APPENDIX I

Paleontological Resources Constraints Analysis

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RE: Paleontological Resources Constraints Analysis for the Prineville-to-Reno Fiber-Optic Interconnect Project, Lassen, Modoc, and Sierra Counties, California

1.0 INTRODUCTION

This memorandum report presents the results of the paleontological constraints analysis conducted by Paleo Solutions in support of portions of Zayo Group LLC's (Zayo) Prineville-to-Reno Fiber-Optic Interconnect Project (Project) located in California. Paleo Solutions was contracted by Stantec to conduct an analysis of existing paleontological data and to provide recommendations for mitigation based on the geological and paleontological data. This work was required by the California Department of Transportation (Caltrans) District 2 to meet their requirements as the lead agency under the California Environmental Quality Act (CEQA). All work was conducted in compliance with applicable federal, state, and local regulations and conforms to Caltrans guidelines and standards contained in the Caltrans Standard Environmental Reference (SER), Volume 1, Chapter 8 (Paleontology). Copies of this memorandum report will be submitted to Caltrans District 2, Zayo, and Stantec.

1.1 Purpose and Need

The purpose of the Project is to improve the quality of rural broadband in south-central Oregon, northeast California, and northwest Nevada, and to make affordable broadband internet services available to currently underserved communities in these areas. This Project will provide connectivity between the network hub in Prineville, and the communities of Bend and La Pine in Oregon; Alturas, Lakeview, and Susanville in California; and the greater Reno/Sparks metropolitan area in Nevada. These communities need increased redundancy and alternative bandwidth services to improve the poor reliability of current options.

To function as a truly redundant system, the fiber-optic interconnection facilities must not only provide expanded and alternative bandwidth in the case of an emergency or catastrophic event (e.g., landslides, windstorms), but must be located away from existing infrastructure to avoid vulnerability to the same outage threats to which the current corridors are subjected.

1.2 Project Description

The Project involves the installation of an underground fiber-optic network. Construction will primarily be performed using a combination of plowing and trenching. Horizontal directional drilling will be used to cross water bodies and roads, and where necessary, to avoid sensitive or protected biological or cultural resources. Alternatively, for some water or road crossing locations, the conduit may be affixed to the side or underside of bridges. The construction method used to install conduit will include a combination of plowing, trenching, boring, and bridge hanging. The Project construction sequence will include several construction “spreads” operating concurrently, each with its own team or teams of construction workers and equipment. The running line would be placed as far away from the roadway edge of pavement as practicable to minimize possible disturbance to highway operations. According to the construction plans, the maximum depth of excavation will be 42 inches below the ground surface.

The Project alignment would consist of the running line, ancillary equipment, and construction areas as outlined below:

- Installation of approximately 193.9 miles of underground shielded fiber-optic telecommunications cable (running line) within four protective 3.2-centimeter-diameter (1.25-inch-diameter) high-density polyethylene (HDPE) standard dimension ratio 11 conduits.
- Installation of ancillary equipment, such as in-line amplifiers (ILAs), new buried fiberglass handholes and/or vaults, splice boxes, and line markers. The ILAs will be housed in 420 square feet by 11 feet tall structures called “regeneration huts”. The vaults will be spaced roughly 3,500 linear feet apart along the running line and will be about 30 inches by 48 inches by 36 inches. The excavation dimensions for each vault will be 15 feet long by 3 feet wide (unspecified depth), although additional area may be needed. Splice vaults are small, rectangular metal enclosures that would be installed within the vaults or hand holes. Line markers, which will be installed every 152.4 meters (500 linear feet), are approximately 1.2 meters (4.0 feet) tall and made of flexible fiberglass. Electrical power will be supplied to the node locations by a commercial power company with a backup generator on site.
- Clean-up and site restoration following construction.

1.3 Project Location

The Project crosses several counties in California, including Lassen County, Modoc County, and Sierra County (Figure 1). The fiber-optic cable and conduit (running line) will be installed within the Caltrans right-of-way (ROW) parallel to US-395, except for an approximately 8.5-mile-long segment in Lassen County between the communities of Standish and Buntingville, where it will follow Standish Bunting Road (Lassen County Road A3) for 7.35 miles and Cummings Road for 1.15 miles before returning to the ROW parallel to US-395 (Appendix A).

The Caltrans ROW varies from approximately 80 feet to 400 feet wide but is typically 200 feet to 300 feet wide. The Lassen County ROW varies in width from approximately 50 feet to 80 feet. The running line will generally follow only one side of US-395 and the county roads for long distances; however, in select locations it could cross the pavement to avoid localized biological or cultural resources.

Most of the proposed installations associated with the Project will occur along US-395 and will require ROW encroachment permits from Caltrans. The Project also crosses lands owned or managed by the U.S. Bureau of Land Management (BLM), U.S. Forest Service (USFS), U.S. Fish and Wildlife Service, California State Lands Commission, and several tribal entities.

Table 1. Zayo Prineville-to-Reno Telecom Project Summary

Project Name	Zayo Prineville-to-Reno Telecom Project
Project Description	The Project involves the installation of an underground fiber-optic network. Construction will primarily be performed using a combination of plowing and trenching. Horizontal directional drilling will be used to cross water bodies and roads, and where necessary, to

<table>
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<tr><td>Project Area</td><td colspan="4">The Project crosses several counties in California, including Lassen County, Modoc County, and Sierra County. The fiber-optic cable and conduit (running line) will be installed within the Caltrans ROW parallel to US-395, except for an approximately 8.5-mile-long segment in Lassen County between the communities of Standish and Buntingville, where it will follow Standish Bunting Road (Lassen County Road A3) for 7.35 miles and Cummings Road for 1.15 miles before returning to the ROW parallel to US-395.</td></tr>
<tr><td>Linear Miles</td><td colspan="4">Approximately 193 miles</td></tr>
<tr><td rowspan="2">Location (PLSS)</td><td>Quarter-Quarter</td><td>Section</td><td>Township</td><td>Range</td></tr>
<tr><td colspan="4">See Appendix C</td></tr>
<tr><td>Topographic Map(s)</td><td colspan="4">USGS Evans Canyon, Beckwourth Pass, Constantia, Doyle, McKesick Peak, Milford, Stony Ridge, Standish, Litchfield, Shaffer Mountain, Karlo, Five Springs, Snowstorm Mountain, Ravendale, Termo, McDonald Peak, Anderson Mountain, Madeline, Likely, Tule Mountain, Infernal Caverns, Little Juniper Reservoir, Alturas, Mahogany Ridge, Surprise, Lauer Reservoir, Davis Creek, Sugar Hill, and Willow Ranch 7.5’ Topographic Quadrangles</td></tr>
<tr><td>Geologic Map(s)</td><td colspan="4">Geologic map of the Chico Quadrangle (Saucedo and Wagner, 1992); Geologic map of the Eagle Lake 30’ x 60’ Quadrangle (Grose et al., 2014a); Geologic map of the Susanville 30’ x 60’ Quadrangle (Grose et al., 2014b); Geologic map of the Alturas 30’ x 60’ Quadrangle (Grose et al., 2016); Geologic map of the Cedarville 30’ x 60’ Quadrangle (Grose et al., 2017)</td></tr>
<tr><td rowspan="20">Mapped Geologic Units(s) and Age(s)</td><td>Geologic Unit and Map Symbol</td><td colspan="2">Age</td><td>Paleontological Potential (**PFYC [BLM, 2016])</td></tr>
<tr><td>Artificial fill*</td><td colspan="2">Recent</td><td>2 (Low)</td></tr>
<tr><td>Alluvium (Q, Qa)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Colluvium (Qc)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Alluvial fan (Qf)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Terrace deposits (Qt)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Lake deposits (Ql)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Sand deposits (Qhs)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Eolian, fluvial, and lacustrine deposits (Qhe)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Dune sand (Qhds)</td><td colspan="2">Holocene</td><td>2 (Low)</td></tr>
<tr><td>Alluvium (Qa)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Alluvial fan deposits (Qf)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Delta deposits of the Susan River (Qd)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Older lake deposits (Qol)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Near-shore and deltaic deposits of Lake Madeline (Qlmd)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Landslide deposits (Qls)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Colluvial gravel (Qg)</td><td colspan="2">Holocene to Pleistocene</td><td>U (Unknown)</td></tr>
<tr><td>Older alluvium (Qoa)</td><td colspan="2">Pleistocene</td><td>3 (Moderate)</td></tr>
<tr><td>Older fan deposits (Qof)</td><td colspan="2">Pleistocene</td><td>3 (Moderate)</td></tr>
</table>

