

Paleontological Resources Monitoring Plan



FERC Docket No. CP09-____-000

January 2009

Table of Contents

Section	Page
1	Introduction 1
2	Construction Methods 1
2.1	Contracted Paleontologist..... 1
2.2	Training of Contractors 1
3	Areas to Be Monitored or Spot Checked 2
3.1	Wyoming 2
3.2	Utah..... 2
3.3	Nevada 3
3.4	Oregon 3
4	Unanticipated Discoveries of Paleontological Resources ... 3
4.1	Paleontological Support During Construction..... 3
4.2	Procedures at Time of Discovery of Unanticipated Paleontological Resources 4
4.3	Recording Procedures for Unanticipated Paleontological Resources..... 4
4.4	Emergency Salvage of Paleontological Resources..... 4
5	Contacts for Unanticipated Discoveries 6
6.	References 8
A	Table A-1A-1
B	Supporting Bureau of Land Management Documentation B-1

List of Tables

Table		Page
Table 1	Contact Information.....	6
Table A-1	Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5.....	A-1

List of Abbreviations and Acronyms

BLM	Bureau of Land Management
MP	milepost
PFYC	potential fossil yield classification
PI	principal investigator
Project	Ruby Pipeline Project
ROW	right-of-way
Ruby	Ruby Pipeline, LLC

1 Introduction

The Ruby Pipeline Project (Project), proposed by Ruby Pipeline, LLC (Ruby), is comprised of approximately 675.2 miles of 42-inch diameter natural gas pipeline, along with associated compression and measurement facilities, located between Opal, Wyoming and Malin, Oregon. An approximate 2.6-mile lateral, PG&E Lateral, would also be constructed south from the Malin Hub. As proposed, the Project would have a design capacity of approximately 1.5 million Dekatherms per day (MMDth/d), depending on final subscriptions. The Project's rights-of-way (ROW) would cross four states: Wyoming, Utah, Nevada, and Oregon. In addition to the pipeline facilities, Ruby proposes the installation of four compressor stations for the Project: one located near the Opal Hub, one in western Utah, one near the mid-point of the Project north of Elko, Nevada, and one northwest of Winnemucca, Nevada. This summary of procedures is supplemented by detailed guidelines in Bureau of Land Management (BLM) document IM2009-011(see Appendix B).

2 Construction Methods

The Project would be constructed in Wyoming, Utah, Nevada, and Oregon. Preparing the right-of-way (ROW) would involve brush and topsoil removal, followed by mechanical grading to a working surface by blading machines, scrapers, and other heavy machinery. Trenching would be accomplished primarily via trenching machines and backhoes. In special cases, boring and directional drilling equipment or manual excavation may be utilized.

2.1 Contracted Paleontologist

The Principal Investigator (PI), a qualified paleontologist, would be contracted by Ruby Pipeline, LLC (Ruby) to oversee paleontological activities. Prior to construction, the PI would obtain relevant Paleontological Use Permits for BLM lands. These permits require a monitoring and recovery plan for fossils, as well as a repository agreement with a recognized institution for the curation and storage of scientifically significant fossils. The PI would (1) oversee training of construction personnel, (2) conduct or oversee monitoring and spot checks of geologic formations classified as Potential Fossil Yield Classification (PFYC) 4 or 5, (3) evaluate paleontological discoveries made by Ruby and construction contractors, and (4) determine appropriate actions regarding significant finds with BLM paleontologists.

2.2 Training of Contractors

When a qualified paleontologist is not present during construction activities, Ruby environmental inspectors and contractor personnel would be responsible for reporting significant fossil discoveries. To this end, Ruby will train contractor personnel prior to construction to (1) understand what a fossil represents, (2) recognize a fossil, (3) know the

procedures to be followed when fossils are discovered, and (4) refrain from collecting significant fossils, except as part of an emergency recovery procedure. This training will be conducted by a qualified paleontologist.

