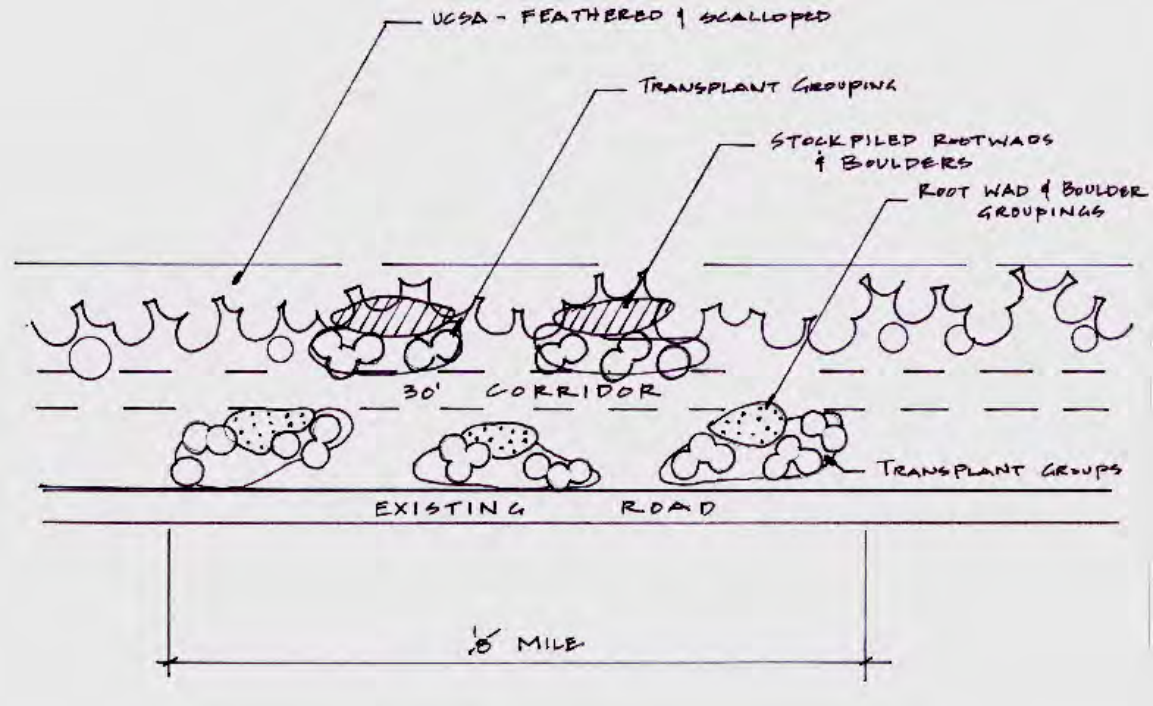


Diagram C – Linear Guideline Template for 1/8th Mile

On federal lands construct root wad and boulder groupings behind transplant groups. Feather and scallop the uncleared storage areas, and stockpile root wads and boulders behind transplant groupings. Limit root wad and boulder groupings to approximately 3 per 1/8th mile.

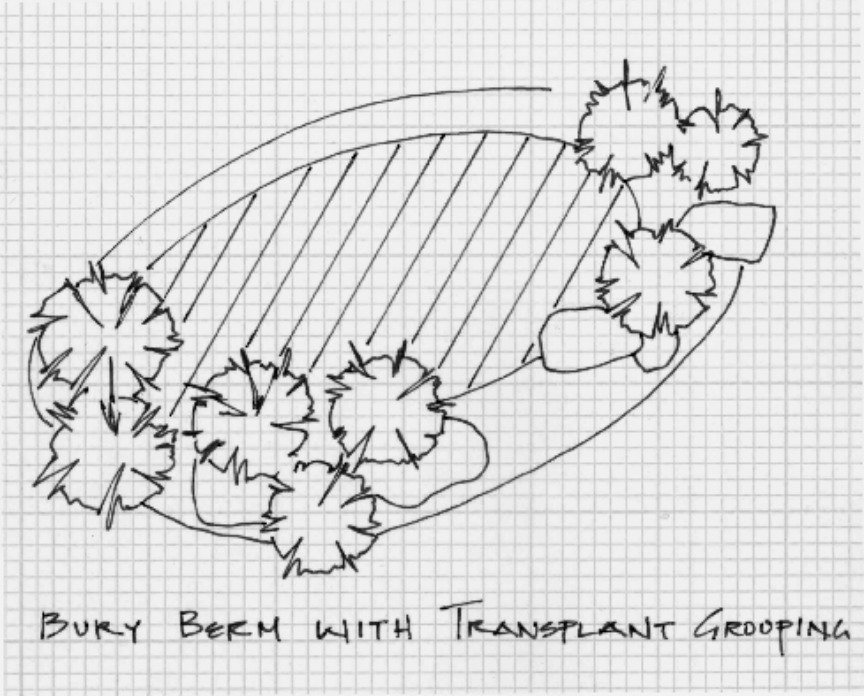


Diagram D – Bury Berm with Transplant Grouping

Bury root wads and boulders and construct a berm with retained topsoil on federal lands. Plant the edges of the berm with transplanted trees, and place recessed boulders in the designed grouping.

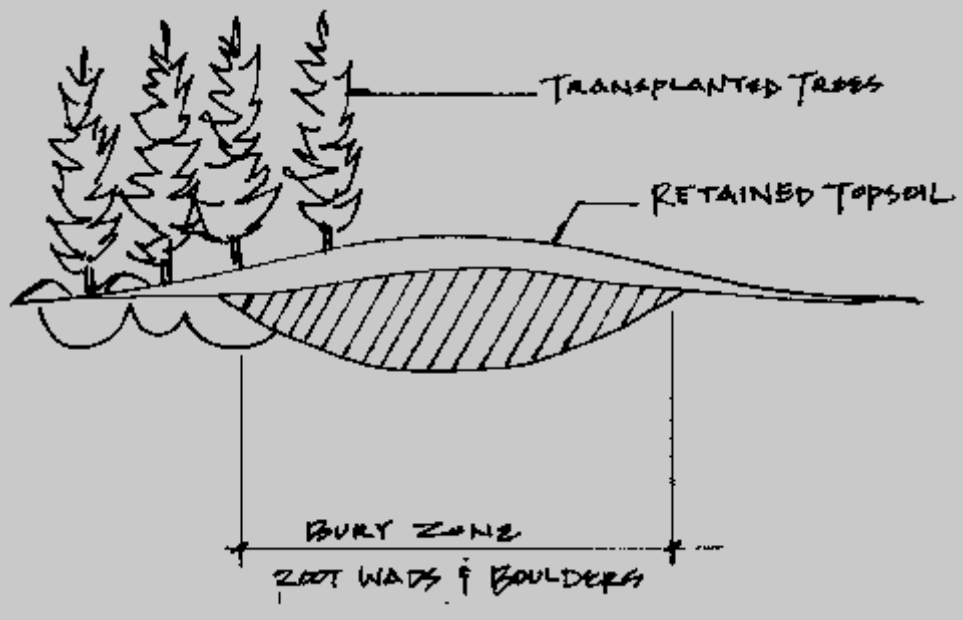


Diagram E – Bury Berm with Transplant Grouping
Plant at edges of bury zone.

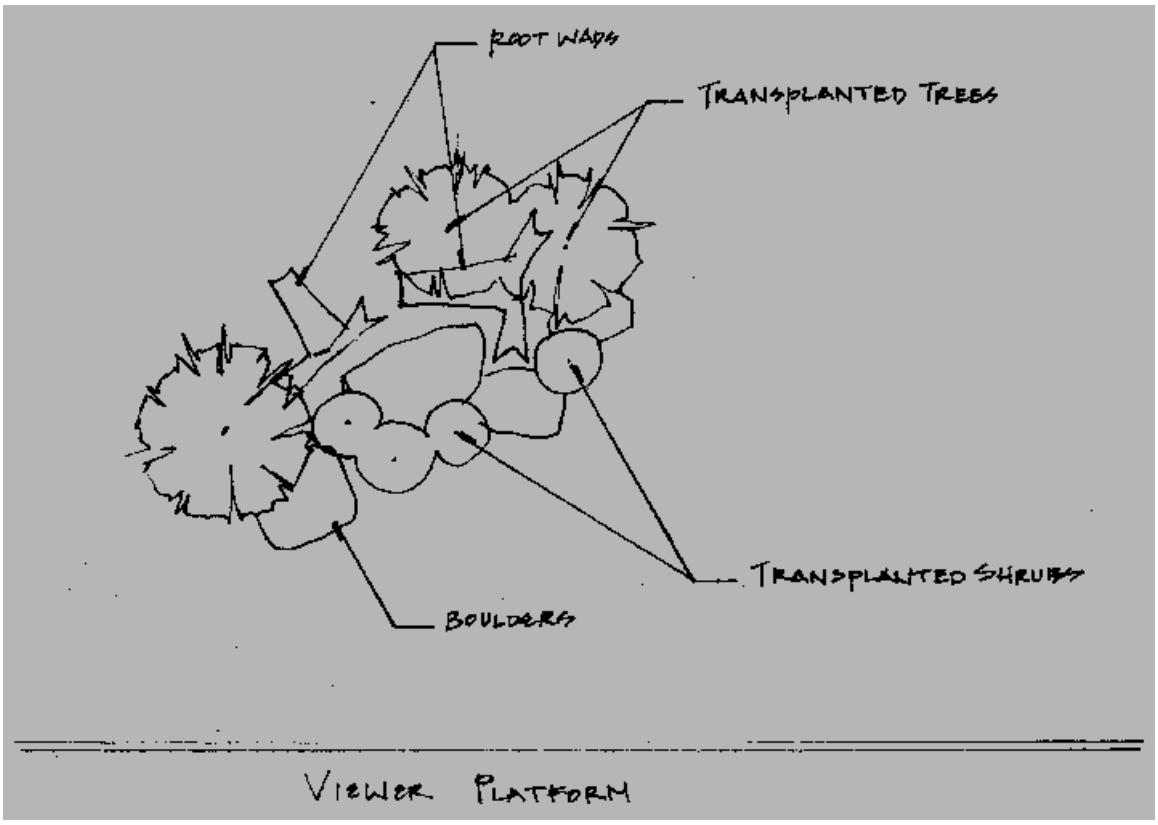


Diagram F – Root Wad and Boulder/Transplant Grouping
Construct groupings to vegetate the cleared ROW.

Expected Results of Mitigation to Meet Modification VQO
The expected results are based on the above mitigations and the specific site designed mitigation by zone and topography.

The immediate foreground of the Clover Creek Road, being heavily modified by pipeline construction would undergo extensive mitigation and over a long period of time will meet modification. Treating the soils by sub soiling, chip and hydro mulching, seeding and planting shrubs and grasses will address the impacts to the forest floor. Screening and burying boulders and root wads, designed berms and transplanted tree groupings will rebuild the foreground view, although the linear 30 foot ROW will always be evident.

It is expected that it will take approximately 10 to 15 years for this to be accomplished. Under the Scenery Management System this is an acceptable time frame, however under the Visual Management System, Partial Retention must be met within the second to third year after completion of the project.

Mitigation to Meet Partial Retention VQO

The forest plan standard for this area is foreground partial retention.
This means that impacts “remain visually subordinate to the characteristic landscape”.

The continued removal of trees over 15ft and shrubs over 6ft within the immediate foreground of the Clover Creek Rd for the extended length of approximately 16.9 miles (4.6 miles being federal lands) would keep a 30ft corridor clear of vegetation less than 15ft in height. This is considered a linear corridor that is inconsistent with the characteristic landscape surrounding the project area. Because this strip is retained throughout the existence of the pipeline in this location, partial retention would not ever be met given the recommended mitigation measures within and along the edge of the ROW.

In order to meet partial retention, the corridor effect must be addressed. Address meaning make the corridor effect “visually subordinate”. To do this the surrounding timbered area would need to be sufficiently “opened up” to a degree that the corridor no longer appears as a contiguous linear feature, but is more like openings that are consistent with those in the surrounding characteristic landscape. This means consistent in “size, amount, intensity, direction, pattern, etc.” Any introduced form, line, color, or texture that is introduced should remain subordinate to the visual strength of the characteristic landscape.”

To do this the surrounding timbered area would need to be sufficiently “opened up” to create a pattern that is both characteristic of natural occurrences, and would blend the 30ft corridor into the modified surrounding landscape. Within the ponderosa pine type vegetation, this could be possible by designing a project that would create open stands of varying sized openings and clusters of trees. This project design would mimic a ponderosa pine stand that has frequent fire occurrences that create an “open park-like stand”, where small shrubs and grasses occur on the forest floor. This type of project is consistent with SMS in that it addresses scenic stability issues making the pine stands more resistant to large stand replacement fire. Combined with the all of the recommended mitigation measures of transplanting within the construction zone (B,C,D) and leaving trees in zone E, this approach would screen parts of the contiguous 30ft opening from the viewer while blending the opening into the newly opened up timbered area, making the impacts visually subordinate to the characteristic landscape.

If this type of approach was included in the chosen alternative, then partial retention could be met as soon as soil color contrast mitigation was successful, and transplanted trees within the 75’ corridor reached 20ft in height. The transplanted tree density would need to mimic the modified basal area of the surrounding area to blend the corridor into the landscape. Partial retention would not be met within the first year, but could eventually be met.

These types of approaches were not addressed in the initial analysis, because it was considered beyond the limits of the project boundary. Whether that was an appropriate reason may be questionable but none the less it is why it was not included.

To be sure of achieving the required VQO, it is important to include measures such as:

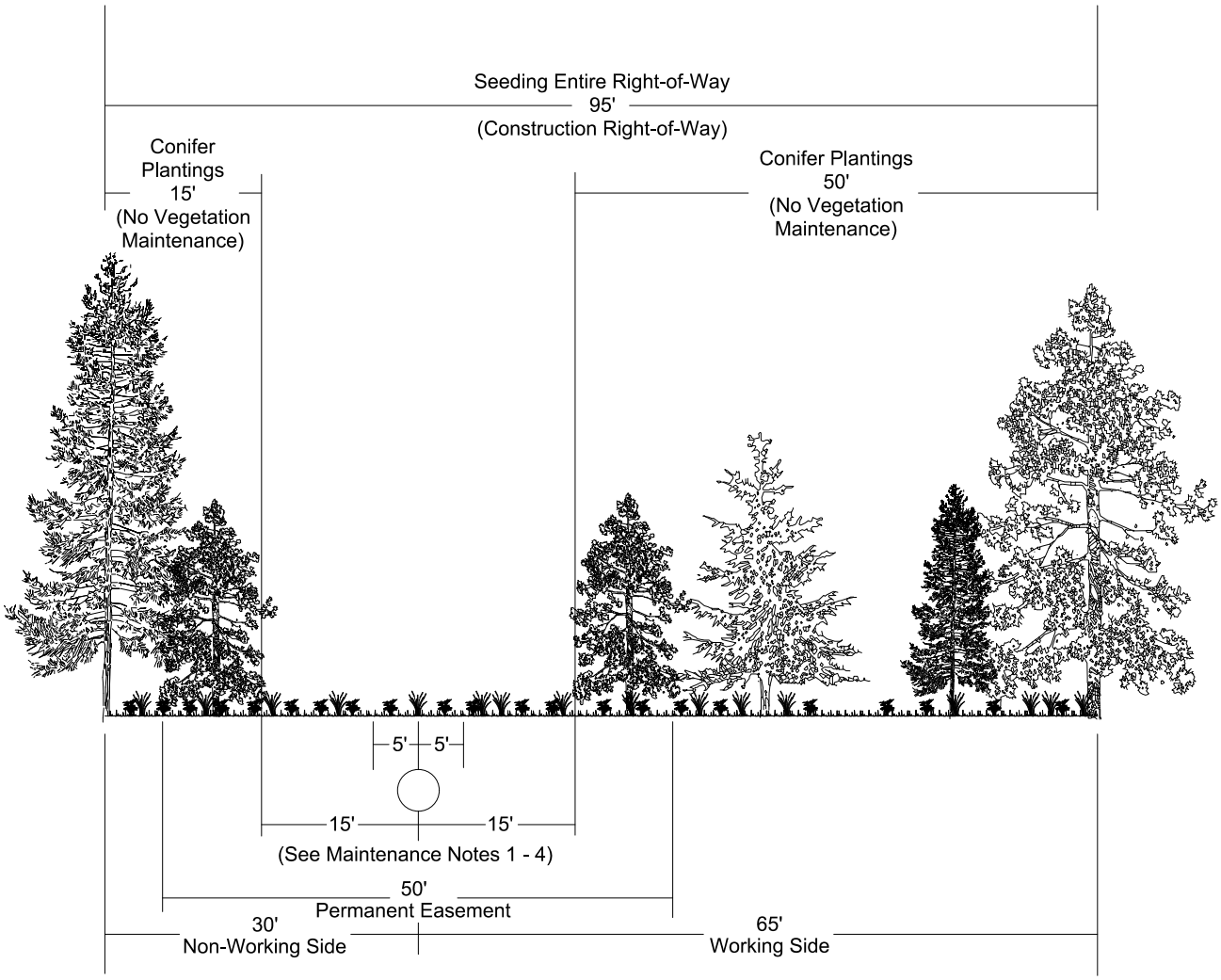
- Replacement of trees that do not survive transplant
- Replacement of browsed shrubs
- Tilling, reseeding and mulching of areas where grasses do not take root

The survival rate of all transplanted and seeded plantings needs to be sufficient to meet the objectives of the mitigation. A survival rate of 70 percent should be achieved at the 5 year mark to ensure the success of the mitigations.