	Near-shore deposits of Lake Lahontan (Qpl)	Pleistocene	3 (Moderate)
	Gravel deposits of Lake Lahontan (Qplg)	Pleistocene	3 (Moderate)
	Andesite and basalt of Northwest Madeline Volcano (Tmma)	Pleistocene	1 (Very Low)
	Andesite and basalt (Tlma)	Pleistocene	1 (Very Low)
	Basalt and andesite of Tule Mountain Volcano (Ttmb)	Pleistocene	1 (Very Low)
	Andesite and basalt from local volcanoes (Tsab),	Pleistocene	1 (Very Low)
	Nonmarine sedimentary rocks (Qos)	Pleistocene	3 (Moderate)
	Fan delta deposits of Long Creek (Qpfd)	Pleistocene	3 (Moderate)
	Nonmarine sedimentary rocks (Ps)	Pliocene	U (Unknown)
	Olivine basalt of Viewland (Tvb)	Pliocene	1 (Very Low)
	Basalt and mafic andesite of Ducasse Reservoir (Tdrb)	Pliocene	1 (Very Low)
	Basalt, mafic andesite, and tuff of Spanish Springs (Tsbl)	Pliocene	2 or 1 (Very Low or Low)
	Tuff of Lava Rock Reservoir (Tlrt)	Pliocene	2 or 1 (Very Low or Low)
	Basalt of Spanish Springs (Tsbu)	Pliocene	1 (Very Low)
	Olivine basalt intrusives of Viewland (Tvbi)	Pliocene	1 (Very Low)
	Basalt of the Vya Group (Tvgb)	Pliocene to late Miocene	1 (Very Low)
	Devils Garden Basalt (Tdgb)	Pliocene to Miocene	1 (Very Low)
	Basalt and andesite volcanoes (Tb)	Pliocene to late Miocene	1 (Very Low)
	Alturas Formation (Ta)	Pliocene to Miocene	U (Unknown)
	Alturas Formation, pyroclastic flow (Tabpf)	Early Pliocene to Miocene	1 (Very Low)
	Pyroclastic rocks of Sugar Hill (Tsht)	Late Miocene	2 or 1 (Very Low or Low)
	Mafic andesites flows of Viewland shield (Tvsa)	Miocene	1 (Very Low)
	Basalt of Franklin Creek (Tfcb)	Miocene	1 (Very Low)
	Basalt of Three Peaks West Volcano (Ttpw)	Miocene	1 (Very Low)
	Hypabyssal intrusions (Tovi)	Miocene	1 (Very Low)

	Basalt and andesite flows and breccias (Ttab)	Miocene	2 or 1 (Very Low or Low)
	Tuff of Rye Patch Canyon (Trpt)	Miocene	2 or 1 (Very Low or Low)
	Mafic andesite of Shinn Mountain (Tsha)	Miocene	1 (Very Low)
	Mafic andesite of Spanish Springs Peak (Tssa)	Miocene	1 (Very Low)
	Andesite and mafic andesite flows (Tsl)	Miocene	1 (Very Low)
	Latite domes of Litchfield (Tld)	Miocene	1 (Very Low)
	Latitic to andesitic flow breccias and tuffs of Litchfield (Tlp)	Miocene	2 or 1 (Very Low or Low)
	Volcanics of New Pine Creek, undifferentiated (Tpvu)	Miocene	1 (Very Low)
	Andesitic flows and pyroclastics (Tfp)	Miocene	1 (Very Low)
	Basaltic flows and pyroclastics of Three Peaks (Ttpf)	Miocene	1 (Very Low)
	Rhyolite tuff and sedimentary rocks (Omv)	Miocene to Oligocene	U (Unknown)
	Tuff of Davis Creek (Tdct)	Oligocene	2 or 1 (Very Low or Low)
	Mafic andesite flows of East Shaffer shield (Tesa)	Cenozoic	1 (Very Low)
	Hornblende-biotite granodiorite (Kgd)	Cretaceous	1 (Very Low)
	Granite and granodiorite (KJgr)	Mesozoic	1 (Very Low)
Permits	No paleontological permits were required for the work conducted.		
Previously Documented Fossil Localities within the Project area	Reviews of literature and online databases yielded numerous vertebrate fossils recorded from sediments similar to those that occur within the Project vicinity (see Section 5.2).		
Recommendation(s)	Construction excavations which disturb geologic units with moderate paleontological potential (PFYC 3) should be monitored by a professional paleontologist in conjunction with worker environmental training to reduce potential adverse impacts on scientifically important paleontological resources to a less than significant level. The timing and frequency (e.g., part-time vs. full-time) of monitoring should be determined by the professional paleontologist based on initial field observations and excavation activities. Additionally, excavations which disturb geologic units with unknown paleontological potential (PFYC U) should be initially monitored in order to inspect for the presence of sensitive sediments and any resources that may be harbored within. In the event that a highly fossiliferous facies are encountered, full-time monitoring should occur until excavations within that facies are complete. Worker environmental training of construction personnel is recommended for excavations impacting sedimentary geologic units with low paleontological potential (PFYC 2). No additional measures are recommended for excavations impacting volcanic and plutonic rock units with very low paleontological potential (PFYC 1) or very low to low		

	potential (PFYC 2 to 1). A summary of the recommended monitoring procedures for each of the mile posts is provided in Appendix B. Prior to construction, a Paleontological Mitigation Plan (PMP) should be prepared. It should provide detailed recommended monitoring locations; a description of a worker training program; detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any subsurface bones or potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PMP.

*Unit is not mapped, although satellite photos indicate that it covers the surface of the Project alignment.

**PFYC = Potential Fossil Yield Classification

Figure 1. Project Location Map.

2.0 DEFINITION AND SIGNIFICANCE OF PALEONTOLOGICAL RESOURCES

As defined by Murphey and Daitch (2007): "Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on earth. Paleontological resources, or fossils, are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. These include mineralized, partially mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Paleontological resources include not only fossils themselves, but also the associated rocks or organic matter and the physical characteristics of the fossils' associated sedimentary matrix.

The fossil record is the only evidence that life on earth has existed for more than 3.6 billion years. Fossils are considered non-renewable resources because the organisms they represent no longer exist. Thus, once destroyed, a fossil can never be replaced. Fossils are important scientific and educational resources because they are used to:

- Study the phylogenetic relationships amongst extinct organisms, as well as their relationships to modern groups;
- Elucidate the taphonomic, behavioral, temporal, and diagenetic pathways responsible for fossil preservation, including the biases inherent in the fossil record;
- Reconstruct ancient environments, climate change, and paleoecological relationships;
- Provide a measure of relative geologic dating that forms the basis for biochronology and biostratigraphy, and which is an independent and corroborating line of evidence for isotopic dating;
- Study the geographic distribution of organisms and tectonic movements of land masses and ocean basins through time;
- Study patterns and processes of evolution, extinction, and speciation; and
- Identify past and potential future human-caused effects to global environments and climates."