3 Areas to Be Monitored or Spot Checked

In the planning and surveying stages of the ROW, each geologic formation along the route was ranked according to the BLM PFYC. These rankings are listed in Table 6A-1 of Resource Report No. 6. Following a literature search, paleontological field surveys of segments ranked as PFYC 3, 4, or 5 were conducted during the summer of 2008. In some areas, formation units ranked as PFYC 3 or higher did not yield fossil resources due to poor exposures, extreme weathering of outcrops, or the fact that no fossils could be identified. For these reasons, not all formations ranked as PFYC 3 are recommended for further field or spot checks prior to construction, as noted below. PFYC geologic formations with rankings of 3, 4, or 5 are listed in Table A-1 (Appendix A). The following state-by-state construction phase recommendations are based on the PFYC rankings, literature reviews, and field surveys.

3.1 Wyoming

Preconstruction field surveys of the ROW in Wyoming revealed vertebrate fossils on the surface only in the Opal area on outcrops of the Bridger Formation, which has a PFYC class 5 ranking. Accordingly, segments between milepost (MP) 0 and MP 0.2 and between MP 1.8 and 6.2 would be monitored during construction. Alluvium and colluvial deposits (PFYC rank of 2) that are listed in Table 6A-1 that outcrop along these areas between higher ranking formations would not require spot checking. Other outcrops of PFYC classes 4 and 5 (see Resource Report No. 6 for relevant outcrops) would be spot checked after trenching, prior to trench infill. Trenches in the following PFYC ranked 3 to 5 formations would be spot checked: Bridger, Green River, Wasatch, Hilliard, and the Aspen Shale-Frontier contact (for false trunks of the fern *Tempskya* (Ash and Read 1976)).

3.2 Utah

In Utah, the highest-ranked formation with significant exposures along the ROW is the Wasatch Formation, ranked by BLM as a PFYC class 4. Preconstruction surveys and literature reports, however, revealed no significant fossils, and the paleontological consultation recommended dropping the Wasatch Formation in this area of Utah to PFYC class 3 (Resource Report No. 6). It is recommended that post-trenching spot checks of the formation be conducted. Spot checks of the Wasatch Formation should be limited to three 0.5-mile segments along the total 22.6-mile length of outcrops of the formation within longer segments occurring at MPs 55.28, 65.99 and 76.74.

As discussed in Resource Report 6, the Salt Lake formation (PFYC 3) can contain significant vertebrate fossils. Although no fossils were observed during the summer 2008 field surveys, the nine instances where the Salt Lake formation would be crossed would be spot checked. See Table A-1 for the MP start and end points. Similarly other PFYC 3 ranked formations like the Kaibab, Toroweap, Park City, Summerville, Entrada, Carmel, Arapien, and Twin Creek formations may contain fossils and also would be field spot checked.

3.3 Nevada

No significant fossils were observed during preconstruction field surveys in Nevada. Spot checks would be conducted for areas near known paleobotanical localities in northwestern Nevada because plant compressions, unlike vertebrates, are typically found only in freshly excavated matrix. As suggested by the BLM, Ruby would conduct post-trenching spot checks of Pleistocene alluvial deposits along the ROW between MP 488 and 496. The Chinle and Ankareh formations also may contain significant fossils and would be spot checked from MP 511.6 to 516.2 and MP 517.5 to 517.8.

There are no formations with a PFYC of 4 or 5 along the ROW in Nevada.

3.4 Oregon

Because of the low PFYC classes of formations along the ROW in Oregon, Ruby would not conduct any monitoring or spot checks in this state.

4 Unanticipated Discoveries of Paleontological Resources

4.1 Paleontological Support During Construction

Fossils (paleontological resources) likely to be encountered during construction include plant compressions (carbonized leaf remains) and petrifications (petrified wood); mollusk shells (snails, clams, and etc.); and isolated or fragmentary vertebrate remains, such as teeth and bones. If such fossils are encountered, they would be evaluated and addressed appropriately by Ruby's paleontologists. There is a small possibility that scientifically significant articulated remains of vertebrate fossils may be encountered in excavations in areas that on the ground surface are classified as PFYC 2 or less, but are underlain by fossil-bearing formations. Such vertebrate fossils are most likely to be found near Opal, Wyoming or in the few Pleistocene deposits (mainly unconsolidated alluvium and colluvium) scattered along the route.