It is also important to use design features that address the larger project work, such as low cut stumps, slash treatment, skid trail treatments, etc. to ensure that these proposed methods do not compound the initial visual impacts.

Attachment 2

(Drawing 3430.34-X-0017)



Planting Notes:
1. Entire right-of-way to be seeded with appropriate seed mixture (see Section 10.9).
2. Trees will be planted in all disturbed forested areas beyond 15' of pipeline centerline.
3. On National Forest System lands, shrubs to be planted from 15' each side of pipeline centerline to the outer edge of the construction limits (see Table 10.13-11).

Volunteer Shrubs

Herbaceous vegetation/ seed mixture

Maintenance Notes:
1. Selective cutting of trees and shrubs greater than 6' tall permitted within 15' of the pipeline
2. No vegetation maintenance proposed beyond 15' of the pipeline centerline.
3. Routine vegetation mowing or clearing shall not be done more frequently than every 3 years. However to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state.
4. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless approved in writing by responsible land management agency or the U.S. Fish and Wildlife Service.

DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP

FOREST
REVEGETATION & MAINTENANCE PLAN

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 3430.34-X-0017	SHEET 1
		%TIME% %PATH%	OF 2

Appendix B

Air, Noise and Fugitive Dust Control Plan

Pacific Connector GAS PIPELINE

Pacific Connector Gas Pipeline, LP

Air, Noise and Fugitive Dust Control Plan

Pacific Connector Gas Pipeline Project

January 2018

Table of Contents

List of Tables

1.0 INTRODUCTION

This Plan describes the practices that will be implemented during construction of the Pacific Connector Gas Pipeline Project (Pipeline or Pipeline Project) to minimize or control the potential impacts to air quality or the impacts caused by noise or fugitive dust on federal lands crossed by the Pipeline Project. The minimization and control measures described in this plan are also important to protecting the safety of construction workers, visiting agency personnel, and the general public that may use the public roads during the construction activities or reside near the construction right-of-way.

Emissions and noise from all phases of construction which includes timber removal and pipeline installation and operation of the proposed pipeline and compressor station would be subject to applicable state and federal air regulations. Air quality regulations affecting construction are primarily concerned with reducing emissions associated with construction equipment and fugitive dust. Therefore, the purpose of this Plan is to outline the Best Management Practices (BMPs) which would be implemented by PCGP to reduce pipeline construction emissions and fugitive dust during construction on federal lands. Emissions associated with construction equipment and fugitive dust are addressed in detail in Section 2.0 of this Plan, which includes the BMPs that would be employed to minimize potential impacts. Section 3.0 of this plan addresses areas of the Pipeline Project that cross soils and rocks (serpentinite and Ultramafic rock) that may contain naturally occurring asbestos (“NOA”) and the mitigation measures that PCGP will implement to reduce potential health risks that could be associated with these materials.

Emissions associated with operation of the Klamath Compressor Station would be addressed by air quality regulatory programs for stationary sources of air pollution. The Klamath Compressor Station is located on private land and will have no direct or indirect effects with respect to air, noise, or fugitive dust emissions on Federal lands or resources. The potential air quality, noise, and fugitive dust impacts associated with construction and operation of this facility will be addressed in FERC’s EIS and therefore are not discussed further in this Plan.

During construction of the Pipeline Project, there would be temporary, short-term noise impacts on federal lands crossed by the pipeline or crossed by construction access roads. Construction noise could have localized and temporary effects on recreational users and wildlife within federal lands. Pipeline construction would proceed in a linear fashion along the right-of-way, and equipment would be operated on an as-needed basis; therefore, exact noise at any particular point cannot be determined. Due to the assembly-line nature of pipeline construction, activities in any area could occur intermittently over a period lasting from several days to a few months. Potential noise impacts associated with construction of the Pipeline Project are discussed in Section 4.0 of this Plan, which includes the BMPs that would be implemented to minimize potential noise-related impacts.

2.0 AIR QUALITY IMPACTS DURING CONSTRUCTION

The Pipeline Project would generate air emissions during the two-year construction period including: (a) exhaust and evaporative emissions from construction equipment and motor vehicles associated with construction work vehicles; and (b) airborne dust associated with excavation and vehicle travel (fugitive dust). The EIS will provide exhaust and fugitive emissions for criteria pollutants and hazardous air pollutants estimated for pipeline construction. Construction activities will be generally limited to daytime hours between dawn to dusk with pollutant emission levels that are variable and intermittent throughout the day, during a typical 60-hour work week. Emissions will result from earthmoving (dust generation) and heavy

equipment use, which is typically diesel fueled. These emissions would be generated from timber clearing, grading activities associated with right-of-way construction, trenching activities, and laying the pipeline (stringing, welding, laying, backfilling) as well as restoration activities. Timber removal and pipeline construction equipment will typically include yarders, yoaders, skidders, feller-bunchers, bulldozers, graders, backhoes, front-end loaders, welding machines, trucks, pickups, and other miscellaneous equipment, each of which will have normal types of silencers and emissions control equipment (catalytic converters) commonly used for these types of equipment. Section 2.1 provides a general sequence of the Pipeline Project's construction activities and potential sources of construction emissions.

Potential dust emissions will vary substantially from day to day depending on the level of activity, the specific operations, and the prevailing weather. A portion of these emissions will likely result from equipment traffic using temporary construction access roads. Section 2.1 also provides potential fugitive dust emission activities that may result from construction.

PCGP's primary method of handling slash during pipeline construction and restoration would be to stockpile and redistribute the woody material on the right-of-way. However, in areas where slash distribution will exceed the BLM and Forest Service fuel loading standards PCGP may dispose of excess woody debris by open burn. Any slash burned on-site would be performed according to standards and guidelines set forth by federal, state, and local regulations, including OAR 340 Division 264, OAR 603 Division 77, and OAR 837 Division 110. PCGP is developing a Prescribed Burning Plan for the POD which will also be submitted to the appropriate agencies for the necessary burning permits. The locations where burning would be conducted and the amount of burning required would not be determined until clearing has been completed. The Prescribed Burning Plan will address the BMPs that would be utilized to minimize emissions from slash burning and, therefore, is not discussed further in this plan.

2.1 Sources of Construction Emissions

Depending on the area along the Pipeline alignment, construction is expected to occur between April 1 of Year One through November 30 of Year Two and may occur seven days a week, up to 12 hours per day. The construction will occur in the following phases:

- Surveying and staking;
- Timber removal;
- Clearing and grading;
- Trenching;
- Pipe hauling and stringing;
- Bending, welding and coating;
- Lowering in, padding and backfilling;
- Fabrication/tie-ins;
- Hydrostatic testing; and
- Reclamation.

Combustion emissions during timber removal and pipeline construction will result from:

- Exhaust from chainsaws used to remove timber and vegetation from the construction right-of-way;
- Exhaust from the diesel timber removal equipment used for right-of-way clearing operations;

- Exhaust from the diesel construction equipment used for construction activities;
- Exhaust from water trucks used to control construction dust emissions;
- Exhaust from diesel-powered welding machines, electric generators, air compressors, and water pumps;
- Exhaust from pickup trucks and diesel trucks used to transport workers and materials around the construction site;
- Exhaust from diesel trucks used to deliver fuel and construction supplies to the construction site; and
- Exhaust from automobiles used by workers to commute to the construction site.

Fugitive dust emissions from construction may result from:

- Dust entrained during site preparation and grading/excavation on the construction right-of-way;
- Dust entrained during onsite travel on paved and unpaved surfaces;
- Dust entrained during aggregate and soil loading and unloading operations; and
- Wind erosion of areas disturbed during construction activities.

2.2 Best Management Practices to Minimize Emissions and Fugitive Dust

To minimize wind erosion and fugitive dust emissions during construction, PCGP will implement the following BMPs:

- Disturb no more earth than required for construction to occur;
- Water the right-of-way, laydown areas, and temporary roads at least daily in areas of active construction, if necessary, as determined by the Environmental Inspector (EI);
- Control project-related traffic speeds on dirt access roads and on linear facility rights-of-way;
- Adhere to speeds as determined by the occupying property owner on private lands and by the county or federal land managing agency on public roads;
- Water gravel or dirt access roads in areas of heavy traffic, as determined necessary by the EI to control fugitive dust;
- Ensure that speeds on the construction right-of-way will not exceed fifteen miles per hour (mph) where fugitive dust can be generated;
- Decrease speed limits when excessive winds prevail and where sensitive areas such as public roads may be adjacent to access roads or the right-of-way;
- Maintain speed limit signs for the duration of the construction activities, and they will be placed where access roads intersect the construction right-of-way. Signs will be designed to endure weather conditions and will be posted in a non-obscured, visible manner;
- Water temporarily stockpiled soils to create a semi-hard protective layer to minimize wind erosion, if necessary, as determined by the EI. This treatment would occur once after the trench has been excavated; and
- Ensure that wind erosion BMPs will be in place during forecasted high wind (greater than 25 mph) weather advisories.

Helicopter use for timber removal will not require the helicopters to land on or near the log landing sites along the construction right-of-way. During timber removal and pipe stringing

activities, helicopters will hover at a safe distance above the forest canopy where wind generated from the blades will be dispersed over a wide area. Potential indirect effects of fugitive dust generated by helicopters will be prevented by properly watering the construction right-of-way at least daily as determined by the EI(s) near log landing sites or in areas where helicopters may hover over or near the construction right-of-way. During timber removal from the construction right-of-way, fugitive dust is not expected to be significant issue because of the helicopter's hovering height and existing ground and slash cover on the construction right-of-way will minimize fugitive dust generation.

PCGP cannot predict how much water would be needed for dust suppression on the construction right-of-way, during dry seasons, but estimates that there would be approximately five 3,000-gallon water trucks per construction spread on a given day. Watering trucks would spray only enough water to control the dust or to reach the optimum soil moisture content to create a surface crust. Runoff should not be generated during this operation. Water may be obtained through municipal sources or withdrawn from surface water or groundwater sources. All appropriate permits/approvals would be obtained prior to withdrawal. The only potential water source for dust control on federal lands that PCGP has identified is Lake of the Woods, which is also a hydrostatic test water source.

PCGP may also use Dustlok® in the water used to suppress fugitive dust emissions where determined necessary by the EI(s). Dustlok® is a naturally occurring by-product of the vegetable oil refining process. Dustlok® penetrates into the bed of the material and bonds to make a barrier that is naturally biodegradable, ensuring that the surrounding ground and water are not contaminated, and minimizing any potential effects to fish and wildlife. While there are no known health risks by the use of Dustlok® to fish and wildlife resources, PCGP would not use Dustlok® within 150 feet of riparian areas.

Additionally to minimize emissions during construction, PCGP will require the contractor to:

- Maintain all equipment in a properly functioning and appropriately tuned condition to minimize potential exhaust emissions from internal combustion engines; and
- Transport construction debris (not slash) off the project for appropriate disposal, rather than burning.

3.0 NATURALLY OCCURRING ASBESTOS (NOA)

The Forest Service has noted a potential safety risk concern where fugitive dust is generated during pipeline construction in areas where an asbestos hazard may be present on the Tiller Ranger District if serpentinite rock and soil are disturbed. Naturally occurring asbestos (NOA) includes fibrous minerals found in certain types of rock formations. A potential safety risk could occur where natural weathering or human disturbance breaks NOA down to microscopic fibers and these fibers are suspended in the air. If airborne NOA is inhaled, these thin fibers can irritate tissues and resist the human body's natural defenses. Asbestos is a known carcinogen. However, there is no health threat if NOA remains undisturbed or does not become airborne (EPA 2009a).

Asbestos is a generic term referring to six types of naturally occurring mineral fibers that are or have been commercially exploited. These fibers belong to two mineral groups: serpentines and amphiboles. Approximately 90% of serpentine is the variety chrysotile, while amphibole asbestos includes crocidolite, amosite, anthophyllite, actinole, and tremolite (Virta 2002). Two of the most common varieties of asbestos minerals that are found naturally are chrysotile and tremolite. The most common and abundant type is chrysotile. Tremolite also occurs but is found

in much lower quantities than chrysotile. Both are found in serpentinite, commonly referred to as serpentine or serpentine rock. Ultramafic rock is the parent igneous rock for serpentinite. Ultramafic rock, other than serpentine, may also contain asbestos (California Department of Conservation 2002). The literature suggests there are fewer health effects with chrysotile asbestos; however this remains a point of disagreement (Gunter 2009, and California Environmental Protection Agency 2001).

3.1 Potential Serpentinite Rocks and Soils Crossed by the Pipeline

To establish areas where potential NOA occurs along the Pipeline alignment, existing geologic mapping was reviewed (GeoEngineers 2017) to determine areas where geologic formations are crossed that are composed of Ultramafic rocks and serpentinite. Table 1 lists the milepost ranges where the Pipeline crosses geologic formations where serpentine rocks may be encountered. GeoEngineers (2017) indicated that the potential for shallow bedrock and the potential need for blasting within these areas of Ultramafic rocks and serpentinite were moderate between MPs 74.7 and 75 and generally high between MPs 101.6 and 110.4.

PCGP also reviewed soil survey reports to determine if data were present to determine the presence of serpentinite soils or bedrock lithologies. However, only the soil survey of the Umpqua National Forest (Radtke and Edwards 1976) provided this information. Table 1 lists the milepost ranges and soil mapping units that are crossed by the Pipeline that have formed from or are underlain by serpentinite bedrock. Prior to construction, verification of serpentinite rocks/soil would be conducted by a qualified geologist using standard geologic mapping techniques at existing outcrops and road cuts to indentify rock contacts.

3.2 Regulatory Requirements

The identification of health risks associated with asbestos fibers has prompted strict regulations to limit the maximum exposure of airborne fibers in workplace environments. The Oregon Department of Environmental Quality (ODEQ) regulates the abatement and disposal of asbestos-containing materials from any public or private building involving demolition, renovation, repair, construction and maintenance activities. The purpose of the ODEQ asbestos rules and program is to prevent asbestos fiber release and exposure. Temporary construction activities such as pipeline construction within areas of potential NOA are not regulated by ODEQ.

Table 1
Geologic and Soil Mapping Data Identifying Potential Areas of Serpentinite Rocks Crossed by the Pipeline

Potential Areas of Serpentinite Soil/Rocks Crossed by the Pipeline from Geologic Mapping [1]

From MP	To MP	Total (miles)	Map Unit	Lithology	Description	Jurisdiction (County)
73.85	75.06	1.2	Jrs	Metamorphic rocks	Serpentinized Ultramafic Rock (Jurassic/Cretaceous)	Private/BLM (Douglas)
78.69	79.02	0.3	Jri	Intrusive rocks	Mafic Intrusive Unit (Jurassic)	Private/BLM (Douglas)
87.19	87.43	0.2	Jri	Intrusive rocks	Mafic Intrusive Unit (Jurassic)	BLM (Douglas)
101.16	102.99	1.8	Jssp	Melange rocks	Serpentinite (Triassic/Jurassic)	Private/BLM/USFS (Douglas)
103.19	103.30	0.1	Jssp	Melange rocks	Serpentinite (Triassic/Jurassic)	Private (Douglas)
104.61	104.75	0.1	Am	Metamorphic rocks	Amphibolite (Paleozoic/Jurassic)	USFS (Douglas)
105.91	106.02	0.1	Msp	Melange rocks	Mataserpentinite (Paleozoic/Jurassic)	USFS (Douglas)
106.19	108.87	2.7	Am	Metamorphic rocks	Amphibolite (Paleozoic/Jurassic)	USFS (Douglas)
	Total	**6.5**				

Potential Areas of Serpentinite Soil/Rocks Crossed by the Pipeline from Soil Inventory [2]

From MP	To MP	Total (miles)	SIR Code	Compo-sition of Mapping Unit	Description of Mapping Unit	Jurisdiction (County)
101.34	101.91	0.57	812	60 percent of Map Unit 81 and 40 percent of Map Unit 82	Mapping Unit 81: Bedrock consists of entirely of hard, moderately competent serpentinite. Depth to bedrock is generally less than three feet but may range to four or five. Mapping Unit 82: Bedrock consists of entirely of hard, moderately competent serpentinite. Depth to bedrock is generally less than three to six feet but may range from three to eight.	USFS (Douglas)
102.31	103.46	1.15				
103.71	103.88	0.17				
104.03	104.30	0.27				
103.46	103.71	0.25	810	70 percent Map Unit 81 and 30 percent of Map Unit 80	Mapping Unit 80: Serpentinite Rockland – Scable and this land type consists of serpentinite outcrops, boulder fields, grassy scablands, and very low quality timber. Greater than 70 percent of this land type occurs as rock outcrops or areas possessing less than 3 inches of soil. Mapping Unit 81: Bedrock consists of entirely of hard, moderately competent serpentinite. Depth to bedrock is generally less than three feet but may range to four or five.	USFS (Douglas)
	Total	**2.41**				

[1] GeoEngineers. 2017. Geologic Hazards and Mineral Resource Report. Pacific Connector Gas Pipeline Project. Coos Bay to Malin, Oregon. Prepared for Pacific Connector Gas Pipeline. August 24, 2017.