Fossils vary widely in their relative abundance and distribution and not all are regarded as significant. According to Caltrans SER, Volume 1, Chapter 8 (Paleontology), scientifically significant paleontological resources are:

> "Sites or geologic deposits containing individual fossils or assemblages of fossils that are unique or unusual, diagnostically or stratigraphically important, and add to the existing body of knowledge in specific areas, stratigraphically, taxonomically, or regionally… Particularly important are fossils found in situ (undisturbed) in primary context (e.g., fossils that have not been subjected to disturbance subsequent to their burial and fossilization). As such, they aid in stratigraphic correlation, particularly those offering data for the interpretation of tectonic events, geomorphological evolution, paleoclimatology, the relationships between aquatic and terrestrial species, and evolution in general. Discovery of in situ fossil bearing deposits is rare for many species, especially vertebrates. Terrestrial vertebrate fossils are often assigned greater significance than other fossils because they are rarer than other types of fossils. This is primarily due to the fact that the best conditions for fossil preservation include little or no disturbance after death and quick burial in oxygen depleted, fine-grained, sediments. While these conditions often exist in marine settings, they are relatively rare in terrestrial settings (e.g., as a result of pyroclastic flows and flashflood events). This has ramifications on the amount of scientific study needed to adequately characterize an individual species and therefore affects how relative sensitivities are assigned to formations and rock units" (Caltrans, 2016).

Vertebrate fossils, whether preserved remains or track ways, are classified as significant by most state and federal agencies and professional groups (and are specifically protected under the California Public Resources Code). In some cases, fossils of plants or invertebrate animals are also considered significant and can provide important information about ancient local environments.

The full significance of fossil specimens or fossil assemblages cannot be accurately predicted before they are collected, and in many cases, before they are prepared in the laboratory and compared with previously collected fossils. Pre-construction assessment of significance associated with an area or formation must be made based on previous finds, characteristics of the sediments, and other methods that can be used to determine paleoenvironmental and taphonomic conditions.

3.0 LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section of the report presents the federal, state, and local regulatory requirements pertaining to paleontological resources that will apply to this project.

3.1 Federal Regulatory Setting

If any federal funding is used to wholly or partially finance a project, it is sited on federal lands, involves a federal permit, and/or includes a perceived federal impact, federal laws and standards apply. The management and preservation of paleontological resources on public and federal lands are prescribed under various laws, regulations, and guidelines.

3.1.1 Antiquities Act of 1906

The Antiquities Act of 1906 (16 USC 431-433) states, in part:

> That any person who shall appropriate, excavate, injure or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than five hundred dollars or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

Although there is no specific mention of natural or paleontological resources in the Act itself, or in the Act's uniform rules and regulations (Title 43 Part 3, Code of Federal Regulations [43 CFR 3]), the term "objects of antiquity" has been interpreted to include fossils by the National Park Service (NPS), the BLM, the Forest Service (FS), and other federal agencies. Permits to collect fossils on lands administered by federal agencies are authorized under this Act. However, due to the large gray areas left open to interpretation due to the imprecision of the wording, agencies are hesitant to interpret this act as governing paleontological resources.

3.1.2 Federal Land Policy and Management Act (FLPMA) (43 USC 1701)

Federal law including the Federal Land Policy and Management Act (FLPMA) of 1976 (43 USC 1701) includes objectives such as the evaluation, management, protection and location of fossils on BLM-managed lands, defines fossils, and lays out penalties for the destruction of significant fossils. Also, NEPA requires the preservation of "historic, cultural, and natural aspects of our national heritage." Most recently, the Omnibus Public Lands Act refines NEPA and FLPMA guidelines and strictures, as well as outlines minimum punishments for removal or destruction of fossils from federal/public lands (see below).

3.1.3 Paleontological Resources Preservation Act (PRPA)

Paleontological Resources Preservation, Title VI, Subtitle D in the Omnibus Public Lands Act of 2009, Public Law 111-011 Purpose: The Secretary (Interior and Agriculture) shall manage and protect paleontological resources on federal land using scientific principles and expertise. With the passage of the PRPA, Congress officially recognizes the importance of paleontological resources on federal lands (US Department of the Interior, US Department of Agriculture) by declaring that fossils from federal lands are federal property that must be preserved and protected using scientific principles and expertise. The PRPA provides:

- Uniform definitions for "paleontological resources" and "casual collecting";
- Uniform minimum requirements for paleontological resource use permit issuance (terms, conditions, and qualifications of applicants);
- Uniform criminal and civil penalties for illegal sale and transport, and theft and vandalism of fossils from Federal lands; and
- Uniform requirements for curation of federal fossils in approved repositories.

3.1.4 Code of Federal Regulations, Title 43

Under the Title 43, Code of Federal Regulations, Section 8365.1-5, the collection of scientific and paleontological resources, including vertebrate fossils, on federal land is prohibited. The collection of a "reasonable amount" of common invertebrate or plant fossils for non-commercial purposes is permissible (43 CFR 8365.1-5 [United States Government Printing Office, 2014]).

3.2 State Regulations

3.2.1 California Environmental Quality Act (CEQA)

The procedures, types of activities, persons, and public agencies required to comply with CEQA are defined in the Guidelines for Implementation of CEQA (State CEQA Guidelines), as amended on March 18, 2010 (Title 14, Section 15000 et seq. of the California Code of Regulations) and further amended January 4, 2013 and December 28, 2018. One of the questions listed in the CEQA Environmental Checklist is: "Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?" (State CEQA Guidelines Appendix G, Section VII, Part F).

3.2.2 State of California Public Resources Code

The State of California Public Resources Code (Chapter 1.7), Sections 5097 and 30244, includes additional state level requirements for the assessment and management of paleontological resources. These statutes require reasonable mitigation of adverse impacts to paleontological resources resulting from development on state lands, and define the excavation, destruction, or removal of paleontological "sites" or "features" from public lands without the express permission of the jurisdictional agency as a misdemeanor. As used in Section 5097, "state lands" refers to lands owned by, or under the jurisdiction of, the state or any state agency. "Public lands" is defined as lands owned by, or under the jurisdiction of, the state, or any city, county, district, authority, or public corporation, or any agency thereof.

3.3 Local Regulatory Setting

3.3.1 Lassen County (2000)

The Lassen County General Plan (2000) does not have any policies pertaining specifically to paleontological resources.

3.3.2 Modoc County

The Modoc County General Plan (2019) does not have any policies pertaining specifically to paleontological resources.

3.3.3 Sierra County

The Sierra County General Plan (2000) does not have any policies pertaining specifically to paleontological resources.

4.0 METHODS

The paleontological scope of work included an analysis of existing data consisting of a geologic map review and a review of literature and online databases. The goal of this report is to identify the paleontological potential of the Project area and make recommendations for the avoidance of adverse impacts on paleontological resources that may occur as a result of the proposed construction. Since the Project is partially sited on federal lands, paleontological sensitivity assignments were determined using the federal Potential Fossil Yield Classification (PFYC) system (BLM, 2016) and best practices in mitigation paleontology (Murphey et al., 2019). Joey Raum, B.S., completed the background research and authored this report. Courtney Richards, M.S., performed the technical review of this report. GIS maps were prepared by Barbara Webster, M.S. Courtney Richards, M.S., oversaw all aspects of the Project as the Paleontological Principal Investigator.

Copies of this report will be submitted to Caltrans District 2, Zayo, and Stantec. Paleo Solutions will retain an archival copy of all project information including maps and other data.