4.2 Procedures at Time of Discovery of Unanticipated Paleontological Resources

In accordance with BLM guidelines (IM2009-011, Appendix B), if significant fossils are discovered construction activity would cease in the immediate area of the discovery, and the discovery would be immediately reported to the Ruby construction supervisor responsible for protection of environmental resources on the associated spread or construction activity. The supervisor would ensure that the discovery is protected from damage and looting and would immediately report the discovery to Ruby's consultant paleontologist. The paleontologist would examine and record the paleontological resource and evaluate its significance in collaboration with BLM paleontologists and determine if additional mitigation (collection and curation) is required. Ground-disturbing construction activities would not resume in the immediate area of the paleontological resource until the paleontologists (consulting and BLM) concur that construction may resume. Agencies may inform Ruby's consultant paleontologist of any required mitigation measures by telephone, with follow-up documentation by mail or email. The list of agency paleontological contacts is provided in Section 5 of this plan.

4.3 Recording Procedures for Unanticipated Paleontological Resources

Paleontological materials of scientific significance discovered during construction would be recorded using methods consistent with modern professional paleontology standards, as detailed in IM2009-011, Appendix B. Initially, field paleontologists would identify the horizontal and vertical extent (i.e., features visible in an exposed trench profile) of fossil vertebrate materials. Scientifically significant fossil vertebrates would be collected and curated into an acceptable museum or academic repository. Collection methods would depend on each individual fossil and its condition. Fractured vertebrate fossils may require the application of a consolidant and plaster and burlap field jacketing. Standard data on the discovered locality would be recorded, including Universal Transverse Mercator coordinates, geologic formation, lithology, and stratigraphic position. The localities would also be plotted on appropriate United States Geological Survey 7.5' quadrangles. In addition, the locality would be documented photographically. This information would be recorded on standard paleontological locality forms.

4.4 Emergency Salvage of Paleontological Resources

Unstable trench conditions and other unforeseen natural or work events could endanger paleontological resources discovered during construction of the pipeline. If paleontological resources are in imminent danger of destruction, Ruby would, without delay, take prudent action to preserve as much paleontological information as possible. Salvage activities would follow standard paleontological procedures to the greatest extent possible, but human safety concerns or the immediacy of the threat to the paleontological resource may require less

exact methods of material extraction, including rapid shovel excavation or use of backhoes or other heavy equipment.

5 Contacts for Unanticipated Discoveries

Table 1 Contact Information

Agency	Name	Contact Information
Ruby Pipeline, LLC	Nicole Pedigo	El Paso Corporation Two North Nevada Avenue Colorado Springs, CO 80903 Phone: 719.667.7529 Email: Nicole.Pedigo@elpaso.com
Ecology and Environment, Inc.	John Montgomery Office Manager	333 SW Fifth, Suite 600 Portland, OR 97204 Phone: 503.248.5600 Email: jmontgomery@ene.com
Consulting Paleontologist	Brooks Britt, Ph.D. Principal Investigator	545 Robin Road Orem, Utah 84097 Phone: 801.422.7316 Mobile: 801.616.9419 Fax: 801.422.0267 Email: brooks.britt@gmail.com
BLM - Utah State Office Regional Utah BLM Lands	Scott Foss, Ph.D. Regional Paleontologist	P.O. Box 45155 Salt Lake City, Utah 84145 Phone (801) 539-4272 Mobile (801) 505-3356 Fax (801) 539-4074 Email: Scott.Foss@blm.gov
BLM Salt Lake Field Office	Larry Garahana Geologist	2370 South 2300 West Salt Lake City, Utah 84119 Phone: 801.977.4371 Email: Larry.garahana@blm.gov
Wyoming BLM Lands	Dale Hansen Wyoming BLM Paleontologist	Office phone 307-775-6052 BLM - Wyoming State Office P.O. Box 1828 Cheyenne, Wyoming 82003 Phone: 307-775-6052 Email: Dale.Hanson@blm.gov
BLM Nevada State Office Nevada BLM Lands BLM Nevada Paleontology	Tom Burke Archaeologist	1340 Financial Blvd Reno, Nevada 89502 Phone: 775.861.6415 Fax: 775.861.6712