[2] Radtke Sherman and Rudolph Edwards. 1976. Soil Resource Inventory. Cottage Grove, Streamboat, Diamond Lake, Glide and Tiller Ranger Districts. Umpqua National Forest. Pacific Northwest Region.

The Occupational Safety and Health Administration (OSHA 2009a) has developed standards to protect workers from exposure to asbestos in the workplace. These standards include:

- 29 CFR 1910.1001 which applies to asbestos exposure in general industry, such as exposure during brake and clutch repair, custodial work, and manufacture of asbestos-containing products.
- 29 CFR 1915.1001 which covers asbestos exposure during work in shipyards.
- 29 CFR 1926.1101 which covers construction work, including alteration, repair, renovation, and demolition of structures containing asbestos.

During OSHA Final Rule Making on asbestos (*OSHA 2009b), OSHA noted that:*

> *OSHA finds that the record indicates that certain construction sites in mostly well-defined areas contain deposits of naturally occurring asbestos. In such areas, airborne asbestos during earthmoving activities may result in significant exposures. In such cases, wetting of the excavation site, often required by local authorities, should be sufficient to suppress measurable airborne asbestos concentrations.*
>
> *In the absence of information which is readily available showing asbestos contamination of soil in the immediate vicinity of a construction site, the employer is not required to take any action under this standard.*

3.3 Best Management Practices for Minimizing Exposures to NOA

Although no testing has been conducted to verify the presence of NOA within the areas of mapped serpentine rocks and soils within the Pipeline Project area, potential exposure to asbestos might occur through incidental contact with serpentine materials in areas noted in Table 1 during temporary pipeline construction activities. Direct contact with asbestos-containing soils/sediments could result in the potential releases of asbestos fibers to air, where they could be breathed into the lungs. However, chronic or long-term inhalation exposure to asbestos is the main type of exposure that can have an adverse effect on health (EPA 2009a).

Quantitative assessments of the asbestos emissions from temporary pipeline construction activities would be difficult to estimate because of the many factors which could potentially influence the rate of release of the asbestos fibers and the high degree of variability of each of these factors. These factors include the asbestos content of the material being disturbed; seasonal variations; and meteorological conditions. Additionally, the size of the area being disturbed; the level of soil disturbance; the equipment being used including equipment size, speed, and mode of operation would affect possible asbestos emissions/exposure (California Environmental Protection Agency 2001).

Given the potential health risks associated with disturbing asbestos-containing materials, PCGP would implement BMPs to reduce fugitive dust emissions in areas where potential NOA occurs (see Table 1). These BMPs may be waived in areas where PCGP conducts a geologic evaluation and determines that the area to be disturbed does not contain any serpentinite or ultramafic rock or may be modified based on site-specific conditions as determined by PCGP's authorized health and safety representative.

The BMPs that would be implemented by PCGP, which have been identified by the EPA (2009a), to minimize fugitive dust emissions from areas of potential NOA include:

- Identification of areas with potential NOA with signs at all access points;
- Reduce grading or excavation speeds;
- Wet exposed surfaces of the construction right-of-way with water or dust suppressant (i.e., Dustlok®) to minimize fugitive dust;
- Stabilize temporary stockpiles by wetting to form a crust;
- Limit grading activities when winds are high or keep wetted;
- Limit speeds of construction vehicles and equipment to 15 miles per hour (MPH) or less;
- Inform operators and construction personnel to keep equipment and vehicle windows and doors closed during construction or on windy days in areas of NOA.
- Clean equipment before moving it off-site of the NOA area;
- Equipment cleaning stations shall be located and designed in coordination with a federal land representative such that contaminated water is not carried off-site;
- Stabilize all disturbed areas with vegetation post-construction (see Erosion Control and Revegetation Plan).

4.0 NOISE

The Pipeline crosses primarily rural and forested environments. About 1 percent of the land crossed by the proposed pipeline (2.2 miles of pipeline corridor) is categorized as having residential, commercial, or industrial use. In rural environments the background noise is assumed to be about 40 dB during daylight hours, when construction would usually occur. The typical ambient sound level for forest habitats ranges from 25 dB to 44 dB. Noise sources in the area are natural (e.g. wind) with incremental noise sources such as aircraft, road traffic, rural residential activities including logging or farming practices.

Federal and state noise limit standards to protect public health and welfare are established for industrial and commercial noise sources (EPA 1974 and OAR, Chapter 340, Division 35). The state-specified noise limits apply to either the property line location closest to the noise source or to locations 25 feet toward the noise source from the point on the noise-sensitive building nearest the noise source, whichever distance from the noise source is greater. Noise-sensitive property includes residences and other facilities normally used for sleeping, schools, churches, hospitals, and public libraries, none of which occur on the federal lands crossed by the Pipeline. Although FERC adopts EPA limits for new compression and associated pipeline facilities, these noise limits do not apply to noise generated from construction activities, agricultural or forestry operations, vehicle traffic, rail traffic, aircraft operations, or various other exempt sources.

Oregon regulations establish additional noise limits for blasting and impulsive noise sources associated with industrial and commercial operations. Noise limits for blasting operations are based on C-weighted decibel measurements in the slow response setting while the noise limits for other impulse sounds are based on unweighted decibel measurements in the peak response setting. The noise limits for blasting operations are 98 dBC for 7 a.m. to 10 p.m., and 93 dBC for 10 p.m. to 7 a.m. as measured at noise sensitive properties (OAR, Section 340-035-0035(1)(d)(A)). The noise limits for other impulse sound from industrial and commercial operations are 100 dB (peak) for 7 a.m. to 10 p.m., and 80 dB (peak) for 10 p.m. to 7 a.m. as measured at noise sensitive properties (OAR, Section 340-035-0035(1)(d)(B)). However, these blasting and impulse sound limits do not apply to construction sites, agricultural operations, forestry operations, or various other exempt sources. Even though these noise limits do not

apply in a regulatory context to construction activities, they provide criteria for judging blasting or impulse noise associated with construction activities.

4.1 Noise Impacts During Construction

Noise from construction will be directly related to and increase accordingly the closer a receptor is to the construction activities. At any location, both the magnitude and frequency of environmental noise may vary considerably over the course of the day and throughout the week. For construction activities, this variation in noise levels is caused primarily by changes in equipment operations and activity locations. Pipeline Project-related vehicles and construction equipment will generate noise during construction. The noise will occur usually during daylight hours, except for some vehicles which may be traveling over roads in the minutes or hours preceding dawn and following dusk as workers return to work or lodging and during horizontal directional drill (HDD) operations. None of the Pipeline Project's six proposed HDDs (Coos Bay Estuary/2, MP 25, and Coos, Rogue, and Klamath rivers) are located on federal lands and will have no direct or indirect effects with respect to air, noise, or fugitive dust emissions on federal lands or resources. The potential noise effects from the proposed HDDs and proposed mitigation measures to minimize potential impacts to adjacent noise sensitive areas will be addressed in FERC's EIS and are not discussed further in this Plan. Additionally, the Pipeline Project's Klamath Compressor Station would be located in Klamath County, Oregon, on a 17-acre private parcel at MP 228.81. Because this facility is located on private lands, the compressor station is not discussed further in this Plan. FERC's EIS will provide additional information regarding the Klamath Compressor Station and potential noise effects and mitigation measure that would minimize potential noise impacts associated with this facility.

The operation of the pipeline is typically not expected to generate noise, except for the regular small vehicle traffic associated with right-of-way and facility inspections. No operational noise from the buried pipeline would be detectable at aboveground locations. Meter stations and other aboveground facilities (mainline block valves) typically do not generate appreciable noise during normal operation. The source of noise at these facilities would be the sound of natural gas moving through underground piping, as transferred to the surface through valves and interconnecting piping. Of the 17 proposed mainline block valves, three are located on federal lands administered by the BLM (i.e., BVA #4 at MP 48.58, BVA #7 at MP 80.03, and BVA #12 at MP 150.70). Noise would not be expected to be audible beyond the edge of the block valve sites or pipeline right-of-way. During operations, minimal increase in ambient noise levels would also occur during periodic right-of-way vegetation maintenance activities (i.e., mowing, chainsaws) during operation. Routine vegetation maintenance clearing would not be conducted more frequently than every 3 years. However, to facilitate periodic corrosion and leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be maintained annually in an herbaceous state. In no case would routine vegetation maintenance clearing occur between April 15 and August 1 of any year to minimize potential impacts to wildlife species.

Noise could potentially impact wildlife for a short duration during clearing and grading of the construction right-of-way, during construction, and during clean up, restoration and travel to and from the construction right-of-way. The average time a given point along the Pipeline is estimated to be disturbed by construction noise would be approximately 8 weeks. This would vary, as the speed at which crew would be able to work would be affected by terrain, construction methods and activities, weather, and environmental construction windows. Additionally, in some remote and steep areas crossed by the proposed Pipeline, helicopters may be used during right-of-way clearing and during pipeline delivery. Section 4.4, of this Plan describes potential noise impacts associated with helicopter use and Section 4.6 describes the

BMPs that would be implemented to minimize potential effects to sensitive species. Blasting may be required for pipeline trenching in areas where hard, non-rippable bedrock occurs within the trench profile. Section 4.5 of this Plan describes potential noise impacts associated with blasting and Section 4.6 describes the BMPs that would be implemented to minimize potential effects to sensitive species.

Construction noise could have localized and temporary impact on recreational users and wildlife within federal lands. Noise and human presence would move along the construction right-of-way, although at a rather slow pace. Therefore, impacts to wildlife because of noise would generally be of short duration and spatially localized. FERC's FEIS will address estimated noise levels from typical construction equipment. The operation of a typical piece of construction equipment results in noise levels of about 88 dBA at 50 feet; the noise impact of that equipment would be 82 dBA at 100 feet and 72 dBA at 300 feet. Although noise from multiple sources working at the same location results in louder levels than a single source alone, decibels are measured on a logarithmic scale, so noise levels cannot be added by standard addition (Washington State Department of Transportation 2007). For example, if two pieces of equipment were operating concurrently in the same area, typical construction noise levels would be about 91 dBA at 50 feet, 85 dBA at 100 feet, and 75 dBA at 300 feet. PCGP notes that these estimates are based on a hard site condition, where noise travels away from the source over a generally flat, hard surface such as water, concrete, or hard-packed soil. However, when ground cover or normal unpacked earth is present between the source and receptor, the ground becomes absorptive to noise energy and is considered a soft site (Washington State Department of Transportation 2007). PCGP expects typical site conditions to mimic soft site conditions, decreasing noise effects. Additionally, the distances at which noise would attenuate to ambient levels would depend on local conditions such as tree cover and density, topography, weather (humidity), and wind, all of which can greatly alter background noise conditions (Michael Minor & Associates 2008). These factors are often impossible to quantify.

The forthcoming FERC FEIS and Draft BA will provide detailed analyses of the potential noise impacts to wildlife and threatened and endangered species (i.e., Marbled Murrelet – MAMU and Northern Spotted Owl – NSO). For purposes of this Plan, summaries of the potential noise impacts to MAMU and NSO are provided below in Sections 4.2 and 4.3, along with the mitigation measures in Section 4.6, which would be implemented to minimize the potential effects of noise generated during construction and operation of the pipeline.

4.2 Marbled Murrelet

PCGP is aware of the temporal and spatial restrictions recommended by the U.S. Fish & Wildlife Service (FWS) to protect nesting murrelets, but due to construction constraints and safety of construction crews, timber clearing and construction activities within the range of the MAMU are proposed during the restrictions. Forest Plan Standards and Guidelines FW-022 and FW-024 also restrict logging by ground-based equipment to the dry season, June 1 through October 31 which conflicts with the MAMU critical breeding season (April 1 to August 5). These seasonal restrictions limit the optimum construction time available for project construction. Therefore, to ensure completion of construction within a two-year window, noise disturbance has the potential to affect MAMU nesting and rearing activities. Section 4.6 of this Plan describes the mitigation measure that would be implemented to minimize potential noise disturbance effects to MAMU.

4.3 Northern Spotted Owl

In a previous Biological Opinion, the FWS (FWS 2006) provided distances from a project boundary within which NSOs could potentially be distracted, or "disturbed," from their normal activity. The distances are often applied to projects as seasonal buffers to minimize impacts on nesting NSOs. The FWS typically considers the harassment threshold for general noise-generating activities within a 0.25- mile radius (125-acre area) of the activity, or within a 1.0-mile radius (2,176-acre area) for large disturbance activities such as open air blasting using more than a 2 pound charge or large aircraft (FWS 2003; Smith et al. 2007; Wille et al. 2006). Additionally, FWS (2003) provided some evidence suggesting that noise that builds gradually, such as a helicopter approaching from a distance, may result in fewer risks than sudden noises. Both helicopter use and blasting will be required during construction. Sections 4.4 (Helicopter Use) and 4.5 (Blasting) address the potential associated impacts, and Section 4.6 describes the mitigation measures that will be utilized to minimize potential noise disturbance effects to NSO.

4.4 Helicopter Use

Double rotor helicopters may be used along a portion (approximately 15.4 miles) of the Pipeline during timber clearing and pipeline construction in areas that would be less accessible to pipeline construction contractors and logging trucks. Noise associated with this size of helicopter (generally >92 dBA) could have negative impacts to species, especially bird species during the breeding season.

Helicopter logging is currently proposed for the following locations in areas of rugged topographic areas with limited access (areas would not be finalized until a contractor is selected):

Begin MP	End MP	Helicopter Staging
		TEWAs 6.49-W, 7.21-N, 7.44-W, 10.22-W, 13.79-W, 14.62-W, 15.75-W, 16.71-W, 18.05, 21.12-W, 23.99-N, 21.87-N
37.10	38.42	TEWAs 36.63-W, 36.97-W, 37.15-N, 38.32-W, 38.32-N, 38.90-W, 39.18-N
46.70R	47.20R	TEWAs 46.75-N, 47.53-N, 47.52-W
60.50	61.50	TEWAs 60.52-N, 60.54-W, 60.59-N, 60.87-W, 60.88-N, 61.43-N
77.80	79.90	TEWAs 77.72-N, 77.95-W, 78.99-W, 79.85-N
92.46	94.50	TEWAs 92.62, 92.62-N, 92.63-W, 93.01, 93.01-N, 94.56-W
95.10	97.05	TEWAs 95.39, 96.22-N, 96.23-W 97.02-N, 97.04-W
97.70	98.00	TEWAs 97.63, 97.79-N, 97.91-W
101.30	102.30	TEWAs 101.62-N, 101.75-N, 102.19-N
108.50	110.40	TEWAs 109.10-W, 110.34-W, 110.73 (Helicopter landing Peavine Quarry)
116.30	117.85	TEWAs 116.59-W, 117.67-N
123.30	125.15	TEWAs 123.53-W, 123.71-N, 124.30-N, 124.54-W, 124.71-W, 124.96-N

4.5 Blasting

Blasting may be required to achieve right-of-way grade and pipeline trench construction in areas where hard, non-rippable bedrock occurs within the trench profile; however, alternate mechanical methods would first be employed in order to attain the desired trench depth, such as ripping, hydraulic hammers or rock saws. The bedrock units that may require blasting are expected to consist primarily of volcanic and metavolcanic rocks in the Klamath Mountains and volcanic rocks in the Cascade Range and along the ridges in the Basin and Range physiographic province. In addition, local areas of well lithified sedimentary rock may require blasting in the Coast Range. Approximately 117.1 miles of the proposed pipeline alignment is considered to have moderate to high blasting potential, although not all substrate within those areas identified may require blasting to achieve the required trench depth. Blasting activities

may involve a single blast or a repetitive blasting sequence. As reported by the Arcata Fish and Wildlife Office (FWS 2006), noise associated with blasting activities may be in the range of 112dB within 50 feet of the trench and may cause alarm in wildlife such as mule deer and threatened and endangered species.

4.6 Mitigation

PCGP has prepared a Blasting and Helicopter Noise Analysis and Mitigation Plan (Michael Minor & Associates 2008) that analyzes the distances at which conventional blasting required for trenching within rock substrate and transport helicopters attenuate to 92 dB. The 92dB threshold criteria is based on the commonly accepted noise level at which MAMU and NSO could be disturbed or disrupted from normal activity during their breeding periods. FWS has established 92dB(A) as the sound-only injury threshold for both NSO and MAMU based on their document *Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (July 26, 2006, Arcata Field Office).