4.1 Analysis of Existing Data

Paleo Solutions reviewed geologic mapping of the Project area and quarter-mile buffer by T.L.T. Grose, G.J. Saucedo, and D.L. Wagner (2014a, 2014b); T.L.T. Grose, A.E. Egger, and M.D. O'Neal (2016, 2017); and G.J. Saucedo and D.L. Wagner (1992). Additionally, Paleo Solutions staff reviewed published and unpublished scientific papers and conducted paleontological record searches of online databases, including the University of California Museum of Paleontology (UCMP) database and the Paleobiology Database (PBDB).

4.2 Criteria for Evaluating Paleontological Sensitivity

The PFYC system was developed by the BLM (BLM, 2016). Because of its demonstrated usefulness as a resource management tool, the PFYC has been utilized for many years for projects across the country, regardless of land ownership. It is a predictive resource management tool that classifies geologic units on their likelihood to contain paleontological resources on a scale of 1 (very low potential) to 5 (very high potential). This system is intended to aid in predicting, assessing, and mitigating paleontological resources. The PFYC ranking system is summarized in Table 2.

Table 2. Potential Fossil Yield Classification (BLM, 2016)

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
1 = Very Low Potential	Geologic units are not likely to contain recognizable paleontological resources.
	Units are igneous or metamorphic, excluding air-fall and reworked volcanic ash units.
	Units are Precambrian in age.
	Management concern is usually negligible, and impact mitigation is unnecessary except in rare or isolated circumstances.

BLM PFYC Designation	**Assignment Criteria Guidelines and Management Summary (PFYC System)**
2 = Low Potential	Geologic units are not likely to contain paleontological resources.
	Field surveys have verified that significant paleontological resources are not present or are very rare.
	Units are generally younger than 10,000 years before present.
	Recent eolian deposits.
	Sediments exhibit significant physical and chemical changes (i.e., diagenetic alteration) that make fossil preservation unlikely.
	Management concern is generally low, and impact mitigation is usually unnecessary except in occasional or isolated circumstances.
3 = Moderate Potential	Sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.
	Marine in origin with sporadic known occurrences of paleontological resources.
	Paleontological resources may occur intermittently, but these occurrences are widely scattered
	The potential for authorized land use to impact a significant paleontological resource is known to be low-to-moderate.
	Management concerns are moderate. Management options could include record searches, pre-disturbance surveys, monitoring, mitigation, or avoidance. Opportunities may exist for hobby collecting. Surface-disturbing activities may require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action could affect the paleontological resources.
4 = High Potential	Geologic units that are known to contain a high occurrence of paleontological resources.
	Significant paleontological resources have been documented but may vary in occurrence and predictability.
	Surface-disturbing activities may adversely affect paleontological resources.
	Rare or uncommon fossils, including nonvertebrate (such as soft body preservation) or unusual plant fossils, may be present.
	Illegal collecting activities may impact some areas.
	Management concern is moderate to high depending on the proposed action. A field survey by a qualified paleontologist is often needed to assess local conditions. On-site monitoring or spot-checking may be necessary during land disturbing activities. Avoidance of known paleontological resources may be necessary.
5 = Very High Potential	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.
	Significant paleontological resources have been documented and occur consistently
	Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities.
	Unit is frequently the focus of illegal collecting activities.
	Management concern is high to very high. A field survey by a qualified paleontologist is almost always needed and on-site monitoring may be necessary during land use activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
U = Unknown Potential	Geologic units that cannot receive an informed PFYC assignment.
	Geological units may exhibit features or preservational conditions that suggest significant paleontological resources could be present, but little information about the actual paleontological resources of the unit or area is known.
	Geologic units represented on a map are based on lithologic character or basis of origin, but have not been studied in detail.
	Scientific literature does not exist or does not reveal the nature of paleontological resources.

BLM PFYC Designation	Assignment Criteria Guidelines and Management Summary (PFYC System)
	Reports of paleontological resources are anecdotal or have not been verified.
	Area or geologic unit is poorly or under-studied.
	BLM staff has not yet been able to assess the nature of the geologic unit.
	Until a provisional assignment is made, geologic units with unknown potential have medium to high management concerns. Field surveys are normally necessary, especially prior to authorizing a ground-disturbing activity.

5.0 ANALYSIS OF EXISTING DATA

The Project is located within the Basin and Range and Modoc Plateau Geomorphic Provinces. The Basin and Range Geomorphic Province is characterized by fault-bounded ranges, down-dropped basins, and interior fluvial and lacustrine drainage systems (Norris and Webb, 1990). The Modoc Plateau Geomorphic Province comprises widespread andesite and basalt flows and underlying silicic pyroclastic rocks and breccias (Grose et al., 2014b). The volcanic plateau has an elevation ranging between approximately 4,000 and 6,000 feet above sea level and is cut by numerous north-south trending faults (Norris and Webb, 1990).

5.1 Geologic Map and Literature Review

Geologic mapping by Grose et al. (2014a, 2014b, 2016, 2017) and Saucedo and Wagner (1992) indicates that the Project alignment is underlain by Holocene-age very young sedimentary deposits, Holocene- to Pleistocene-age young sedimentary deposits, Pleistocene-age old sedimentary deposits, Pliocene-age very old sedimentary deposits, Pleistocene- to Oligocene-age volcanic rocks, and Miocene- and Mesozoic-age plutonic rocks (Appendix A).

5.1.1 Artificial Fill (Recent)

Artificial fill comprises recent deposits of previously disturbed sediments emplaced by construction operations and are found in areas where recent construction has taken place. Color is highly variable, and sediments are mottled in appearance. These sediments are not mapped within the Project area but are likely to be encountered within previously disturbed portions of the Project.

5.1.2 Very Young Sedimentary Deposits (Q, Qa, Qc, Qf, Qt, Ql, Qhs, Qhe, Qhds) (Holocene)

Very young sedimentary deposits are Holocene-age (less than 11,000 years old) and include surficial deposits consisting of variable compositions of clay, silt, sand, gravel, and larger clasts that were laid down in modern fluvial and lacustrine systems. Gravel is composed of igneous and metamorphic rocks that range from granule- to cobble-sized and which generally vary between subangular to subrounded depending on the source proximity. These surficial units are generally unconsolidated, undissected, and less topographically developed than older units. There are seven Holocene-age geologic units mapped within the Project alignment, including alluvium (Q, Qa), colluvium (Qc), alluvial fan (Qf), terrace deposits (Qt), lake deposits (Ql), sand deposits (Qhs), and eolian, fluvial, and lacustrine deposits (Qhe) (Grose et al., 2014a, 2014b, 2016, 2017; Saucedo and Wagner, 1992; Appendix A). Also mapped within the Project vicinity, within the quarter-mile buffer, is Holocene-age dune sand (Qhds) (Saucedo and Wagner, 1992; Appendix A).

5.1.3 Young Sedimentary Deposits (Qa, Qf, Qd, Qol, Qlmd, Qls, Qg) (Holocene to Pleistocene)

Young sedimentary deposits are Holocene- to Pleistocene-age (approximately 2.51 million years to less than 11,000 years old) and include surficial deposits consisting of variable compositions of clay, silt, sand, gravel, and larger clasts that were laid down in modern and ancient fluvial and lacustrine systems. Gravel is composed of igneous and metamorphic rocks that range from granule- to cobble-sized and which generally vary between subangular to subrounded depending on the source proximity. These sediments are generally unconsolidated to weakly consolidated and often dissected where elevated. They are moderately indurated, relatively elevated, and contrast the lower lying Holocene-age surficial sediments. There are six Holocene- to Pleistocene-age geologic units mapped within the Project alignment, including alluvium (Qa), alluvial fan deposits (Qf), delta deposits of the Susan River (Qd), older lake deposits (Qol), near-shore and deltaic deposits of Lake Madeline (Qlmd), and landslide deposits (Qls), the latter of which comprise displaced sections of land masses (Grose et al., 2014a, 2014b, 2016, 2017; Saucedo and Wagner, 1992; Appendix A). Also mapped within the Project vicinity, within the quarter-mile buffer, are Holocene- to Pleistocene-age colluvial gravel (Qg) (Grose et al., 2016; Appendix A).