Table 1 Contact Information

Agency	Name	Contact Information
		Email: tom_burke@blm.gov
BLM Elko District Tuscarora & Wells Field Offices	Bryan Hockett Bill Fawcett	3900 East Idaho Street Elko, Nevada 89801 Fax: 775.753.0255 bryan_hockett@blm.gov Phone: 775.753.0276 bill_fawcett@blm.gov Phone: 775.753.0200
BLM Winnemucca District Humboldt River Office	Pat Haynal Archaeologist	5100 East Winnemucca Blvd. Winnemucca, Nevada 89445 Phone: 775.623.1524 Fax: 775.623.1503 Patrick_haynal@blm.gov
BLM Surprise Field Office (covers northwestern Nevada)	Penni Borghi Archaeologist	602 Cressler St. Cedarville, California 96104 Phone: (530) 279-2732 Email: Penni_Borghi@ca.blm.gov
BLM Oregon Prineville District	John Zancanella Archaeologist	3050 NE Third Prineville, OR 97754 Phone: 541.416.6735 Email: John_Zancanella@or.blm.gov

6. References

Ash, S. R. and Read, C. 1976. *North American Species of Tempskya and their Stratigraphic Significance*. U.S. Government Printing Press. Washington, D.C.

United States Geological Survey. 1994. *Bedrock Geology for Wyoming at 1:500,000*. <http://partners.wygisc.uwyo.edu/wygeolibrary/explorer.jsf>. Accessed May 2008.

_____. 2003a. *Spatial Digital Database for the Geologic Map of Nevada*. <http://pubs.usgs.gov/of/2003/of03-66/>. Accessed May 2008.

_____. 2003b. *Spatial Digital Database for the Geologic Map of Oregon*. <http://pubs.usgs.gov/of/2003/of03-67/>. Accessed May 2008.

Utah Geological Survey. 2000. *Digital Geologic Map of Utah*. <http://ugs.utah.gov/>. Accessed May 2008.

A Table A-1

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3-5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
0.00	0.23	0.23	Tb	Volcanic and sedimentary	Bridger Formation	5	Yes	Yes
0.23	0.41	0.18	Tgl	Lacustrine sedimentary	Green River Formation: Laney Member	5	Yes	Yes
0.41	0.61	0.20	Tw	Fluvial sedimentary	Wasatch Formation, main body	5	Yes	Yes
1.36	1.78	0.42	Tgl	Lacustrine sedimentary	Green River Formation: Laney Member	5	Yes	Yes
1.78	6.20	4.42	Tb	Volcanic and sedimentary	Bridger Formation	5	Yes	Yes
6.20	6.64	0.44	Tgl	Lacustrine sedimentary	Green River Formation: Laney Member	5	Yes	Yes
7.38	7.69	0.31	Tgl	Lacustrine sedimentary	Green River Formation: Laney Member	5	Yes	Yes
9.30	10.20	0.90	Tw	Fluvial sedimentary	Wasatch Formation, main body	5	Yes	Yes
10.20	11.06	0.86	Tgw	Lacustrine sedimentary	Green River Formation: Wilkins Peak Member	5	Yes	Yes
11.06	11.76	0.70	Tgrw	Fluvial and lacustrine sedimentary	Green River and Wasatch Formations	5	Yes	Yes
11.76	12.89	1.13	Tgw	Lacustrine sedimentary	Green River Formation: Wilkins Peak Member	5	Yes	Yes
12.89	13.39	0.50	Tgrw	Fluvial and lacustrine sedimentary	Green River and Wasatch Formations	5	Yes	Yes
13.39	14.44	1.05	Kg	Marine sedimentary	Gannett group	3	Yes	Yes
14.44	15.12	0.68	Tw	Fluvial sedimentary	Wasatch Formation, main body	5	Yes	Yes
15.12	16.44	1.32	Tgrw	Fluvial and lacustrine sedimentary	Green River and Wasatch Formations	5	Yes	Yes