The noise analysis and mitigation plan (Michael Minor & Associates 2008) indicated that under the worst case conditions with common and appropriate mitigation measures applied to trench blasting operations, it is expected that blasting noise would attenuate to 92 dB within 200 feet of the source, and to 70 dB within 1,025 feet of the blast source in soft rock. Table 4.6.1.2-9 in the FEIS (FERC, 2009) summarized the results of the analysis and indicates distances from a blast-related noise source to the projected 92 dBA criteria. This table has been excerpted here as Table 2:

Table 2
Projections of Distances for Blasting Noise to Attenuate to 92 dBA under Different Conditions

Propagation Conditions	Distance to Attenuate to 92 dBA Level		
	Un-Mitigated	Soft Rock - Mitigated	Hard Rock - Mitigated
Normal a/	Up to 4,000 feet	Less than 125 feet	Less than 125 feet
Moderate b/	Up to 5,000 feet	125 feet	Less than 125 feet
High c/	> 5,500 feet	200 feet	125 feet

a/ Normal: assumes moderate temperatures and minimal reflective surfaces
b/ Moderate: assumes colder temperatures, or reflective surfaces, or a low pressures system
c/ High: assumes combined low temperature with inversion, wind in the direction of the noise sensitive land use and low dense cloud cover.

Although the potential noise disturbance from blasting is well below the 0.25-mile buffer radius the FWS typically considers as the harassment threshold for general noise-generating activities, PCGP would limit noise from blasting, if it is required during construction to protect sensitive resources, through application of various measures, as outlined in the noise analysis and mitigation plan (Michael Minor & Associates 2008). Table 1 of this plan (Michael Minor & Associates 2008) summarizes various mitigation measures that can be applied to blasting of this type to minimize associated noise and has been excerpted below as Table 3. The mitigation measures include drilling small (2.5-inch) charge holes on tight centers; stemming the blast holes with sand and placing inert material on top of the blast area including the use of blasting mats; using timing delays for charges; and directing the blast vibration away from sensitive receptors (Michael Minor & Associates 2008).

Table 3
Charge Related Noise Mitigation Methods

Mitigation Method	Benefit
Drill small charge holes on tight centers	Blast energy is contained in the rock so less energy is released into the atmosphere as noise and air-over-pressure
Leave approximately 3-4 feet of soil on top of the blast area during initial mechanical excavations	Leaving the soil on the blast area will contain blast noise and air-over-pressure from the blast, reducing noise impacts
Use blast mats on top of the soil on the blast area	Additional mass of the mats also contains the blast noise and air overpressure, increasing energy for fracturing rock and also reduces noise and overpressure.
Use of timing delays for charges	Limit the number of charges going off at any one time reduces the overall noise and air-over-pressure from the blast
Blast small horizontal and vertical sections	By taking smaller sections for each blast, less explosives are needed reducing overall energy related to the blast
Stem the blast holes with dense sand	Stemming is the practice of packing the top portions of the blast holes with sand after the charge is loaded. This helps to force the energy of the blast into the rock and helps prevent energy from blowing out of the top of the hole, reducing noise and air-over-pressure impacts.
Timing charges to direct blast vibration away from sensitive receivers	Through the use of proper timing, charges can be detonated to direct the transmission of vibration away from sensitive receivers
Source: Explosive Product Divisions Blaster's Handbook, 1989 and Rosenthal, 1987	

Similar to blasting, the noise analysis and mitigation plan (Michael Minor & Associates 2008) provided that large transport helicopters will attenuate to 92 dB at distances of 650-700 feet from the aircraft. The greater distance for helicopter use is due to the directional aspects of blade slap noise that is directed toward the ground. Mitigation for helicopter noise includes operational restrictions, such as maintaining a high altitude and flight paths away from noise sensitive areas whenever possible. There are no feasible noise mitigation measures for helicopter noise during hauling, as the slow speeds used during hauling result in blade slap being the dominant noise source. However, the potential noise disturbances from large transport helicopter use are well below the 0.25-mile buffer radius that the FWS typically considers as the harassment threshold for general noise-generating activities.

To minimize potential effects to MAMU and NSO, PCGP has developed scheduling strategies to minimize construction activities near known MAMU stands and NSO nest patches and has analyzed the potential effects to these species (will be provided in FERC's EIS and BA). Because of the construction constraints associated with the extent of the Pipeline Project, the rugged topographic setting, the seasonal weather patterns, as well as the biological constraints, a hierarchical scheduling approach was discussed which outlined the preferred seasonal and daily timing restrictions that could be applied to minimize effects to MAMU and NSO. The proposed Pipeline Project schedule applied the seasonal and daily timing restrictions, where feasible, with the objective of completing restoration during the second year of construction prior to the beginning of inclement weather. Near occupied MAMU stands and NSO nest patches, during construction, clearing, and/or ground-disturbing activities, PCGP would comply with the conservation measures specified in the BO that would be issued by the FWS through the consultation process. Such conservation measures could include no timber clearing,

construction, and/or blasting within 0.25 mile, and no double-rotor helicopter use within 700 feet of an occupied stand from April 1 through September 15.

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Appendix C

Blasting Plan

Pacific Connector GAS PIPELINE

Pacific Connector Gas Pipeline, LP

Blasting Plan

Pacific Connector Gas Pipeline Project

January 2018

Table of Contents

List of Tables

List of Figures

List of Attachments

1.0 INTRODUCTION

The purpose of this Blasting Plan is to provide guidelines for the safe use and storage of blasting materials proposed for use during construction of the Pacific Connector Gas Pipeline Project (Pipeline or Pipeline Project). This Blasting Plan is intended to help ensure the safety of construction personnel, the public, nearby facilities and sensitive resources.

Blasting may be required to achieve right-of-way grade and pipeline trench construction in areas where hard, non-rippable bedrock occurs within the trench profile; however, alternate mechanical methods will first be employed in attempt to attain the desired trench depth, such as ripping, hydraulic hammers or rock saws. The bedrock units that may require blasting are expected to consist primarily of volcanic and metavolcanic rocks in the Klamath Mountains and volcanic rocks in the Cascade Range and along the ridges in the Basin and Range physiographic province. In addition, local areas of well-lithified sedimentary rock may require blasting in the Coast Range. Approximately 117.1 miles of the proposed pipeline alignment is considered to have moderate to high blasting potential, although not all substrate within those areas identified may require blasting to achieve the required trench depth (GeoEngineers, 2017).

2.0 GENERAL

Blasting for grade or trench excavation shall be utilized only after all other reasonable means of excavation have been used and are unsuccessful in achieving the required results. The purpose of blasting during pipeline construction is to fracture rock within the pipeline trench profile to facilitate removal. This is accomplished using relatively small charges, typically 2 to 10 pounds, set on tight centers detonated with a delay between each charge. Measures are taken to prevent rock fragments, or flyrock, from leaving the trench, and to reduce blasting noise levels. Following completion of a successful blast, the broken rock is then removed from the trench using mechanical excavation equipment. Similar blasting practices may also be used to remove rock obstructions during construction of the right-of-way. Mine and quarry blasting operations, with which the general public may have greater association, are generally conducted in a fundamentally different manner. These operations typically use much larger charges, often exceeding 100 pounds per delay and promote rock displacement. As such, noise and vibration levels associated with mine and quarry blasting are usually much greater than those generated from blasting during pipeline construction.

Prior to any blasting, a site-specific blasting plan must be submitted by the Construction Contractors (Contractors) to Pacific Connector Gas Pipeline, LP (PCGP/Company) for approval. All site-specific blasting plans for work performed on federal lands shall also be provided to the jurisdictional agency for review and acceptance. This Blasting Plan (Appendix C to the POD) does not relieve the Contractors of the responsibility for developing site-specific blasting plans.

3.0 BLASTING PROCEDURES

3.1 General Blasting Procedure

The following sequence of events outlines the general procedure completed for each blast event. These steps represent a minimum requirement and outline the general order of the blasting procedure (safety measures are further detailed in subsection 6.1):

1. Conduct safety meeting prior to any blasting activities;
2. Erect warning signs and traffic control devices as necessary;
3. Set up lightning detectors;

4. Measure drilled holes to confirm depth and location;
5. Evaluate potentially affected structures and facilities;
6. Load holes with explosive charges;
7. Set up seismic equipment to monitor particle velocities near any structures 200 feet or less from blast.
8. Clear the blast affected zone and initiate applicable road closures;
9. Give the warning signal;
10. Give the blast signal;
11. Detonate the blast;
12. After the blaster has checked for misfires and given the “ALL CLEAR” signal, any potentially affected aboveground or underground facilities will be inspected by Company for blast related damage; and
13. Complete the Blasting Log Record.

3.2 Blasting Contractor Qualification

Blasting operations shall be conducted by or under the direct and constant supervision of experienced personnel legally licensed and certified to perform such activity in the jurisdiction where blasting occurs. The Contractors shall provide the Company with evidence of experience and such licenses and permits prior to any blasting activities.

3.3 Federal, State, County and Local Regulations/Restrictions

Blasting related operations including obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material, drilling, and ground-motion monitoring shall comply with applicable federal, state, and local regulations and permit conditions.

Applicable Federal regulations include but may not be limited to the following:

(a) Safety and health. OSHA, 29 CFR Part 1926, Subpart U.

(b) Storage, security, and accountability. Bureau of Alcohol, Tobacco, and Firearms (BATF), 27 CFR

(c) Shipment. DOT, 49 CFR Parts 171-179, 390-397.

3.4 Pre-Blasting Requirements

Contractors shall place all necessary "one calls" 72 hours prior to any blasting related operations or as required by one-call system(s). Before performing any activities associated with blasting on the construction right-of-way, all property owners will be notified of impending blasting activities. The authorized Bureau of Land Management (BLM) and US Forest Service (FS) officers shall be notified a minimum of 72 hours prior to any blasting related operations. Reclamation would be provided a two-week notification of any required blasting activities with Klamath Project boundaries.

3.5 Site-Specific Blasting Plans

Contractors shall furnish a site-specific Blasting Plan to the Company at least five working days prior to any proposed pipeline blasting related operations and shall obtain Company approval in writing prior to drilling. Any changes to the Blasting Plan that could increase the particle velocity or ground movement shall require prior written approval by Company. All site-specific blasting

plans for work performed on federal lands shall also be provided to the jurisdictional agency for review.

The Site-Specific Blasting Plan provided by Contractors shall include the following:

- Explosive type, product name and size, weight per unit, and density;
- Delay type, sequence, and delay (ms);
- Initiation method (non-electric (shock tube) detonator is the only approved initiation system);
- Stemming material and tamping method;
- Hole depth, diameter, and pattern;
- Explosive depth, distribution, and maximum weight per delay;
- Number of holes per delay;
- Distance and orientation to nearest aboveground structure;
- Distance and orientation to nearest underground structure;
- Procedures for storing, handling, transporting, loading, and firing explosives, fire prevention, inspections after each blast, misfires, flyrock and noise prevention, stray current accidental-detonation prevention, signs and flagmen, warning signals prior to each blast, notification prior to blasting, and disposal of waste blasting material;
- Seismograph company, names, equipment and sensor location;
- Copies of all required federal, state, and local permits;
- Blaster's name, company, copy of license, and statement of qualifications;
- Magazine type and locations for explosives and detonating caps;
- Typical rock type and geology structure (solid, layered, or fractured);
- Pipeline location (MP and Stationing); and
- Applicable Alignment Sheet numbers.

The following restrictions on blasting methods/techniques will be enforced and must be considered during development of the blasting plan:

- The blasting agent Ammonium Nitrate and Fuel Oil (ANFO) shall not be allowed for right-of-way construction or pipeline trench blasting;
- Emulsion-type explosives shall not be allowed;
- The minimum time delay between the detonation of charges shall not be less than 8 milliseconds;
- There will be no more than one shot/delay;
- Neither electric blasting caps nor electric initiation systems may be used; only non-electric initiation systems are allowed;
- Provisions of the PCGP Fire Prevention and Suppression Plan

3.6 Monitoring of Blasting During Pipeline Construction

Drilling and blasting shall be completed with Company inspector(s) present. Company Inspector's approval is required to proceed prior to each blast.

Seismograph equipment will be used to measure blast induced vibration in the vertical, horizontal, and longitudinal directions. Peak particle velocity (PPV) is an industry accepted unit of measure used to characterize blast induced vibration. The unit is derived by measuring the maximum speed of a point and calculating the distance it would travel during a one second interval. Seismic monitoring may be discontinued at PCGP's discretion if the blasting schedule and blasting performance consistently produce PPVs lower than the maximum allowable limit.

PPV will be recorded at any adjacent utility, water wells, potable springs and any aboveground structure within 200 feet of the blasting. PCGP may photograph structures or facilities near blasting locations to document pre-blast conditions. Similarly, PCGP may video record blast events.

When blasting is completed in noise sensitive areas, peak noise and overpressure will be monitored and recorded in compliance with the stipulations outlined in the Federal Energy Regulatory Commission's (FERC) Biological Assessment.

Contractor shall complete a blasting log record immediately after each blast and submit a copy to the Company representative.

4.0 BLAST EFFECTS MITIGATION

PCGP will implement measures to reduce noise, air overpressure, vibration and flyrock as necessary to protect construction and agency personnel, public and private properties, and sensitive natural resources. Each of these effects and suggested mitigation measures are discussed in the following sections.

4.1 Blast Noise Mitigation

Air overpressure is energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave is known as the peak air overpressure, generally measured in decibels (dB). The pressure waves consist of energy over a wide range of frequencies, some of which are audible and may be sensed in the form of noise, but most are at inaudible frequencies less than 20 Hz. This relatively low frequency component can be sensed by people in the form of a pressure wave known as concussion. The noise and concussion together is known as air overpressure.

Several forms of mitigation may be used to reduce noise and air overpressure resulting from trench blasting. Controlling blast noise and air overpressure is essential for successful blasting. High noise and air overpressure levels indicate much of the blast energy was wasted (creating noise and overpressure) and not used to fracture rock (Michael Minor & Associates, 2008). In order to limit the noise, and increase the level of energy forced into the rock, virtually all trench blasting operations will employ various mitigation measures to contain the blast energy and use it to fracture rock.

Additional mitigation may be applied to prevent noise from reaching noise sensitive areas. One method is related to the blasting methodology and how the charges are set. Another method is to physically block the noise and air overpressure using massive barriers. Each of these methods and how they relate to the Pipeline Project are discussed below.

Specific impacts and mitigation of effects to federally listed species as a result of blasting activities are discussed in the Air, Noise and Fugitive Dust Control Plan (see Appendix B to the POD) as well as the FERC's Biological Assessment.

4.1.1 Charge-Related Noise Mitigation

Several parameters of the blast design may be modified to limit noise created from blasting activities. Table 1 summarizes different blast mitigation methods and their benefits. The methods used and their effectiveness depend on the rock formation, height and width of the blast area, and topography surrounding the blast location (Explosive Product Divisions Blaster's Handbook 1989).

Table 1
Charge-Related Noise Mitigation Methods

Mitigation Method	Benefit
Drill small charge holes on tight centers	Blast energy is contained in the rock so less energy is released into the atmosphere as noise and air-over-pressure
Leave approximately 3-4 feet of soil on top of the blast area during initial mechanical excavations	Leaving the soil on the blast area will contain blast noise and air-over-pressure from the blast, reducing noise impacts
Use blast mats on top of the soil on the blast area	Additional mass of the mats also contains the blast noise and air overpressure, increasing energy for fracturing rock and also reduces noise and overpressure.
Use of timing delays for charges	Limit the number of charges going off at any one time reduces the overall noise and air-over-pressure from the blast
Blast small horizontal and vertical sections	By taking smaller sections for each blast, less explosives are needed reducing overall energy related to the blast
Stem the blast holes with dense sand	Stemming is the practice of packing the top portions of the blast holes with sand after the charge is loaded. This helps to force the energy of the blast into the rock and helps prevent energy from blowing out of the top of the hole, reducing noise and air-over-pressure impacts.
Timing charges to direct blast vibration away from sensitive receivers	Through the use of proper timing, charges can be detonated to direct the transmission of vibration away from sensitive receivers
Source: Explosive Product Divisions Blaster's Handbook, 1989 and Rosenthal, 1987.	

4.1.2 Physical Mitigation Methods

Physical mitigation refers to the placement of a physical barrier between the noise source and receiver. Physical mitigation for blast noise would only be required if blasting is performed in noise sensitive areas. The effectiveness of this measure is dependent upon the mass and density of the barrier which is typically placed directly over the blast location. The goal of this measure is to reduce blast noise levels by up to approximately 15 dB. The blasting methodology anticipated for use during construction of the Pipeline Project would require placement of approximately 10 to 12 pounds of mass per square foot to achieve a reduction of 15 dB. Mass used to cover the blast area may include native or import soil or other material. Covering the blast area with several feet of on-site inert material should be sufficient to mitigate unacceptable noise and air overpressure impacts (Michael Minor & Associates 2008).

Additionally, mass could be added, as necessary, by covering the blast area with layers of blast mats. Blast mats are normally made of old tires or rubber conveyor belts and are very effective

at reducing blast overpressure and noise. Typically, blast mats can weigh as much as 50 pounds per square foot. As shown in Photo 1 below, typical blast mats would require the use of a loader, crane, or heavy-duty forklift to move and place the mats.