5.1.4 Old Sedimentary Deposits (Qoa, Qof, Qpl, Qplg, Qos, Qpfd) (Pleistocene)

Old sedimentary deposits are Pleistocene-age (approximately 2.51 million years to 11,000 years old) and include deposits consisting of variable compositions of clay, silt, sand, gravel, and larger clasts that were laid down in ancient terrestrial and marine environments. Gravel is composed of igneous and metamorphic rocks that range from granule to cobble-sized and which generally vary between subangular to subrounded depending on the source proximity. These deposits are moderately to well indurated and are generally characterized by their low-moderate to moderate relief and dissected surfaces. They are relatively elevated and contrast the lower lying Holocene-age sedimentary deposits. There are six Pleistocene-age sedimentary geologic units mapped within the Project alignment, including older alluvium (Qoa), older fan deposits (Qof), near-shore deposits of Lake Lahontan (Qpl), gravel deposits of Lake Lahontan (Qplg), nonmarine sedimentary rocks (Qos), and fan delta deposits of Long Creek (Qpfd) (Grose et al., 2014a, 2014b, 2016, 2017; Saucedo and Wagner, 1992; Appendix A).

5.1.5 Very Old Sedimentary Deposits (Ps) (Pliocene)

Very old sedimentary deposits are Pliocene-age (approximately 5.51 million years to 2.33 million years old) and include nonmarine sedimentary rocks (Ps) within the Project area. This unit comprises undifferentiated deposits of fluvial and lacustrine shale, sandstone, and ash (Saucedo and Wagner, 1992).

5.1.6 Volcanic Rocks (Tmma, Tlma, Ttmb, Tvb, Tdrb, Tsbl, Tlrt, Tvgb, Tdgb, Tb, Ta, Tabpf, Tsht, Tvsa, Ttpw, Ttab, Trpt, Tsha, Tssa, Tsl, Tfcb, Tdct, Tesa, Tsab, Tsbu, Tvbi, Tld, Tlp, Tpvu, Tfp, Ttpf, Omv) (Pleistocene to Oligocene)

Volcanic rocks are formed by the eruption and subsequent rapid cooling of molten rock (also known as lava) at the earth's surface. Within the Project alignment, there are three Pleistocene-age volcanic geologic units, including andesite and basalt of Northwest Madeline Volcano (Tmma), andesite and basalt (Tlma), and basalt and andesite of Tule Mountain Volcano (Ttmb); four Pliocene-age volcanic geologic units, including olivine basalt of Viewland (Tvb), basalt and mafic andesite of Ducasse Reservoir (Tdrb), basalt, mafic andesite, tuff of Spanish Springs (Tsbl), and tuff of Lava Rock Reservoir (Tlrt); five Pliocene- to Miocene-age volcanic geologic units, including basalt of the Vya Group (Tvgb), Devils Garden Basalt (Tdgb), basalt and andesite volcanoes (Tb), Alturas Formation (Ta), and Alturas Formation, pyroclastic flow (Tabpf); nine Miocene-age volcanic geologic units, including pyroclastic rocks of Sugar Hill (Tsht), mafic andesites flows of Viewland shield (Tvsa), basalt of Three Peaks West Volcano (Ttpw), basalt and andesite flows and breccias (Ttab), tuff of Rye Patch Canyon (Trpt), mafic andesite of Shinn Mountain (Tsha), mafic andesite of Spanish Springs Peak (Tssa), andesite and mafic andesite flows (Tsl), and basalt of Franklin Creek (Tfcb); one Oligocene-age volcanic geologic unit, including tuff of Davis Creek (Tdct); and Cenozoic-age mafic andesite flows of East Shaffer shield (Tesa) (Grose et al., 2014a, 2014b, 2016, 2017; Saucedo and Wagner, 1992; Appendix A). Also mapped within the Project vicinity, within the quarter-mile buffer, are Pleistocene-age andesite and basalt from local volcanoes (Tsab), Pliocene-age basalt of Spanish Springs (Tsbu), Pliocene-age olivine basalt intrusives of Viewland (Tvbi), Miocene-age latite domes of Litchfield (Tld), Miocene-age latitic to andesitic flow breccias and tuffs of Litchfield (Tlp), Miocene-age volcanics of New Pine Creek, undifferentiated (Tpvu), Miocene-age andesitic flows and pyroclastics (Tfp), Miocene-age basaltic flows and pyroclastics of

Three Peaks (Ttpf), and Oligocene- to Miocene-age rhyolite tuff and sedimentary rocks (Omv) (Grose et al., 2014a, 2014b, 2016, 2017; Saucedo and Wagner, 1992; Appendix A).

5.1.7 Plutonic Rocks (Tovi, Kgd, KJgr) (Miocene and Mesozoic)

Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava (volcanic) or magma (plutonic). Intrusive (plutonic) igneous rocks form below the earth's surface. Magma is formed by the partial melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition. Three plutonic geologic units are mapped within the Project alignment, including Miocene-age hypabyssal intrusions (Tovi), Cretaceous-age hornblende-biotite granodiorite (Kgd), and Mesozoic-age granite and granodiorite (KJgr) (Grose et al., 2014b, 2017; Saucedo and Wagner, 1992; Appendix A).

5.2 Paleontological Resources

5.2.1 Artificial Fill (Recent)

Any fossil resources contained within these sediments will have been removed from their original deposition locations and, therefore, lack significant stratigraphic contextual data. Therefore, these deposits are considered to have a low potential for producing significant paleontological resources (PFYC 2) based on BLM (2016) guidelines.

5.2.2 Very Young Sedimentary Deposits (Q, Qa, Qc, Qf, Qt, Ql, Qhs, Qhe, Qhds) (Holocene)

Holocene-age sediments are typically too young to contain fossilized material (SVP, 2010), although they may shallowly overlie sensitive older (e.g., Pleistocene) deposits at variable depth. Therefore, Holocene-age alluvium (Q, Qa), colluvium (Qc), alluvial fan (Qf), terrace deposits (Qt), lake deposits (Ql), sand deposits (Qhs), eolian, fluvial, lacustrine deposits (Qhe), and Holocene-age dune sand (Qhds) are considered to have a low potential for producing significant paleontological resources (PFYC 2) based on BLM (2016) guidelines.

5.2.3 Young Sedimentary Deposits (Qa, Qf, Qd, Qol, Qlmd, Qls, Qg) (Holocene to Pleistocene)

Holocene-age sediments are typically too young to contain fossilized material (SVP, 2010), although they may shallowly overlie sensitive older (e.g., Pleistocene) deposits at variable depth. Numerous Ice Age taxa have been recovered from Pleistocene-age deposits throughout Lassen and Modoc counties as well as other areas of California (see Section 5.2.2.4). Therefore, Holocene- to Pleistocene-age alluvium (Qa), alluvial fan deposits (Qf), delta deposits of the Susan River (Qd), older lake deposits (Qol), near-shore and deltaic deposits of Lake Madeline (Qlmd), and colluvial gravel (Qg) are considered to have an unknown potential for producing paleontological resources (PFYC U) based on BLM (2016) guidelines, until more subsurface data is acquired. Additionally, fossils contained within landslide deposits may lack stratigraphic context due to displacement from the original area of deposition, thereby reducing the significance of the fossils. The resources, however, may retain some significance if any stratigraphic structure is preserved in the landslide masses. Therefore, Holocene- to Pleistocene-age landslide deposits (Qls) are considered to have an unknown potential for producing paleontological resources (PFYC U) based on BLM (2016) guidelines, until more subsurface data is acquired.