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
16.44	19.15	2.71	Ka	Marine sedimentary	Aspen shale	3	Yes	Yes
19.15	20.59	1.44	Kf	Marine sedimentary	Frontier Formation	3	Yes	Yes
20.59	26.27	5.68	Kh	Marine sedimentary	Hilliard shale	3	Yes	Yes
26.27	27.69	1.42	Kf	Marine sedimentary	Frontier Formation	3	Yes	Yes
27.69	27.73	0.04	TKe	Fluvial and marsh sedimentary	Evanston Formation	3	Yes	Yes
27.73	28.05	0.32	Kf	Marine sedimentary	Frontier Formation	3	Yes	Yes
28.05	28.82	0.77	TKe	Fluvial and marsh sedimentary	Evanston Formation	3	Yes	Yes
28.82	40.64	11.82	Tgrw	Fluvial and lacustrine sedimentary	Green River and Wasatch Formations	5	Yes	Yes
40.64	41.15	0.51	Tw	Fluvial sedimentary	Wasatch Formation, main body	5	Yes	Yes
41.15	42.08	0.93	TKe	Fluvial and marsh sedimentary	Evanston Formation	3	Yes	Yes
42.08	42.57	0.49	Kg	Marine sedimentary	Gannett group	3	Yes	Yes
42.57	43.22	0.65	Tf	Fluvial sedimentary	Fowkes Formation (Pliocene? and Eocene)	3	Yes	Yes
43.22	43.34	0.12	Kss	Marine sedimentary	Sage Junction, Quely, Cokeville, Thomas Fork, and Smiths Formations	3	Yes	Yes
43.34	46.21	2.87	TKe	Fluvial and marsh sedimentary	Evanston Formation	3	Yes	Yes