Photo 1
Typical Blast Mats Made from Used Tires

4.2 Vibration Mitigation

Particle velocity is a function of the type and size of charge, geologic properties and the distance between source and receptor. Blast induced vibration is best managed by proper blast design. Use of proper charge size and detonation sequence will help ensure vibration levels are managed within appropriate specifications to reduce vibration related impacts.

The current industry accepted PPV limit for blasting near in-service pipelines is 4 inches per second adjacent to the pipeline. Whenever blasting near third-party pipelines and other underground facilities, the more stringent of 4 inches per second or the requirements of the third-party operating company shall be implemented. For aboveground structures (including water wells), the peak particle velocity shall not exceed 2 inches per second.

For all aboveground facilities within 200 feet of blasting operations, additional seismograph equipment shall be used to monitor PPV at the aboveground facility. If the measured PPV at an existing pipeline or other structure exceeds the limits outlined above, blasting activities shall immediately cease. All potentially affected facilities will be inspected and the blasting plan will be modified to reduce the PPV prior to any further blasting. All aboveground facilities within 200 feet shall be inspected before and after all blasting activities.

If blasting occurs within 200 feet of identified water wells or potable springs, water flow performance and water quality testing will be conducted before blasting. If the water well is damaged, the well owner will either be compensated for damages or a new well will be provided.

When blasting near aboveground structures, charge size shall be in accordance with the scaled distance (SD) factor guidelines provided by the Office of Surface Mining Reclamation and Enforcement (OSMRE). For distances less than 300 feet, OSMRE states that the SD factor shall exceed 50. The SD factor is equal to the distance from the blast to the above-ground structure divided by the square root of the charge (lb/delay). Listed below (for convenience) are limits on charges as a function of distance in accordance with OSMRE:

Distance from Blast to Structure, ft	Maximum Charge lb/delay
50	1.0
60	1.4
70	2.0
80	2.6
90	3.2
100	4.0
110	4.8
120	5.8
130	6.8
140	7.8
150	9.0
175	12.2
200	16.0

4.3 Fly Rock Mitigation

Fly-rock refers to rock inadvertently thrown from the blast area or construction right-of-way. Mitigation measures to eliminate or reduce fly rock are the same as those used to reduce overpressure and PPV. These measures include using site specific blast plans with proper charge size, spacing, placement and sequence. In addition, blasting mats or padding shall be used on all shots where necessary to prevent scattering of loose rock onto adjacent property and to prevent damage to nearby structures and overhead utilities.

4.4 In-Water Blasting

It is not anticipated that in-water blasting will be required during construction of the Pipeline Project. However, blasting may occur near water bodies or within dry streambeds.

PCGP may opt to blast stream crossing locations where consolidated rock makes traditional trenching methods unfeasible or costly. Explosives detonated near water may produce shock waves that generate hydrostatic pressure changes lethal to fish, eggs, and larvae (British Columbia Ministry of Transportation 2000). Shock waves propagated from ground to water are less lethal to fish than in water explosions since some energy is reflected or lost at ground-water interface (Alaska Department of Fish and Game 1991).

In order to limit the instantaneous hydrostatic pressure change (resulting from nearby blasting) to levels below those known to be harmful to fish and aquatic species, the types of explosives, size of charges, sequence of firing, etc. will be selected to minimize shock wave stresses on aquatic life adjacent to the blasting area.

The Alaska Department of Fish and Game (1991) reported that a pressure change of 2.7 psi is the level for which no fish mortality occurs and concluded that fish would be sufficiently protected from blasting by limiting overpressures to 2.7 psi. This conservative overpressure limit, is from 1.7 to 4.5 psi below mortality levels reported in other studies. The Alaska Department of Fish and Game (1991) further analyzed the straight line distances through rock and other materials for which various charge weights dissipated to an overpressure standard of 2.7 psi. This study concluded that overpressures generated by 1 to 2 pound charges detonated

in rock diminish to 2.7 psi at distances of 34 and 49 feet, respectively. This distance is further reduced if soil exists between the charge location and the receptor location.

When using the dam-and-pump or flume stream crossing method, the typical construction right-of-way configuration at a streambed (dry open-cut) crossing will be no less than 25-feet on one side of the pipe trench and 50+ feet on the opposite side of the pipe trench depending on the construction right-of-way width at the stream crossing (75 or 95 feet). Therefore, an area within the waterbody crossing approximately 25-feet wide (in the worst case scenario) may be exposed to instantaneous hydrostatic pressure changes above 2.7 psi.

When using the diverted open-cut stream crossing methodology at the South Umpqua River crossing locations, the construction right-of-way will be more amenable to the setback distances with an approximate 50-feet of construction right-of-way on both sides of the trench. However, as the trench proceeds across the stream bed, the trench blasting will approach the diverted portion of the stream crossing. This will likely result in blasting right up to the bladder dam edge which is used to divert the stream flow.

If instantaneous hydrostatic pressure differentials cannot be maintained at acceptable levels during construction in critical habitat locations, additional mitigation measures, such as modified blast design or bubble curtains may be employed. Bubble curtain mitigation involves the use of bubblers placed within the waterbody between the source and receptor to help attenuate pressure changes. Additionally, where blasting may need to occur within stream beds, mitigation measures to minimize impacts to aquatic species are provided in the Fish Salvage Plan included as Appendix L to the POD.

5.0 QUARRY BLASTING

The foregoing sections of this document serve to address blasting measures to be implemented by PCGP during construction. The purpose of this Section is to address concerns related to third party blasting conducted in the vicinity of the operational Pipeline. PCGP will evaluate blast plans and conduct monitoring (as necessary) within 200 feet of the pipeline for general construction activity, quarries, utility construction and test facilities, and within 1,500 feet for any large surface mining activities to help ensure the safety and integrity of the pipeline. This policy is common within the gas transmission industry. Oregon One Call laws and Oregon Occupational Safety and Health Division Administrative Rules will help ensure proper notifications are made prior to commencement of blasting operations.

The Agency managed Heppsie Mountain and Peavine quarries are located in the proximity of the Pipeline alignment. Although not currently active, both quarries are identified as regional rock product sources and are retained for future development. PCGP visited these sites with Agency personnel and a third party contract blaster and developed sample blast plans for each quarry (see Attachment A and Attachment B). The sample blast plans were developed as “most likely” scenarios and were evaluated for compliance with PCGP’s specifications. The sample blast plans and analysis indicate future rock production could be safely accomplished using conventional blasting practices and without harm to the in-service pipeline.

Similar to pipeline blasting, quarry blasting is accomplished using charges in multiple holes detonated individually in a patterned sequence. This is necessary to achieve proper rock breakage and displacement. This type of patterned blast is therefore a series of small detonations rather than one large cumulative blast and produces a series of pressure waves rather than one large cumulative wave. The analysis of an in-service pipeline subjected to blasting effects considers each individual pressure wave, provided the timing delay between

each charge is sufficient. For a fixed location and type of explosive, the charge weight detonated per delay is the governing factor in pipe stress analysis. The other parameters used in the analysis of blasting near in-service pipelines include the physical properties and operating condition of the pipeline, the manufacturer, type and energy release ratio of the explosive, the maximum weight of explosive detonated per delay and geologic conditions.

If rock harvesting is required on federal lands in proximity to the Pipeline, a blast plan will be developed by the blasting contractor and will incorporate the necessary federal and industry specifications and stipulations. The blasting contractor will customize the blast plan to suit his equipment, strategy and desired yield volume. Once the final plan has been developed, PCGP and the federal agencies will review and accept the plan to ensure the proper guidelines have been met. If necessary, the parameters of a blast plan may generally be altered as long as the maximum charge weight per delay does not exceed a threshold limit.

The following bullet list illustrates the normal industry practice for development and acceptance of a blast plan. The blaster will develop his own blast plan to safely satisfy his contract requirements in compliance with the owner's blasting specifications. The normal procedure is as follows;

- The blasting contractor submits a general blast plan to the owner in compliance with the owner's blasting specifications.
- The owner or owner's blasting consultant and affected parties audit the submitted blast plan and approves or disapproves with comments and/or suggestions.
- With disapproval, the blaster resubmits, or goes to work with an owner approved blast plan.
- Following the blast, the blaster would submit a blast report showing the actual conditions of the blast in compliance with the owner's blasting specifications.

The blaster needs to write the final blast plan in compliance with the owner's blasting specifications. Only the blaster knows what type of drill will be used, what the shot rock will be used for and what size equipment will be used to excavate and handle material.

Although ANFO will not be used during pipeline right-of-way and ditch construction, ANFO is proposed for use during quarry blasting operations.

Following installation and commissioning of the Pipeline Project, the following Oregon Occupational Safety and Health Division Administrative Rules will apply: "Blasting operations in the proximity of overhead power lines, communication lines, utility services, or other services and structures shall not be carried on until the operators and/or owners have been notified and measures for safe control have been taken (Oregon Administrative Rules Oregon Occupational Safety and Health Division 1926.900(o))."

5.1 Heppsie Mountain Quarry

PCGP is aware of the BLM's intention to preserve the Heppsie Mountain quarry site as a potential source for rock and aggregate products, and has implemented measures to help ensure the future availability of this mineral resource. The original Pipeline alignment followed a two track road through the quarry area, bisecting the quarry. The alignment has since been moved down slope to avoid future concerns regarding lost production volumes and land stability. The nearest portion of the pipeline to the perceived quarry location is approximately 88 feet from exploratory boring BH-5 (see Figure 1 in Attachment A). The results of this boring suggest this is the practical limit of mineable rock products. Moreover, PCGP has reviewed

existing bore logs and visited the site with blasting consultants to evaluate potential post installation impacts to mining operations or the pipeline.

Although PCGP has developed and analyzed sample blast plans and determined quarry development could be completed without harm to the in-service pipeline, the BLM requires that the Heppsie Mountain Quarry be shot prior to the installation of the pipeline. The resultant blasted rock will have dimensions of 24 inches or less. A map of the quarry indicating the area to be shot (outlined in blue), as well as cross sections of the quarry, are attached as Attachment A. These cross sections display the elevation, length and width of the quarry floor after the shot is completed. Once shot, the blasted rock will remain in place for future use as determined by the BLM.

The BLM is requiring this blasting because the BLM will not assume unknown risk associated with complications, limitations, or liability associated with developing this quarry in the future. The BLM will provide compensation to PCGP for all work associated with pre-blasting the Heppsie Mountain Quarry prior to the start of construction.

PCGP shall notify the Authorized Officer of the Medford BLM at least seven days prior to commencing quarry blasting operations. PCGP will be responsible for all blasting related activity conducted for the Pipeline Project.

5.2 Peavine Quarry

It is PCGP's understanding that all developed rock material at the existing Peavine Quarry has been utilized. Additional undeveloped resources have been identified at this site, including the rock knoll to the northeast of the existing pit. The minimum distance between the proposed rock source development area and the centerline is approximately 200 feet (see Figure 2 in Attachment B). PCGP visited the site with 3B Blast Consulting, Inc. to evaluate likely blasting scenarios and potential impacts to the in-service Pipeline. It is not anticipated that presence of the pipeline will hinder or impede rock products development at this site.

Notifications triggered by Oregon One Call laws and Oregon Occupational Safety and Health Division Administrative Rules will be made to PCGP prior to drilling and blasting operations within the Quarry. If blasting operations are to be conducted within 200 feet of the in-service Pipeline, PCGP will require the opportunity to review and approve all blast plans prior to blasting. Seismic monitoring may also be required to help ensure continued safe operating conditions for both Pacific Connector and the Peavine Quarry. All costs associated with these additional monitoring and safety control measures at the Peavine quarry, required by the Company, shall be borne by PCGP.

6.0 SAFETY

6.1 Personnel Safety

Personnel safety is of paramount importance when conducting blasting operations. The following practices and procedures shall be strictly followed to help ensure safety of all persons, including the general public.

Only authorized, qualified, and experienced personnel shall handle explosives.

Smoking, firearms, matches, open flames, and heat-and-spark-producing devices shall be prohibited in or within 50 feet of explosive magazines or while explosives are being handled, transported, or used. No explosive material shall be located or stored where they may be

exposed to flame, excessive heat, sparks, or impact. Additional considerations and measures are discussed in the Fire Prevention and Suppression Plan included as Appendix K to the POD.

A code of blasting signals shall be established and posted in conspicuous places. Employees, construction personnel, and visitors shall learn and use this code.

Contractor shall use every reasonable precaution including, but not limited to, visual and audible warning signals, warning signs, flag person, and barricades to ensure personnel safety.

Warning signs, with lettering a minimum of 4-inches in height on a contrasting background will be erected and maintained at all approaches to the blast area. Flaggers will be stationed on all roadways passing within 1,000 feet of the blast area to stop all traffic during blasting operations.

An audible blasting signal (air horn or siren) shall be sounded 5 minutes before and after each blast.

Blasting operations shall be conducted only during daylight hours.

Holes shall not be re-drilled which have contained explosive material. Holes shall not be drilled where danger exists of intersecting another hole containing explosive material.

Blasting shall not begin until occupants of nearby buildings, stores, residences, places of business, places of public gathering, and farmers have been notified by the Company sufficiently in advance to protect personnel, property, and livestock. Company shall notify all such occupants at least 72 hours prior to blasting.

No loaded blast holes shall be left unattended or unprotected. No explosives shall be abandoned. No loaded blast holes shall be left overnight.

In the case of a misfire, the blaster shall provide proper safeguards for personnel until the misfire has been re-blasted or safely removed.

All loading and blasting activity shall cease and personnel in and around the blast area will retreat to a position of safety, during the approach and progress of an electrical storm irrespective of the type of explosives or initiation system used. This is a key safety precaution and will always be observed. All explosive materials and all non-electric initiation systems are susceptible to premature initiation by lightning.

No drilling may commence near a previous blast area until such blast area has been inspected to verify the absence of misfires. If a misfire occurs adjacent to a hole to be drilled, the misfire is cleared by the blaster using whatever techniques are called for by the situation prior to commencement of drilling. Should a misfire occur at some distance from the drilling area, drilling may be stopped while clearing preparations are underway. When the misfire is to be cleared by reshooting, drilling will be shutdown and personnel evacuated to a place of safety prior to detonation.

All transportation of explosives will be in accordance with applicable federal, state and local laws and regulations. Any vehicle used to transport explosives shall be in proper working condition and equipped with tight wooden or non-sparking metal floor and sides. If explosives are carried in an open-bodied truck, they will be covered with a waterproof and flame-resistant tarpaulin. Wiring will be fully insulated to prevent short-circuiting, and at least two (2) hand-held

fire extinguishers will be carried. The truck will be plainly marked as to its cargo so that the public may be adequately warned. Metal, flammable or corrosive substances will not be transported in the same vehicle with explosives. There will be no smoking, and unauthorized or unnecessary personnel will not be allowed in the vehicle. Loading and unloading of explosives will be done carefully by competent, qualified personnel.

Metallic slitters will be used to open fiberboard cases, provided the metallic slitter does not come in contact with the metallic fasteners of the case. There will be no smoking, no matches, no open lights, or other fire or flame nearby while handling or using explosives. Explosives will not be placed where they are subject to flame, excessive heat, sparks or impact. Partial cases or packages of explosives will be closed after use. No explosives will be carried in the pockets or clothing of personnel.

No blast will be fired without a positive signal from the "person in charge" or head blaster. This person will have made certain that all surplus explosives are in a safe place; all persons, vehicles, and/or boats are at a safe distance; and adequate warning has been given. Adequate warning of a blast will consist of but not be limited to the following:

- Notification of day and time given to BLM/FS, railroads, highway departments, city engineer, etc. Notification must be given at least 72 hours prior to blasting;
- Notification of homeowners nearby;
- Stopping vehicular and/or pedestrian traffic near the blast site; and
- Signal given by an air horn, whistle or similar device using standard warning signals.

Only authorized and necessary personnel will be present where explosives are being handled or used.

Condition of the hole will be checked with a wooden tamping pole prior to loading. Surplus explosives will not be stacked near working areas during loading. Detonating fans will be cut from spool before loading the balance of charge into the hole. No explosives will be forced into a bore hole past an obstruction. Loading will be done by a blaster holding a valid license or by construction personnel under his direct supervision.

6.2 Storage of Explosives

Explosive materials shall not be stored on Federal land without prior written permission from the BLM/FS. Copies of this permission shall be posted on each magazine and a copy given to the construction Chief Inspector.

All explosives and initiation devices shall be stored in locked magazines that have been located, constructed, approved, and licensed in accordance with federal, state, and local regulations. Magazines shall be dry, well ventilated, reasonably cool (painting of the exterior with a reflective color), bullet and fire resistant, and kept clean.

Magazine location shall be in accordance with federal, state, and local regulations. Where no regulations apply, magazines shall be located in accordance with the latest edition of the 175th anniversary edition of the Blaster's Handbook and ATF P5400-7 "Explosives Law and Regulations" (Bureau of Alcohol, Tobacco and Fire Arms).

Magazines shall be marked in minimum 3-inch high letters with the words "DANGER – EXPLOSIVES." Signs shall be staked 10' away from and at a 45-degree angle to the magazine.