5.2.4 Old Sedimentary Deposits (Qoa, Qof, Qpl, Qplg, Qos, Qpfd) (Pleistocene)

Numerous Ice Age taxa have been recovered from Pleistocene-age deposits throughout Lassen and Modoc counties as well as other areas of California. Fossils recorded from Pleistocene-age sediments in Lassen County include blue chub (*Gila bicolor, Gila coerulea*), chiselmouth (*Acrocheilus*), cyprinid fish (*Ptychocheilus, Lavinia*), ray-finned fish (*Chasmistes*), Pacific salmon and trout (*Oncorhyncus*), deer mouse (*Peromyscus*), cotton rat (*Sigmodon medius*), antelope squirrel (*Ammospermophilus*), hare and jackrabbit (*Lepus*), cotton rabbit (*Sylvilagus*), dog (*Canis*), coyote (*Canis latrans*), horse (*Equus*), camel (*Camelops*), pronghorn (*Sphenophalos*), bison (*Bison latifrons*), sabre-tooth cat (*Smilodon*), mastodon (*Mammut pacificus*), and mammoth (*Mammuthus*) (UCMP, 2020; Paleobiology Database [PBDB], 2020; Table 3). Fossils recorded from Pleistocene-age sediments in Modoc County include horse (*Equus*), musk oxen (*Symbos*), bison (*Bison*), camel (Camelidae), elephant (Proboscidea) (UCMP, 2020; PBDB, 2020; Table 3). Additional localities recorded from Pleistocene-age sedimentary deposits throughout central and southern California have produced specimens including mammoth (*Mammuthus*), mastodon (*Mammut*), camel (Camelidae), horse (Equidae), bison (*Bison*), giant ground sloth (*Megatherium*), peccary (Tayassuidae), cheetah (*Acinonyx*), lion (*Panthera*), saber-toothed cat (*Smilodon*), capybara (*Hydrochoerus*), dire wolf (*Canis dirus*), and numerous taxa of smaller mammals (Rodentia) (Jahns, 1954; Jefferson, 1991; Table 3). Therefore, Pleistocene-age older alluvium (Qoa), older fan deposits (Qof), near-shore deposits of Lake Lahontan (Qpl), gravel deposits of Lake Lahontan (Qplg), nonmarine sedimentary rocks (Qos), and fan delta deposits of Long Creek (Qpfd) are considered to have a moderate potential for producing paleontological resources (PFYC 3) based on BLM (2016) guidelines.

5.2.5 Very Old Sedimentary Deposits (Ps) (Pliocene)

Geologic units with informal names like Pliocene-age nonmarine sedimentary deposits (Ps), are not responsive to searches in the literature because they lack formal designation. However, online databases record numerous vertebrate fossils from similar Pliocene-age sedimentary sediments in Lassen and Modoc counties. Fossils recorded from Pliocene-age sedimentary deposits in Lassen County include dabbling duck (*Anas*), blue chub (*Gila coerulea*), Pacific salmon and trout (*Oncorhyncus*), chiselmouth (*Acrocheilus*), cyprinid fish (*Ptychocheilus, Lavinia*), ray-finned fish (*Chasmistes*), common sucker (*Catostomus*), sculpin (*Cottus*), small cat (*Felis*), rabbit (*Hypolagus*), extinct horse (*Plesippus*), camel (*Titanotylopus*, *Hemiauchenia*), and American mountain deer (*Odocoileus lucasi*) (UCMP, 2020; PBDB, 2020; Table 3). Fossils recorded from Pliocene-age sedimentary deposits in Modoc County include pond frog (*Rana*), spiny lizard (*Sceloporus*), bird (Aves), dabbling duck (*Anas*), carp and minnow (Cyprinidae), blue chub (*Gila coerulea*), Pacific salmon and trout (*Oncorhyncus*), chiselmouth (*Acrocheilus*), cyprinid fish (*Ptychocheilus, Lavinia*), ray-finned fish (*Chasmistes*), common sucker (*Catostomus*), deer mouse (*Peromyscus*), small-eared shrew (*Cryptotis*), and mouse (*Mimomys sawrockensis*) (UCMP, 2020; PBDB, 2020; Table 3). Therefore, Pliocene-age nonmarine sedimentary deposits (Ps) are considered to have an unknown potential for producing paleontological resources (PFYC U) based on BLM (2016) guidelines until more lithological data is obtained.

5.2.6 Volcanic Rocks (Tmma, Tlma, Ttmb, Tvb, Tdrb, Tsbl, Tlrt, Tvgb, Tdgb, Tb, Ta, Tabpf, Tsht, Tvsa, Ttpw, Ttab, Trpt, Tsha, Tssa, Tsl, Tfcb, Tdct, Tesa, Tsab, Tsbu, Tvbi, Tld, Tlp, Tpvu, Tfp, Ttpf, Omv) (Pleistocene to Oligocene)

Igneous rocks are crystalline or non-crystalline rocks that form through the cooling and subsequent solidification of lava or magma. Volcanic (extrusive) igneous rocks form at the earth's surface when lava, which is formed by the partial melting of pre-existing plutonic rocks in the earth's crust or mantle due to increases in temperature, changes in pressure, or changes in geochemical composition, erupts and rapidly solidifies. Extreme temperatures in the environments in which most extrusive igneous rocks form prevent the preservation of fossils (e.g., basaltic and andesitic lava flows, pyroclastic flows). However, some volcanic deposits, namely ash and tuff, can harbor significant intact paleontological resources.

There are no specimens in the UCMP or PBDB specifically attributed to ash or tuff deposits within Lassen, Modoc, or Sierra counties. However, the Pliocene-age Alturas Formation, which includes tuff and volcaniclastic sandstone deposits as well as lake clays, has produced vertebrate fossils in Modoc County (UCMP, 2020; PBDB, 2020). Most of the listed localities do not specify which facies of the Alturas Formation the fossils were recovered from; however, several were reported from sandstone, volcaniclastic sandstone, and siltstone facies. Recorded specimens from the Alturas Formation include pond frog (*Rana*), spiny lizard (*Sceloporus*), bird (Aves), dabbling duck (*Anas*), carp and minnow (Cyprinidae), blue chub (*Gila coerulea*), Pacific salmon and trout (*Oncorhyncus*), chiselmouth (*Acrocheilus*), cyprinid fish (*Ptychocheilus, Lavinia*), ray-finned fish (*Chasmistes*), common sucker (*Catostomus*), deer mouse (*Peromyscus*), small-eared shrew (*Cryptotis*), and mouse (*Mimomys sawrockensis*) (UCMP, 2020; PBDB, 2020; Table 3).