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
46.21	47.68	1.47	Kss	Marine sedimentary	Sage Junction, Quely, Cokeville, Thomas Fork, and Smiths Formations	3	Yes	Yes
47.68	48.01	0.33	Tf	Fluvial sedimentary	Fowkes Formation (Pliocene? and Eocene)	3	Yes	Yes
55.28	60.74	5.46	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
61.07	64.89	3.82	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
64.89	65.15	0.26	J1	Marine and eolian sedimentary	Summerville, Entrada, Carmel, Arapien, Twin Creek and other Fms	3	Yes	Yes
65.15	65.28	0.13	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
65.28	65.99	0.71	J1	Marine and eolian sedimentary	Summerville, Entrada, Carmel, Arapien, Twin Creek and other Fms	3	Yes	Yes
65.99	71.10	5.11	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
71.47	72.17	0.70	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
72.34	72.87	0.53	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
73.60	73.82	0.22	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
73.85	74.01	0.16	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
74.19	75.08	0.89	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
75.40	76.64	1.24	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
76.74	82.74	6.00	T1	Fluvial and lacustrine sedimentary	Wasatch, Cotton, Flagstaff, Claron, White Sage and other Fms	3	Yes	Yes
92.88	94.54	1.66	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
95.22	98.77	3.55	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
134.86	135.51	0.65	M3	Marine sedimentary	Chainman, Manning Canyon, Doughnut and other Fms	3	Yes	No
141.25	141.87	0.62	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
143.25	143.54	0.29	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
187.78	188.07	0.29	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3-5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
189.46	189.80	0.34	P2	Lacustrine sedimentary	Kaibab, Toroweap, Park City and other Fms	3	Yes	Yes
192.61	192.95	0.34	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
193.74	193.81	0.07	P2	Lacustrine sedimentary	Kaibab, Toroweap, Park City and other Fms	3	Yes	Yes
196.94	197.26	0.32	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
213.60	214.10	0.50	T4	Volcanic and sedimentary	Salt Lake Fm and other valley-filling alluvial, lacustrine, and volcanic units	3	Yes	Yes
228.74	228.86	0.12	P1	Marine sedimentary	Cedar Mesa, Diamond Creek, Arcturus and other Fms	3	Yes	No
229.78	230.57	0.79	P1	Marine sedimentary	Cedar Mesa, Diamond Creek, Arcturus and other Fms	3	Yes	No
230.57	230.62	0.05	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
231.10	231.21	0.11	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
244.44	245.24	0.80	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
246.70	247.07	0.37	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
247.32	247.66	0.34	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
248.16	248.37	0.21	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
248.88	249.86	0.98	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
250.24	250.43	0.19	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
251.46	255.45	3.99	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
256.22	256.38	0.16	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
257.25	259.78	2.53	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
262.11	262.53	0.42	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
263.18	264.75	1.57	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
265.23	266.38	1.15	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
272.45	272.96	0.51	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
275.96	280.22	4.26	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
283.74	291.11	7.37	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
291.27	293.58	2.31	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
294.87	295.10	0.23	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
296.18	299.37	3.19	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
300.30	301.61	1.31	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
301.97	304.51	2.54	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3-5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
306.74	307.36	0.62	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
309.15	310.24	1.09	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
311.16	315.35	4.19	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
324.68	327.67	2.99	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
328.18	328.29	0.11	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
329.00	333.52	4.52	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
333.79	336.70	2.91	Ts3	Volcanic	Tuffaceous sedimentary rocks	3	Yes	No
363.96	368.32	4.36	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
368.39	368.96	0.57	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
371.04	371.76	0.72	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
373.15	373.24	0.09	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
393.14	416.03	22.89	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
420.05	442.62	22.57	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3-5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
443.23	443.83	0.60	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
443.83	444.73	0.90	JTRs	Sedimentary	Sedimentary rocks (Jurassic and upper Triassic)	3	Yes	No
444.73	456.95	12.22	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
456.95	461.15	4.20	Qp	Unconsolidated sedimentary	Playa, marsh, and alluvial-flat deposits, locally eroded	3	Yes	No
461.15	463.75	2.60	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
463.75	483.26	19.51	Qp	Unconsolidated sedimentary	Playa, marsh, and alluvial-flat deposits, locally eroded	3	Yes	No
483.26	484.45	1.19	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
485.21	485.42	0.21	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
486.00	488.32	2.32	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
488.32	495.98	7.66	Qp	Unconsolidated sedimentary	Playa, marsh, and alluvial-flat deposits, locally eroded	3	Yes	No
495.98	500.55	4.57	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	Yes
501.20	506.05	4.85	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	Yes
506.05	506.23	0.18	JTRs	Sedimentary	Sedimentary rocks (Jurassic and upper Triassic)	3	Yes	Yes
509.56	510.37	0.81	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	Yes

Table A-1 Geologic Units by Milepost and Paleontologic Sensitive Areas with PFYC Rankings of 3–5

Start MP	End MP	Length (miles)	Map Unit	Rock Type	Formation	Paleo Sensitivity (PFYC) 5 is most sensitive	Summer 2008 Field Checked	Recommend for Spot/Field Check
510.37	511.04	0.67	JTRs	Sedimentary	Sedimentary rocks (Jurassic and upper Triassic)	3	Yes	Yes
511.59	516.21	4.62	Tr2	Alluvial and lacustrine sedimentary	Age equivalent to Chinle, Ankareh Fms	3	Yes	Yes
517.54	517.77	0.23	Tr2	Alluvial and lacustrine sedimentary	Age equivalent to Chinle, Ankareh Fms	3	Yes	Yes
523.24	525.19	1.95	Qa	Unconsolidated sedimentary	Surficial alluvium and colluvium	3	Yes	No
532.83	533.39	0.56	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
533.70	533.87	0.17	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
538.69	540.20	1.51	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
554.40	555.33	0.93	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No
555.73	555.99	0.26	Tts	Volcanic	Tuffaceous sedimentary rocks; tuffs; pumicites; and silicic flows (Miocene)	3	Yes	No

Notes:

This table reflects geologic units > PFYC 3 and accounts for the 675.2 miles of the Project.

Fms = Formations

Sources: United States Geological Survey, 1994, 2003a, 2003b; Utah Geological Survey, 2000.

B Supporting Bureau of Land Management Documentation