Placement and angle should insure that a bullet fired perpendicular to the face of the sign does not penetrate the magazine.

Initiation devices shall not be stored in the same box, container or magazine with other explosives. Explosives and initiation devices shall not be stored in wet or damp areas; near oil, gasoline, cleaning solvents; near sources of heat, radiators, steam pipes, stoves, etc. No metal or metal tools shall be stored in the magazine. There shall be no smoking, matches, open lights, or other fire or flame inside or within 50 feet of storage magazines or explosive materials. The loading and unloading of explosive materials into or out of the magazine shall be done in a professional manner with no loitering, horseplay, or prank-playing.

Magazines shall be kept locked at all times unless explosives are being delivered or removed by authorized personnel. Admittance shall be restricted to the magazine keeper, blasting supervisor, or licensed blaster. Magazine construction shall meet the requirements of ATF P5400.7 “Explosives Law and Regulations” (Bureau of Alcohol Tobacco and Fire Arms) and all applicable federal, state, and local regulations.

Accurate and current records shall be kept of the explosive material inventory to ensure that oldest stocks are utilized first, satisfy regulatory requirements and for immediate notification of any loss or theft. Magazine records shall reflect the quantity of explosions removed, the amount returned, and the net quantity used at the blasting site. Recordkeeping shall comply with the applicable regulations of the BATF and the Department of Homeland Security.

When explosive materials are taken from the storage magazine they shall be kept in the original containers until used. Small quantities of explosive materials may be placed in day boxes, powder chests or detonator boxes. Any explosive material not used at the blast site shall be returned to the storage magazine and replaced in the original container as soon as possible.

7.0 REFERENCES

Alaska Department of Fish and Game. 1991. Rationale for Blasting Standards (11 AAC 95) Developed to Prevent Explosive Injury to Fish. Alaska Department of Natural Resources Office of Habitat Management and Permitting.

Explosives Product Division. *Blasters' Handbook.* 1989. 16th edition Wilmington, Delaware: E.I. du Pont de Nemours & Co., Inc.

GeoEngineers, 2017. Geologic Hazards and Mineral Resources Report. Pacific Connector Gas Pipeline Project. Coos Bay to Malin Oregon. August 21, 2017. Prepared for Pacific Connector Gas Pipeline, LP.

Michael Minor & Associates. 2008. Blasting and Helicopter Noise Analysis & Mitigation Plan. Construction Support Noise Analysis Coos Bay to Malin, Oregon. February 2008. Prepared for Pacific Connector Gas Pipeline, L.P. Portland, Oregon.

Rosenthal, Michael F., and Gregory L. Morlock. 1987. Blasting Guidance Manual. Washington, D.C.: U.S. Department of the Interior, Office of Mining Reclamation and Enforcement.

Attachment A

Heppsie Mountain Quarry

SAMPLE

3B BLAST CONSULTING, INC.

2135 M ROAD, GRAND JUNCTION, CO 81505 PHONE & FAX 970-858-0980

BLAST PLAN

JOB NAME HEPPSIE MTN. QUARRY DATE _____

ADDRESS _____ TIME _____ AM/PM

BLAST NUMBER & STATION NUMBER SAMPLE

NAME & LICENSE NUMBER OF BLASTER: _____

SIGNATURE _____ BLAST CREW _____

DIRECTION AND DISTANCE TO NEAREST STRUCTURE PACIFIC CONNECTOR PIPELINE 85' N. OF BLAST

WEATHER CONDITIONS _____

TYPE OF MATERIAL BLASTED	1. BASALT	NUMBER OF HOLES	1. 16	BURDEN 1. 6'	SPACING 1. 6'
	2. _____		2. _____	2. _____	2. _____
HOLE DIAMETER	1. 3" Ø	HOLE DEPTH	1. 22'	STEMMING TYPE 1. CRUSHED ROCK	STEMMING LENGTH 1. 5'
	2. _____		2. _____	SUBDRILL 2'	2. _____

EXPLOSIVES/ACCESSORIES TYPE/BRAND NAME	LBS/UNITS	EXPLOSIVES/ACCESSORIES TYPE/BRAND NAME	LBS/UNITS
ORICA ANFO	704#	30' ORICA HANDI DET 25/50ms	16 ea
ORICA PENTEX CAST BOOSTERS 1/4#	4#	12' ORICA EXEL CONNECTADET 42ms	5 ea

TOTAL POUNDS IN SHOT 708#

MAXIMUM HOLES PER DELAY 1 MAXIMUM LOADED POUNDS PER DELAY 44#

NUMBER OF DECKS PER HOLE N/A LOADED POUNDS PER DECK N/A

INITATION SYSTEM ELECTRIC (NONELECTRIC) BRAND NAME ORICA

BLASTING MACHINE USED SHOTSHELL PRIMER

DELAY PERIODS USED 25 & 42 ms

TOTAL NUMBER OF CAPS OR DELAY CONNECTORS 2/ea

MATS OR OTHER PROTECTION USED YES (NO) TYPE _____

SAMPLE

BLAST PLAN

3B BLAST CONSULTING,INC.

SKETCH OF BLAST LAYOUT

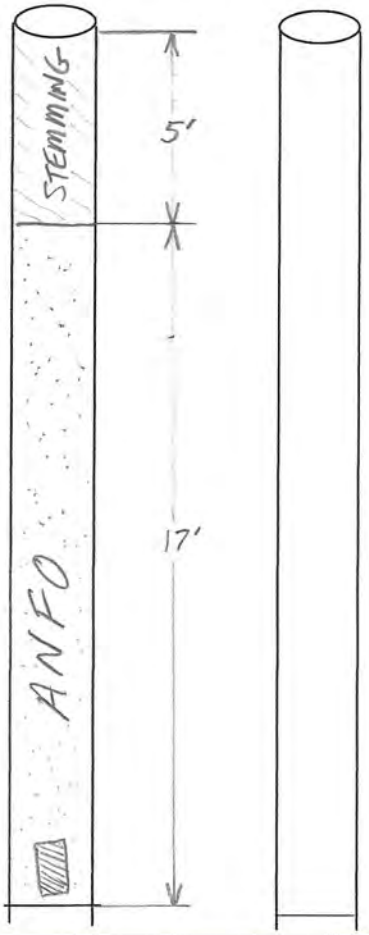
IDENTIFY SHOT LOCATION BY STATION, OR BY DIRECTION AND DISTANCE TO KNOWN STRUCTURE OR OBJECT. SHOW NORTH ARROW. SHOW DELAY NUMBER BY HOLE AND WIRING/CORD/TUBING HOOKUP.

BLAST LOCATION & BLAST NUMBER SAMPLE DATE _____

SEE ATTACHED DRAWING

TYPICAL HOLES

SHOW: DEPTH, STEMMING, DECKS, WATER, PRIMER LOCATIONS, SUBDRILLING, ETC.



DITCH FOOTAGE _____ FEET

QUANTITY OF MATERIAL BLASTED 432 CUBIC YARDS
1,088 TONS

POWDER FACTOR: 1.6 LBS/CUBIC YARD
___LBS/TON

SEISMOGRAPH RESULTS (IF USED, RECORDS ATTACHED)

TYPE _____ NAME OF OPERATOR _____ COMPANY _____

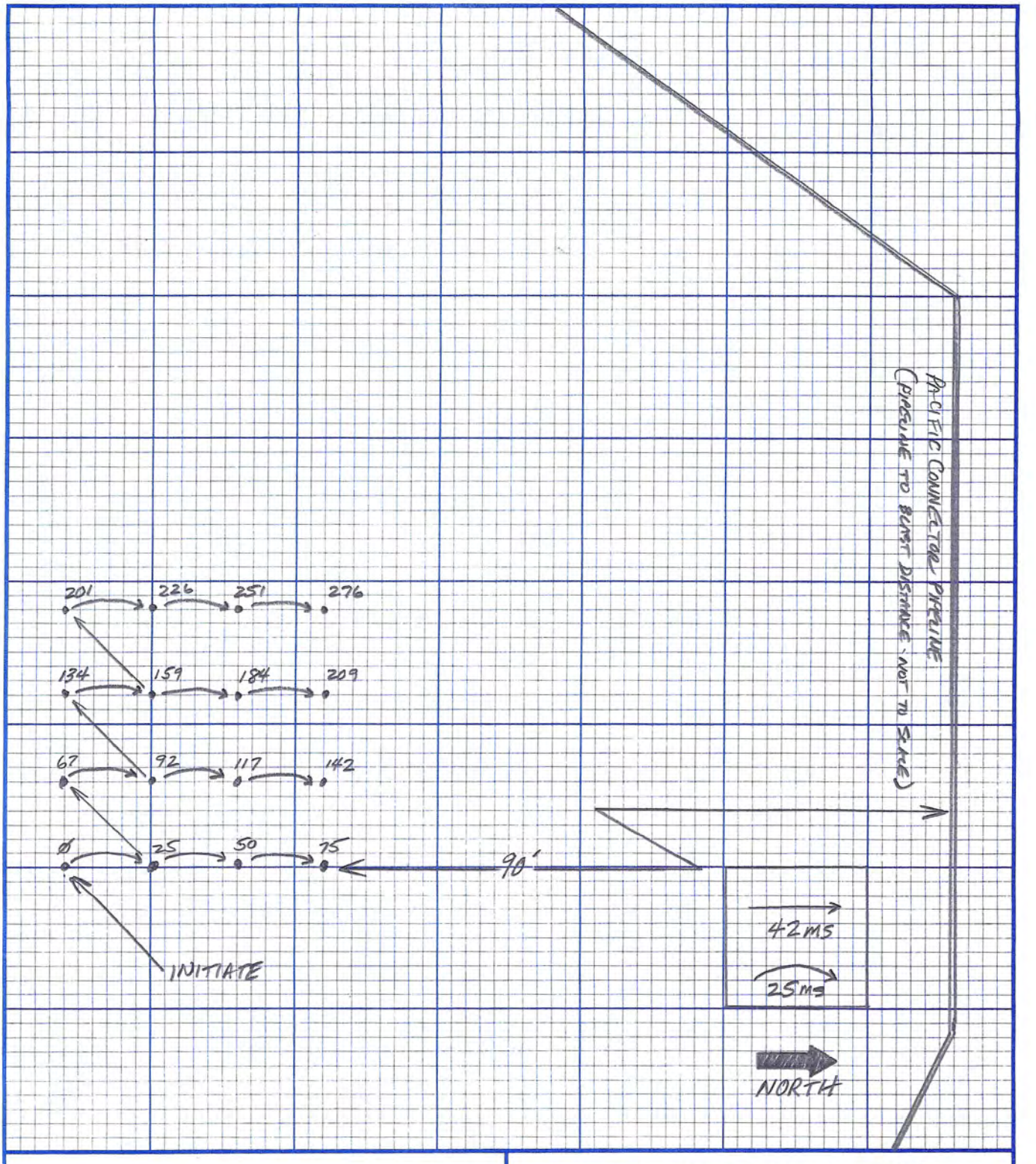
LOCATION OF SETUP _____ DISTANCE FROM BLAST SITE _____ DIRECTION FROM BLAST SITE _____

PEAK PARTICLE VELOCITY _____ MEASUREMENTS _____ TRANSVERSE _____ VERTICAL _____ LONGITUDINAL PEAK SOUND PRESSURE _____

SHOT RESULTS

FRAGMENTATION _____ MUCKPILE _____ FLYROCK _____

COMMENTS _____



3B Blast Consulting, Inc.

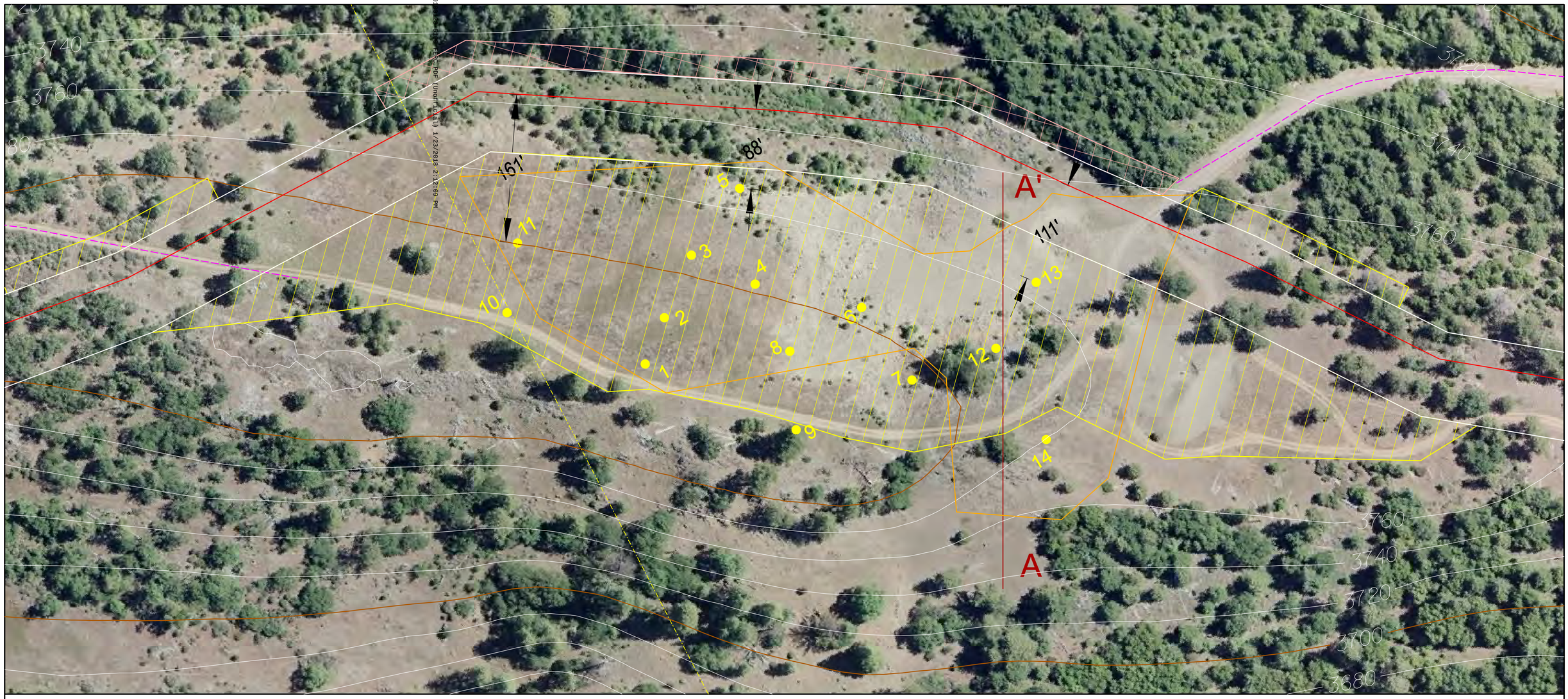
2135 M Road
Grand Junction, Colorado 81505
Office (970) 858-0980
Cell (970) 260-6820

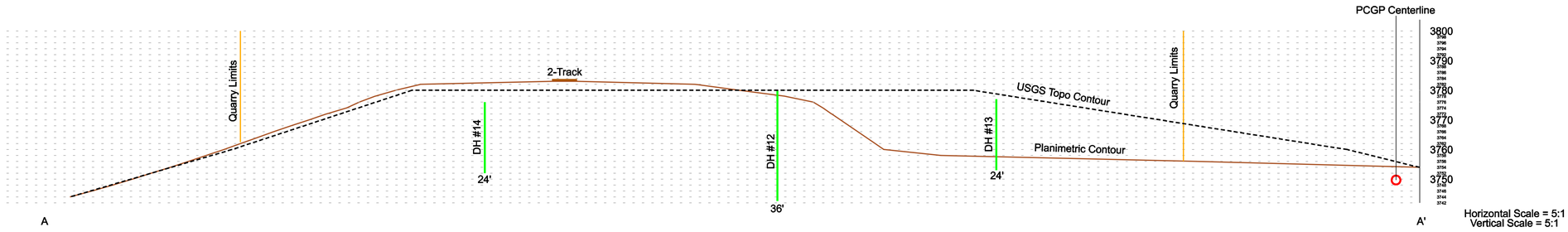
PROJECT: SAMPLE BLAST PATTERN & TIMING DIAGRAM

LOCATION: HEPPSIE MTN. QUARRY

DATE: 11/2/09

10 SCALE





LEGEND

- 36-inch Proposed PCGP Project Construction Right-of-Way
- *(Shown as white on photography)*
- Temporary Extra Work Area
- Uncleared Storage Area
- Tax Parcel Boundaries
- Heppsie Mtn. Quarry Limits
- Bore Holes

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
0	02-21-08	EE	DRAFT RE-ISSUED FOR FERC REVIEW		DD	DD

50 0 50 100 150 FEET

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP
ENVIRONMENTAL ALIGNMENT

BLM HEPPSIE MOUNTAIN QUARRY

Pacific Connector GAS PIPELINE

DRAWN BY: JST	DATE: 01-MAR-2007	ISSUED FOR BID:	
CHECKED BY: JST	DATE: 01-MAR-2007	ISSUED FOR CONSTRUCTION:	
APPROVED BY: EE	DATE: 01-MAR-2007	DRAWING NUMBER: Figure 1	SHEET OF
		$DATE$	
		$FILE$	

Heppsie Mountain Quarry
SAMPLE/DRAFT BLASTING SPECIFICATIONS

PURPOSE

This document is to state Company's procedure for drilling and blasting in the Heppsie Mountain Quarry.