Pleistocene-age andesite and basalt of Northwest Madeline Volcano (Tmma), Pleistocene-age andesite and basalt (Tlma), Pleistocene-age basalt and andesite of Tule Mountain Volcano (Ttmb), Pleistocene-age andesite and basalt from local volcanoes (Tsab), Pliocene-age olivine basalt of Viewland (Tvb), Pliocene-age basalt and mafic andesite of Ducasse Reservoir (Tdrb), Pliocene-age basalt of Spanish Springs (Tsbu), Pliocene-age olivine basalt intrusives of Viewland (Tvbi), Pliocene- to Miocene-age basalt of the Vya Group (Tvgb), Pliocene- to Miocene-age Devils Garden Basalt (Tdgb), Pliocene- to Miocene-age basalt and andesite volcanoes (Tb), Pliocene- to Miocene-age Alturas Formation, pyroclastic flow (Tabpf), Miocene-age mafic andesites flows of Viewland shield (Tvsa), Miocene-age basalt of Three Peaks West Volcano (Ttpw), Miocene-age mafic andesite of Shinn Mountain (Tsha), Miocene-age mafic andesite of Spanish Springs Peak (Tssa), Miocene-age andesite and mafic andesite flows (Tsl), Miocene-age basalt of Franklin Creek (Tfcb), Miocene-age latite domes of Litchfield (Tld), Miocene-age volcanics of New Pine Creek, undifferentiated (Tpvu), Miocene-age andesitic flows and pyroclastics (Tfp), Miocene-age basaltic flows and pyroclastics of Three Peaks (Ttpf), and Cenozoic-age mafic andesite flows of East Shaffer shield (Tesa) are considered to have very low potential for producing significant paleontological resources (PFYC 1) based on BLM (2016) guidelines.

Pliocene-age basalt, mafic andesite, tuff of Spanish Springs (Tsbl), Pliocene-age tuff of Lava Rock Reservoir (Tlrt), Miocene-age basalt and andesite flows and breccias (Ttab), Miocene-age pyroclastic rocks of Sugar Hill (Tsht), Miocene-age latitic to andesitic flow breccias and tuffs of Litchfield (Tlp), Miocene-age tuff of Rye Patch Canyon (Trpt), and Oligocene-age tuff of Davis Creek (Tdct) are considered to have very low to low potential for producing significant paleontological resources (PFYC 2 to 1) based on BLM (2016) guidelines.

Pliocene- to Miocene-age Alturas Formation (Ta) is considered to have an unknown potential for producing paleontological resources (PFYC U) based on BLM (2016) guidelines. The unnamed and undifferentiated Oligocene- to Miocene-age rhyolite tuff and sedimentary rocks (Omv) are also considered to have an unknown potential for producing paleontological resources (PFYC U) based on BLM (2016) guidelines since fossils are known to occur in Oligocene- to Miocene-age sedimentary rocks in the region and it is uncertain which facies of this geologic unit is present in the Project vicinity.

5.2.7 Plutonic Rocks (Tovi, Kgd, KJgr) (Miocene and Mesozoic)

Plutonic rocks are formed by the slow cooling and solidification of molten rock (also known as magma) below the earth's surface. Extreme temperatures and the environments in which these intrusive igneous rocks form prevent the preservation of fossils. Therefore, Miocene-age hypabyssal intrusions (Tovi), Cretaceous-age hornblende-biotite granodiorite (Kgd), and Mesozoic-age granite and granodiorite (KJgr) are considered to have a very low potential for producing significant paleontological resources (PFYC 1) based on BLM (2016) guidelines.

Table 3. Paleontological Literature and Record Search Results

Institutional Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
Not Reported	Pleistocene-age sedimentary deposits	*Gila bicolor* *Gila coerulea* *Acrocheilus* *Ptychocheilus* *Lavinia*	blue chub blue chub chiselmouth cyprinid fish cyprinid fish	Lassen County	UCMP, 2020; PBDB, 2020

Institutional Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
		Chasmistes *Oncorhyncus* *Peromyscus* *Sigmodon medius* *Ammospermophilus* *Lepus* *Sylvilagus* *Canis* *Canis latrans* *Equus* *Camelops* *Sphenophalos* *Bison latifrons* *Smilodon* *Mammut pacificus* *Mammuthus*	ray-finned fish Pacific salmon/trout deer mouse cotton rat antelope squirrel hare/jackrabbit cotton rabbit dog coyote horse camel pronghorn bison sabre-tooth cat mastodon mammoth		
UCMP V5037, V6037, V6613, V6629	Pleistocene-age sedimentary deposits	*Equus* *Symbos* *Bison* Camelidae Proboscidean	horse musk oxen bison camel elephant	Modoc County	UCMP, 2020; PBDB, 2020
Not Reported	Pleistocene-age sedimentary deposits	*Mammuthus* *Mammut* Camelidae Equidae *Bison* *Megatherium* Tayassuidae *Acinonyx* *Panthera* *Smilodon* *Hydrochoerus* *Canis dirus* Rodentia	mammoth mastodon camel horse bison giant ground sloth peccary cheetah lion saber-tooth cat capybara dire wolf rodent	Southern and Central California	Jahns, 1954; Jefferson, 1991
Not Reported	Pliocene-age sedimentary deposits	*Anas* *Gila coerulea* *Oncorhyncus* *Acrocheilus* *Ptychocheilus* *Chasmistes* *Catostomus* *Cottus* *Felis* *Hypolagus* *Plesippus* *Titanotylopus* *Hemiauchenia* *Odocoileus lucasi*	dabbling duck blue chub Pacific salmon/trout Chiselmouth cyprinid fish ray-finned fish common sucker sculpin small cat rabbit extinct horse camel camel American mountain deer	Lassen County	UCMP, 2020; PBDB, 2020
UCMP V95026, V95027, V95028,	Alturas Formation (Pliocene-age)	*Rana* *Sceloporus* Aves	pond frog spiny lizard bird	Modoc County	UCMP, 2020;

Institutional Locality Number/ Name	Geologic Unit	Taxon	Common Name	Location	Source
V95029, V95030, V95031, V95032, V95033, V95038		*Anas* Cyprinidae *Gila coerulea* *Oncorhyncus* *Acrocheilus* *Ptychocheilus* *Chasmistes* *Catostomus* *Peromyscus* *Cryptotis* *Mimomys sawrockensis*	dabbling duck carp/minnow blue chub Pacific salmon/trout chiselmouth cyprinid fish ray-finned fish common sucker deer mouse small-eared shrew mouse		PBDB, 2020

6.0 IMPACTS TO PALEONTOLOGICAL RESOURCES

Impacts on paleontological resources can generally be classified as either direct, indirect, or cumulative. Direct adverse impacts on surface or subsurface paleontological resources are the result of destruction by breakage and crushing as the result of surface disturbing actions including construction excavations. In areas that contain paleontologically sensitive geologic units, ground disturbance has the potential to adversely impact surface and subsurface paleontological resources of scientific importance. Without mitigation, these fossils and the paleontological data they could provide if properly recovered and documented, could be adversely impacted (damaged or destroyed), rendering them permanently unavailable to science and society.

Indirect impacts typically include those effects which result from the continuing implementation of management decisions and resulting activities, including normal ongoing operations of facilities constructed within a given project area. They also occur as the result of the construction of new roads and trails in areas that were previously less accessible. This increases public access and therefore increases the likelihood of the loss of paleontological resources through vandalism and unlawful collecting. Human activities that increase erosion also cause indirect impacts to surface and subsurface fossils as the result of exposure, transport, weathering, and reburial.

Cumulative impacts can result from incrementally minor but collectively significant actions taking place over a period of time. The incremental loss of paleontological resources over time as a result of construction-related surface disturbance or vandalism and unlawful collection would represent a significant cumulative adverse impact, because it would result in the destruction of non-renewable paleontological resources and the associated irretrievable loss of scientific information.