REFERENCES

The blasting specifications incorporate by inclusion and reference to the following publications:

1. The Surface Mining Control and Reclamation Act of 1977 (30 USC 1201).

2. Department of Interior's Office of Surface Mining Reclamation and Enforcement Regulations (30 CFR, Parts 715, 780, 816 and 817).

3. Federal Occupational Safety and Health Standard (29 CFR 1910.109, Explosives and Blasting Agents).

4. BATF, Federal Explosives Law and Regulations (ATF P 5400.7).

5. Blaster's Handbook, ISEE 17th Edition.

6. Explosives Engineering, Construction Vibrations and Geotechnology, by Lewis L. Oriard

7. Department of Interior, Bureau of Mines, RI 9523, Surface Mine Blasting Near Pressurized Pipelines, Report of Investigations/1994

8. Vibration and Ground Rupture Criteria For Buried Pipelines, by Lewis L. Oriard

DEFINITIONS

Airblast – The airborne shock wave or acoustic transient generated by an explosion.

ANFO – A blasting agent containing no essential ingredients other than prilled ammonium nitrate and fuel oil.

Blast (Blasting) - The firing of explosive materials for breaking rock.

Blast Area – The area of a blast within the influence of flying rock missiles, gases, and concussion.

Blast Hole (Drill Hole, Bore Hole) – A hole drilled in the material to be blasted for the purpose of containing an explosive charge.

Blasting Contractor – The contractor performing the blasting.

Blaster-in-Charge – The person qualified to be in charge of and responsible for the loading and firing of a blast.

Blasting Vibrations – The energy from a blast that manifests itself in vibrations, which are transmitted through the earth away from the immediate blast area.

Burden – The distance from the borehole and the nearest free face or the distance between boreholes measured perpendicular to the spacing. Also the material to be blasted by a given hole.

Collar – The mouth or opening of a borehole.

Column Charge – A charge of explosives in a blasthole in the form of a long continuous or unbroken column

Company –Pacific Connector Gas Pipeline, LP.

Company Engineer – The PCGP assigned Engineer.

Company Representative – The Company Line Supervisor, Area Maintenance Supervisor, Assigned Inspector, or Administrator who is responsible for investigating the proposed blasting as set forth below.

Cutoff – A break in a path of detonation or initiation caused by extraneous interference, such as flyrock or shifting ground.

Deck Loading (Decking) – A method of loading explosives in which the explosive charges called decks or deck charges, in the same hole, are separated by stemming or an air cushion.

Delay – A distinct pause of predetermined time between detonation or initiation impulses to permit the firing of explosive charges separately.

Density – The mass of an explosive per unit volume, usually expressed in grams per cubic centimeter or pounds per cubic foot.

Detonating Cord – A flexible cord containing a center core of high explosive, which may be used to initiate other high explosives.

Detonator – Any device containing an initiating or primary explosive that is used for initiating detonation in another explosive material.

Dynamite – A high explosive used for blasting, consisting essentially of a mixture of, but not limited to nitroglycerin, nitrocellulose, ammonium nitrate, sodium nitrate, and carbonaceous materials.

Emulsion – An explosive material containing substantial amounts of oxidizer dissolved in water droplets, surrounded by immiscible fuel, or droplets of an immiscible fuel surrounded by water containing substantial amounts of oxidizer.

Facility – Pipelines and their appurtenances, including, but not limited to, buildings, pump houses, warehouses, etc.

Flyrock – Rocks propelled from the blast area by the force of the explosion.

Ground Vibration – Shaking the ground by elastic waves emanating from a blast; usually measured in inches per second of peak particle velocity.

Inhabited Buildings – A building regularly occupied in whole or part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other structure where people are accustomed to assemble.

Nonelector Detonator – A detonator that does not require the use of electric energy to function.

Particle Velocity – A measure of the intensity of ground vibration, specifically the velocity of motion of the ground particles as they are excited by the wave of energy.

Powder Factor – The amount of explosive used per unit of rock.

MAOP – Maximum Allowable Operating Pressure

Scaled Distance – A factor relating similar blast effects from various charges of explosive material at various distances.

Spacing – The distance between boreholes. In bench blasting, the distance is measured parallel to the free face and perpendicular to the burden.

Stemming - Inert material placed in a borehole on top of or between separate charges of explosive material. Used for the purpose of confining explosive materials or to separate charges of explosive material in the same borehole.

Subdrilling – The practice of drilling boreholes below floor level or working elevation to insure breakage of rock to working elevation.

For additional blasting terminology, refer to Blaster's Handbook, ISEE 17th Edition.

POLICY

Before any blasting is permitted, the blasting contractor will submit a blast plan to the BLM. No blasting will be permitted until the BLM and PCGP accept the blast plan. If an unsuitable blast is performed, the BLM, in consultation with the Company representative, may require that a new blast plan be submitted for BLM/ Company acceptance before drilling and blasting resumes.

The blasting contractor will be responsible for the blast plan and all blasting related activity shall be in compliance with all regulatory agencies.

The BLM, in consultation with the Company, will, at all times, have the authority to prohibit or halt the contractor's blasting operations if it is apparent that, through the methods being employed, the blasting specifications are not being employed, regulations are not being followed, or unsuitable blasting results are being obtained.

BLASTING CONTRACTOR DATA

1. Name, address, phone numbers
2. Contact person, phone numbers
3. BATF Permit
4. State &and local permit(s), if applicable
5. Insurance as required

BLAST PLAN

Acceptance of the blast plan by the BLM/Company does not relieve the contractor of his responsibility for the accuracy and adequacy of the plan when implemented in the field. The blast plan shall contain full details of the drilling and blasting patterns and controls that the contractor proposes to use.

The blast plan will be reviewed and signed by the blaster- in -charge to acknowledge his understanding and compliance with the plan.

The blast plan shall contain the following minimum information:

1. Resume, references & licenses of blaster-in-charge.
2. Anticipated number of holes to be drilled and shot per blast.
3. Scaled plan and section views of the proposed drill pattern including free face, burden, spacing, blast hole diameter, blast hole angles, cut depth and subdrill depth.
4. Scaled loading diagram showing the type and amount of explosives, primers, initiators and location and depth of stemming, including the material to be used as stemming. Maximum amount of explosives to be used per delay and per blast.
5. A diagram and explanation of the initiation sequence of blast holes including delay times for each blast hole. The type of delay system.
6. Manufacturer's product information sheets and material safety data sheets for all explosives, primers, delays and initiators to be used.
7. Sample of blast report to be used.
8. Vibration and airblast monitoring plan to include:
    a. Description of blast monitoring equipment and list if individuals that will operate such equipment
    b. Calibration records

9. Description of flyrock controls
10. Method of handling misfires or cut-offs
11. Complete description of the clearing and guarding procedures that will be used to ensure employees, company representatives, visitors and the general public are restricted to safe locations and accounted for during blasting. This description shall include, but not be limited to:
    a. Visible and audible warning signs and signals
    b. Access blocking methods
    c. Guard placement and release procedure
    d. Primary initiation procedure
    e. System by which the blaster-in-charge will communicate with right of way security guards
15. Description of explosives storage to include:
    a. Approval of BATF, stage agency and local fire department (if applicable) and landowner
    b. Inventory control and documentation

c. Control of explosives on the right of way to prevent theft
d. Magazine location

16. Description of explosives and accessories transportation procedure.
17. Fire Prevention and Suppression Plan

BLAST REPORT

A record of each blast will be kept on file and submitted with the seismograph report to the company representative not later than the next workday after the blast, and before the next blast. The blast report shall contain at least the following minimum data as applicable:

1. Name of blasting contractor
2. Exact location of the blast, date and time of detonation
3. Type of material blasted
4. Number of holes, burden and spacing
5. Diameter and depth of holes
6. Types of explosives used
7. Total amount of each explosive used
8. Maximum amount of explosives and holes detonated within 8 milliseconds
9. Method of firing type and circuit
10. Direction, distance in feet and identification of the nearest facility, pipeline or inhabited building
11. Weather conditions
12. Type and height or length of stemming
13. A statement as to whether mats or protection against flyrock were used
14. Type of delay caps used and delay periods used
15. The person taking the seismograph reading shall accurately indicate exact location of the geophone placement and shall show the distance of the seismograph from the blast
16. Seismograph records
17. Sketch of blast pattern, including number of holes, burden and spacing distance, delay pattern, and if decking is used, a hole profile.

BLASTING OPERATIONS

1. All blasting operations, including the transport, storage, handling, and loading of explosives shall be performed under the direct supervision of the blaster-in-charge and in accordance with all Federal, State, and local regulations. The blaster-in-charge must be authorized to act on behalf of the blasting contractor and be licensed by the applicable regulatory agencies to possess, transport and use explosives.

2. Blast holes shall be drilled on the patterns shown on the blast plan and shall not exceed 3” in diameter unless approved by the BLM/Company.
3. 52 pounds of explosives per 8 millesecond delay shall be the maximum charge weight allowed.
4. Hole plugs shall be placed in the blast holes as they are drilled to prevent overburden, drill cuttings or other foreign material from falling into the holes after drilling.
5. Cap and fuse initiation shall not be allowed.
6. A nonelectric, surface delay and in-hole detonator initiation system shall be used (Example: Handidet, EZ Det) for sequential initiation of charges. *One hole per delay shall be initiated.*
7. Clean, 3/8” minus angular crushed rock stemming material shall be used in all blastholes. Drill cuttings shall not be allowed for use as stemming.
8. Vibration and Airblast:
    a. All blasts shall be monitored. The geophone shall be placed on undisturbed ground on the side closest to the blast on the Pacific Connector Gas Pipeline. The geophone placement shall comply with standards discussed in Chapter 38: Vibration and Airblast, of the ISEE Blaster’s Handbook, 17th Edition.
    b. Vibration limits for buried pipelines shall be 4 inches per second peak particle velocity.
    c. The Blaster shall be responsible for vibration and airblast monitoring. If the specified vibration and airblast limits are exceeded, the blast plan shall be revised and drilling and blasting operations will be terminated until acceptance of the revised blast plan is granted by the BLM in consultation with the Company.

Attachment B

Peavine Quarry

SAMPLE

3B BLAST CONSULTING, INC.

2135 M ROAD, GRAND JUNCTION, CO 81505 PHONE & FAX 970-858-0980

BLAST PLAN

JOB NAME PEAVINE ROCK QUARRY DATE

ADDRESS TIME AM/PM

BLAST NUMBER & STATION NUMBER SAMPLE

NAME & LICENSE NUMBER OF BLASTER:

SIGNATURE BLAST CREW

DIRECTION AND DISTANCE TO NEAREST STRUCTURE PACIFIC CONNECTOR PIPELINE OVER 200' N. OF CLOSEST HOLE

WEATHER CONDITIONS

TYPE OF MATERIAL BLASTED	1. BASALT	NUMBER OF HOLES	1. 150	BURDEN 1. 8'	SPACING 1. 8'
	2.		2.	2.	2.
HOLE DIAMETER	1. 4" Ø	HOLE DEPTH	1. 22'	STEMMING TYPE 1. CRUSHED ROCK	STEMMING LENGTH 1. 7'
	2.		2.	SUBDRILL 2'	2.

EXPLOSIVES/ACCESSORIES TYPE/BRAND NAME	LBS/UNITS	EXPLOSIVES/ACCESSORIES TYPE/BRAND NAME	LBS/UNITS
ORICA ANFO	10,350#	30' ORICA EXEL HANDIDET 25/9oms	150
ORICA PENTEX CAST BOOSTER 1/4#	37.5#	12' ORICA EXEL CONNECTADET 42MS	31

TOTAL POUNDS IN SHOT 10,387.5#

MAXIMUM HOLES PER DELAY 1 MAXIMUM LOADED POUNDS PER DELAY 69#

NUMBER OF DECKS PER HOLE N/A LOADED POUNDS PER DECK N/A

INITATION SYSTEM ELECTRIC (NONELECTRIC) BRAND NAME ORICA

BLASTING MACHINE USED SHOTSHELL PRIMER

DELAY PERIODS USED 25 & 42 MS

TOTAL NUMBER OF CAPS OR DELAY CONNECTORS 181

MATS OR OTHER PROTECTION USED YES (NO) TYPE

SAMPLE

BLAST PLAN

3B BLAST CONSULTING,INC.

SKETCH OF BLAST LAYOUT

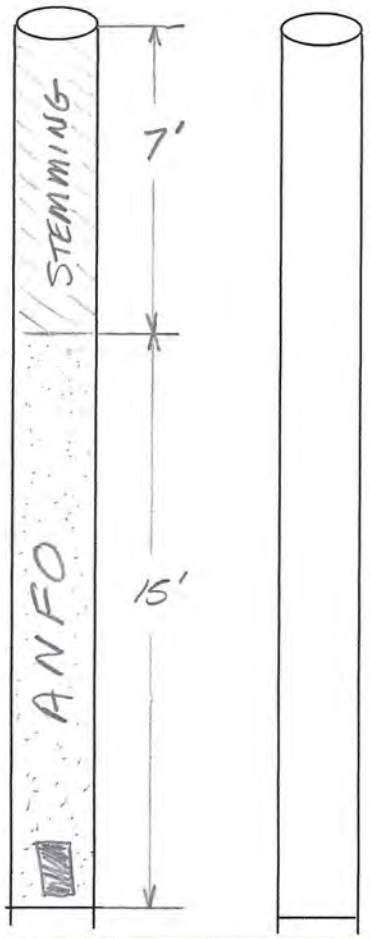
IDENTIFY SHOT LOCATION BY STATION, OR BY DIRECTION AND DISTANCE TO KNOWN STRUCTURE OR OBJECT. SHOW NORTH ARROW. SHOW DELAY NUMBER BY HOLE AND WIRING/CORD/TUBING HOOKUP.

BLAST LOCATION & BLAST NUMBER SAMPLE (PEAVINE QUARRY) DATE _____

SEE ATTACHED DRAWING

TYPICAL HOLES

SHOW: DEPTH, STEMMING, DECKS, WATER, PRIMER LOCATIONS, SUBDRILLING, ETC.



DITCH FOOTAGE _____ FEET

QUANTITY OF MATERIAL BLASTED 2,050 CUBIC YARDS

18,000 TONS

POWDER FACTOR: 1.47 LBS/CUBIC YARD

___LBS/TON

SEISMOGRAPH RESULTS (IF USED, RECORDS ATTACHED)

TYPE _____ NAME OF OPERATOR _____ COMPANY _____

LOCATION OF SETUP _____ DISTANCE FROM BLAST SITE _____ DIRECTION FROM BLAST SITE _____

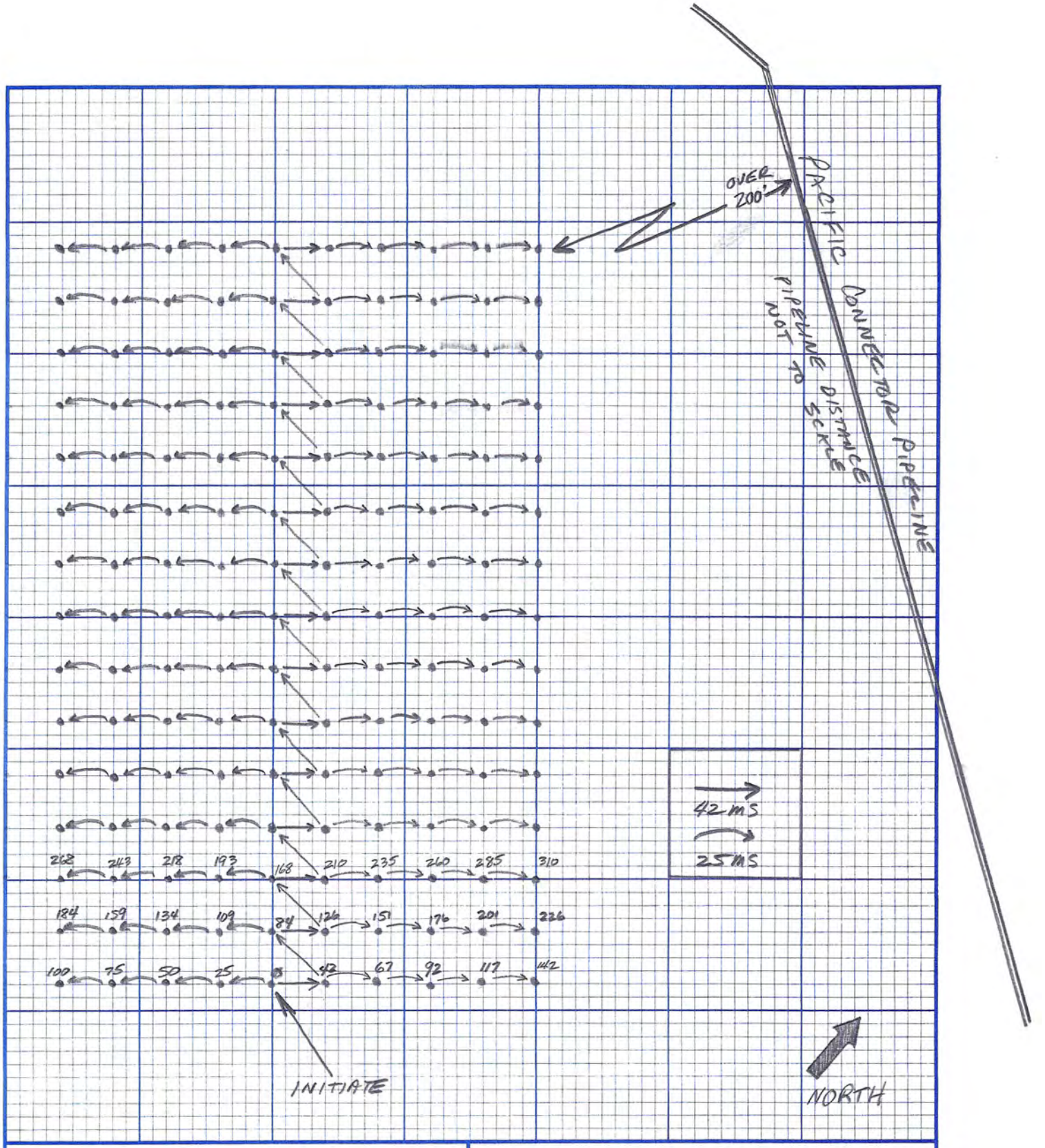
PEAK PARTICLE VELOCITY _____ MEASUREMENTS _____ TRANSVERSE _____ VERTICAL _____ LONGITUDINAL

PEAK SOUND PRESSURE _____

SHOT RESULTS

FRAGMENTATION _____ MUCKPILE _____ FLYROCK _____

COMMENTS _____



3B Blast Consulting, Inc.

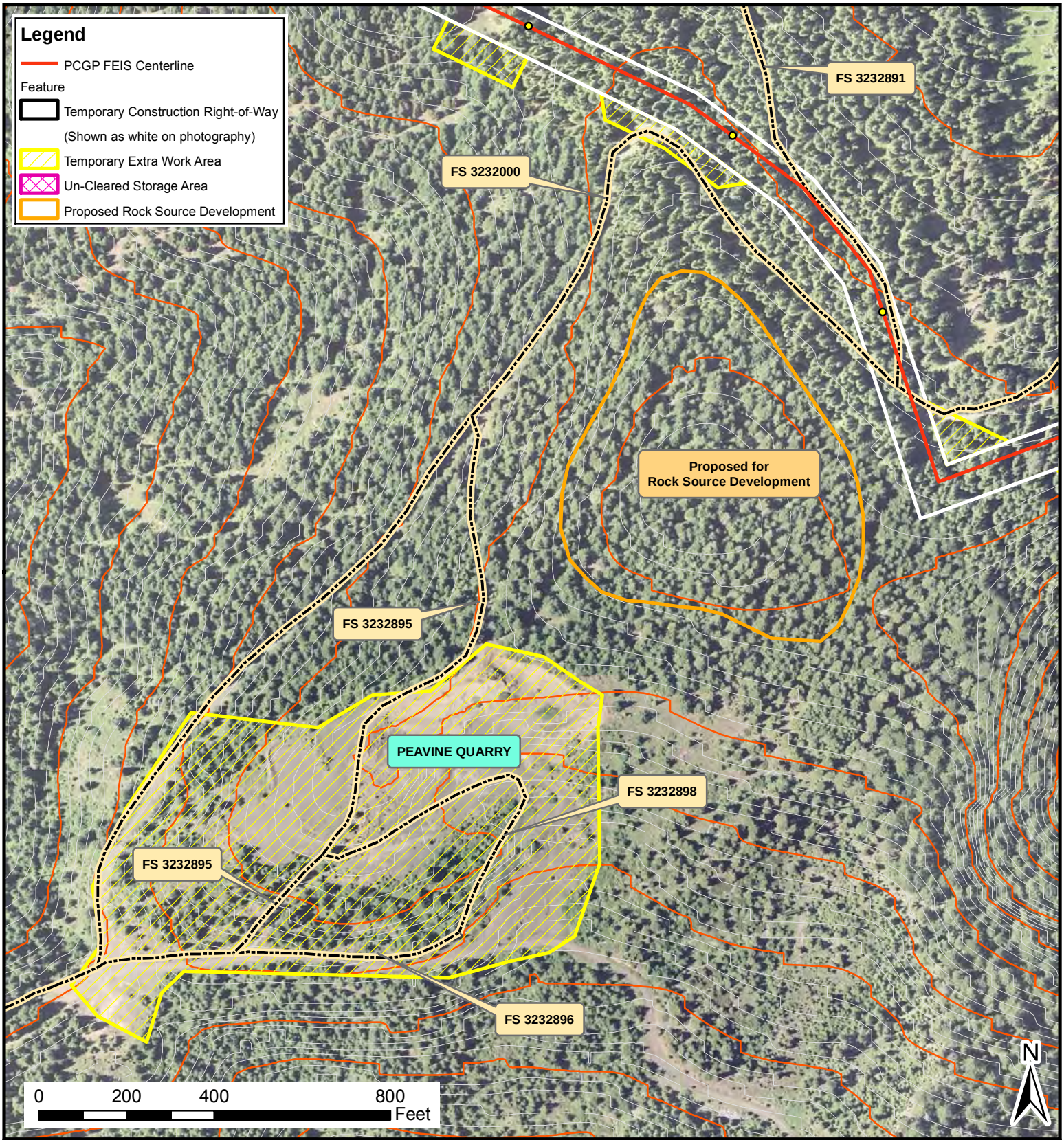
2135 M Road
Grand Junction, Colorado 81505
Office (970) 858-0980
Cell (970) 260-6820

PROJECT: SAMPLE BLAST PATTERN

LOCATION: PEAVINE ROCK QUARRY

DATE: 11/2/09

NO SCALE



DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP

FOREST SERVICE PEAVINE QUARRY

Pacific Connector GAS PIPELINE

NO.	DATE	BY	REVISION NUMBER	W.O. NO.	CHK.	APP
0	03-09-2010	EE	PLAN OF DEVELOPMENT BLASTING PLAN		DD	DD

DWG. BY:	DATE:	ISSUED FOR BID:	SCALE: AS NOTED
CHK BY:	DATE:	ISSUED FOR CONTS:	
APPR. BY:	DATE:	DRAWING NUMBER: **Figure 2**	SHEET OF

Peavine Rock Quarry
SAMPLE/DRAFT BLASTING SPECIFICATIONS

PURPOSE — This document is to state Company's procedure for drilling and blasting in the Peavine Rock Quarry.

REFERENCES — The blasting specifications incorporate by inclusion and reference to the following publications:

1. The Surface Mining Control and Reclamation Act of 1977 (30 USC 1201).
2. Department of Interior's Office of Surface Mining Reclamation and Enforcement Regulations (30 CFR, Parts 715, 780, 816 and 817).
3. Federal Occupational Safety and Health Standard (29 CFR 1910.109, Explosives and Blasting Agents).
4. BATF, Federal Explosives Law and Regulations (ATF P 5400.7).
5. Blaster's Handbook, ISEE 17th Edition.
6. Explosives Engineering, Construction Vibrations and Geotechnology, by Lewis L. Oriard
7. Department of Interior, Bureau of Mines, RI 9523, Surface Mine Blasting Near Pressurized Pipelines, Report of Investigations/1994
8. Vibration and Ground Rupture Criteria For Buried Pipelines, by Lewis L. Oriard
9. Standard Specifications For Construction of Roads and Bridges on Federal Highway Projects, FP03 (U.S. Customary Units), Section 205 – Rock Blasting, and all applicable USFS Supplemental Specifications.

DEFINITIONS — Airblast – The airborne shock wave or acoustic transient generated by an explosion.

ANFO – A blasting agent containing no essential ingredients other than prilled ammonium nitrate and fuel oil.

Blast (Blasting) - The firing of explosive materials for breaking rock.

Blast Area – The area of a blast within the influence of flying rock missiles, gases, and concussion.

Blast Hole (Drill Hole, Bore Hole) – A hole drilled in the material to be blasted for the purpose of containing an explosive charge.

Blasting Contractor – The contractor performing the blasting.

Blaster-in-Charge – The person qualified to be in charge of and responsible for the loading and firing of a blast.

Blasting Vibrations – The energy from a blast that manifests itself in vibrations, which are transmitted through the earth away from the immediate blast area.

Burden – The distance from the borehole and the nearest free face or the distance between boreholes measured perpendicular to the spacing. Also the material to be blasted by a given hole.

Collar – The mouth or opening of a borehole.

Column Charge – A charge of explosives in a blasthole in the form of a long continuous or unbroken column

Company –Pacific Connector Gas Pipeline, LP. (PCGP)

Company Engineer – The PCGP assigned Engineer.

Company Representative – The Company Line Supervisor, Area Maintenance Supervisor, Assigned Inspector, or Administrator who is responsible for investigating the proposed blasting as set forth below.

Cutoff – A break in a path of detonation or initiation caused by extraneous interference, such as flyrock or shifting ground.

Deck Loading (Decking) – A method of loading explosives in which the explosive charges called decks or deck charges, in the same hole, are separated by stemming or an air cushion.

Delay – A distinct pause of predetermined time between detonation or initiation impulses to permit the firing of explosive charges separately.

Density – The mass of an explosive per unit volume, usually expressed in grams per cubic centimeter or pounds per cubic foot.

Detonating Cord – A flexible cord containing a center core of high explosive, which may be used to initiate other high explosives.

Detonator – Any device containing an initiating or primary explosive that is used for initiating detonation in another explosive material.

Dynamite – A high explosive used for blasting, consisting essentially of a mixture of, but not limited to nitroglycerin, nitrocellulose, ammonium nitrate, sodium nitrate, and carbonaceous materials.

Emulsion – An explosive material containing substantial amounts of oxidizer dissolved in water droplets, surrounded by immiscible fuel, or droplets of an immiscible fuel surrounded by water containing substantial amounts of oxidizer.

USFS—Umpqua National Forest

Facility – Pipelines and their appurtenances, including, but not limited to, buildings, pump houses, warehouses, etc.

Flyrock – Rocks propelled from the blast area by the force of the explosion.

Ground Vibration – Shaking the ground by elastic waves emanating from a blast; usually measured in inches per second of peak particle velocity.

Inhabited Buildings – A building regularly occupied in whole or part as a habitation for human beings, or any church, schoolhouse, railroad station, store, or other structure where people are accustomed to assemble.

Nonelector Detonator – A detonator that does not require the use of electric energy to function.

Particle Velocity – A measure of the intensity of ground vibration, specifically the velocity of motion of the ground particles as they are excited by the wave of energy.

Powder Factor – The amount of explosive used per unit of rock.

MAOP – Maximum Allowable Operating Pressure

Scaled Distance – A factor relating similar blast effects from various charges of explosive material at various distances.

Spacing – The distance between boreholes. In bench blasting, the distance is measured parallel to the free face and perpendicular to the burden.

Stemming - Inert material placed in a borehole on top of or between separate charges of explosive material. Used for the purpose of confining explosive materials or to separate charges of explosive material in the same borehole.

Subdrilling – The practice of drilling boreholes below floor level or working elevation to insure breakage of rock to working elevation.

For additional blasting terminology, refer to Blaster's Handbook, ISEE 17th Edition.

POLICY

Before any blasting is permitted, the blasting contractor will submit a blast plan to the Umpqua National Forest. No blasting will be permitted until the USFS and PCGP accept the blast plan. If an unsuitable blast is performed, the FS, in consultation with the Company representative, may require that a new blast plan be submitted for USFS/Company acceptance before drilling and blasting resumes.

The blasting contractor will be responsible for the blast plan and all blasting related activity shall be in compliance with all regulatory agencies.

The USFS, in consultation with the Company, will, at all times, have the authority to prohibit or halt the contractor's blasting operations if it is apparent that, through the methods being employed, the blasting specifications are not being employed, regulations are not being followed, or unsuitable blasting results are being obtained.

BLASTING CONTRACTOR DATA

1. Name, address, phone numbers
2. Contact person, phone numbers
3. BATF Permit
4. State &and local permit(s), if applicable
5. Insurance as required

BLAST PLAN

Acceptance of the blast plan by the USFS/Company does not relieve the contractor of his responsibility for the accuracy and adequacy of the plan when implemented in the field. The blast plan shall contain full details of the drilling and blasting patterns and controls that the contractor proposes to use.

The blast plan will be reviewed and signed by the blaster- in -charge to acknowledge his understanding and compliance with the plan.

The blast plan shall contain the following minimum information:

1. Resume, references & licenses of blaster-in-charge.
2. Anticipated number of holes to be drilled and shot per blast.
3. Scaled plan and section views of the proposed drill pattern including free face, burden, spacing, blast hole diameter, blast hole angles, cut depth and subdrill depth.
4. Scaled loading diagram showing the type and amount of explosives, primers, initiators and location and depth of stemming, including the material to be used as stemming. Maximum amount of explosives to be used per delay and per blast.
5. A diagram and explanation of the initiation sequence of blast holes including delay times for each blast hole. The type of delay system.
6. Manufacturer's product information sheets and material safety data sheets for all explosives, primers, delays and initiators to be used.
7. Sample of blast report to be used.
8. Vibration and airblast monitoring plan to include:
    a. Description of blast monitoring equipment and list if individuals that will operate such equipment
    b. Calibration records
9. Description of flyrock controls
10. Method of handling misfires or cut-offs
11. Complete description of the clearing and guarding procedures that will be used to ensure employees, company representatives, visitors and the general public are restricted to safe locations and accounted for during blasting. This description shall include, but not be limited to:
    a. Visible and audible warning signs and signals
    b. Access blocking methods
    c. Guard placement and release procedure
    d. Primary initiation procedure

e. System by which the blaster-in-charge will communicate with right of way security guards

15. Description of explosives storage to include:
    a. Approval of BATF, stage agency and local fire department (if applicable) and landowner
    b. Inventory control and documentation
    c. Control of explosives on the right of way to prevent theft
    d. Magazine location
16. Description of explosives and accessories transportation procedure.
17. Fire Prevention and Suppression Plan

BLAST REPORT

A record of each blast will be kept on file and submitted with the seismograph report to the company representative not later than the next workday after the blast, and before the next blast. The blast report shall contain at least the following minimum data as applicable:

1. Name of blasting contractor
2. Exact location of the blast, date and time of detonation
3. Type of material blasted
4. Number of holes, burden and spacing
5. Diameter and depth of holes
6. Types of explosives used
7. Total amount of each explosive used
8. Maximum amount of explosives and holes detonated within 8 milliseconds
9. Method of firing type and circuit
10. Direction, distance in feet and identification of the nearest facility, pipeline or inhabited building
11. Weather conditions
12. Type and height or length of stemming
13. A statement as to whether mats or protection against flyrock were used
14. Type of delay caps used and delay periods used
15. The person taking the seismograph reading shall accurately indicate exact location of the geophone placement and shall show the distance of the seismograph from the blast
16. Seismograph records
17. Sketch of blast pattern, including number of holes, burden and spacing distance, delay pattern, and if decking is used, a hole profile.

BLASTING OPERATIONS

1. All blasting operations, including the transport, storage, handling, and loading of explosives shall be performed under

the direct supervision of the blaster-in-charge and in accordance with all Federal, State, and local regulations. The blaster-in-charge must be authorized to act on behalf of the blasting contractor and be licensed by the applicable regulatory agencies to possess, transport and use explosives.

2. Blast holes shall be drilled on the patterns shown on the blast plan and shall not exceed 4" in diameter unless approved by the USFS/Company.
3. 70 pounds of explosives per 8 millesecond delay shall be the maximum charge weight allowed.
4. Hole plugs shall be placed in the blast holes as they are drilled to prevent overburden, drill cuttings or other foreign material from falling into the holes after drilling.
5. Cap and fuse initiation shall not be allowed.
6. A nonelectric, surface delay and in-hole detonator initiation system shall be used (Example: Handidet, EZ Det) for sequential initiation of charges. *One hole per delay shall be initiated.*
7. Clean, 3/8" minus angular crushed rock stemming material shall be used in all blastholes. Drill cuttings shall not be allowed for use as stemming.
8. Vibration and Airblast:
    a. All blasts shall be monitored. The geophone shall be placed on undisturbed ground on the side closest to the blast on the Pacific Connector Gas Pipeline. The geophone placement shall comply with standards discussed in Chapter 38: Vibration and Airblast, of the ISEE Blaster's Handbook, 17th Edition.
    b. Vibration limits for buried pipelines shall be 4 inches per second peak particle velocity.
    c. The Blaster shall be responsible for vibration and airblast monitoring. If the specified vibration and airblast limits are exceeded, the blast plan shall be revised and drilling and blasting operations will be terminated until acceptance of the revised blast plan is granted by the USFS in consultation with the Company.