Excavations within the Project area that impact Pleistocene-age older alluvium (Qoa) (PFYC 3), Pleistocene-age older fan deposits (Qof) (PFYC 3), Pleistocene-age near-shore deposits of Lake Lahontan (Qpl) (PFYC 3), Pleistocene-age gravel deposits of Lake Lahontan (Qplg) (PFYC 3), Pleistocene-age nonmarine sedimentary rocks (Qos) (PFYC 3), or Pleistocene-age fan delta deposits of Long Creek (Qpfd) (PFYC 3) may well encounter scientifically important paleontological resources. Additionally, excavations within geologic units with unknown paleontological potential (PFYC U), including Holocene- to Pleistocene-age alluvium (Qa), Holocene- to Pleistocene-age alluvial fan deposits (Qf), Holocene- to Pleistocene-age delta deposits of the Susan River (Qd), Holocene to Pleistocene-age older lake deposits (Qol), Holocene- to Pleistocene-age near-shore and deltaic deposits of Lake Madeline (Qlmd), Holocene- to Pleistocene-age landslide deposits (Qls), Holocene- to Pleistocene-age colluvial gravel (Qg), Pliocene-age nonmarine sedimentary rocks (Ps), Pliocene- to Miocene-age Alturas Formation (Ta), and Oligocene- to Miocene-age rhyolite tuff and sedimentary rocks (Omv) may well encounter important paleontological resources if the sediments are conducive to fossilization. Surface grading or shallow excavations in sedimentary geologic units with low paleontological potential (PFYC 2) are unlikely to uncover significant fossil vertebrate remains since these units are either too young or not conducive to fossilization. Additionally, surface grading or shallow excavations entirely within artificial fill or previously disturbed sediments are also unlikely to uncover significant fossil vertebrate remains since, any recovered resources will lack stratigraphic context. However, these deposits may shallowly overlie older sedimentary deposits. Excavations entirely within volcanic and plutonic rocks with very low paleontological potential (PFYC 1) or very low to low potential (PFYC 2 to 1) are unlikely to encounter any fossil resources, because of the environments in which these rocks form.

Grading and other earthmoving activities may result in significant adverse direct impacts to paleontological resources throughout the majority of the Project area, if substantial excavations occur where older sedimentary deposits (PFYC 3 and U) occur at the surface or at depth. No indirect or cumulative impacts are anticipated from any of the planned Project activities.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Construction excavations which disturb geologic units with moderate paleontological potential (PFYC 3) should be monitored by a professional paleontologist in conjunction with worker environmental training to reduce potential adverse impacts on scientifically important paleontological resources to a less than significant level. The timing and frequency (e.g., part-time vs. full-time) of monitoring should be determined by the professional paleontologist based on initial field observations and excavation activities. Additionally, excavations which disturb geologic units with unknown paleontological potential (PFYC U) should be initially monitored in order to inspect for the presence of sensitive sediments and any resources that may be harbored within. In the event that a highly fossiliferous facies are encountered, full-time monitoring should occur until excavations within that facies are complete. Worker environmental training of construction personnel is recommended for excavations impacting sedimentary geologic units with low paleontological potential (PFYC 2). No additional measures are recommended for excavations impacting volcanic and plutonic rock units with very low paleontological potential (PFYC 1) or very low to low potential (PFYC 2 to 1). A summary of the recommended monitoring procedures for each of the mile posts is provided in Appendix B.

Prior to construction, a Paleontological Mitigation Plan (PMP) should be prepared. It should provide detailed recommended monitoring locations; a description of a worker training program; detailed procedures for monitoring, fossil recovery, laboratory analysis, and museum curation; and notification procedures in the event of a fossil discovery by a paleontological monitor or other project personnel. Any subsurface bones or potential fossils that are unearthed during construction should be evaluated by a professional paleontologist as described in the PMP.

If you have any questions concerning the results for this study, please contact me at crichards@paleosolutions.com.

Sincerely,

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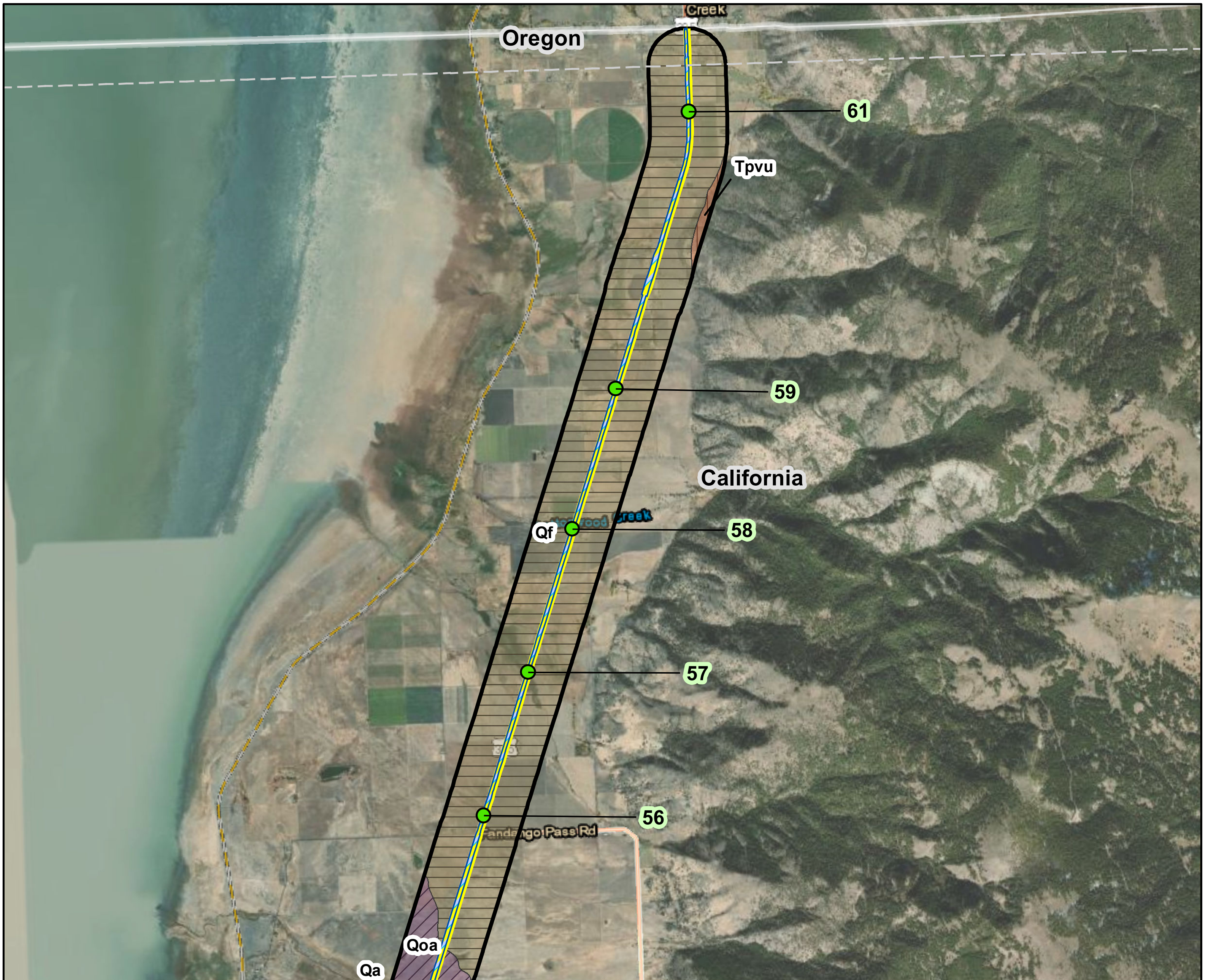
APPENDIX A

Geology and Paleosensitivity Maps



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Qa: Alluvium (Holocene)
- Qf: Alluvial fan (Holocene)
- Qoa: Older alluvium (Pleistocene)
- Tpvu: Volcanics of New Pine Creek, undifferentiated (Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 2 - Low
- Class 3 - Moderate

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose, Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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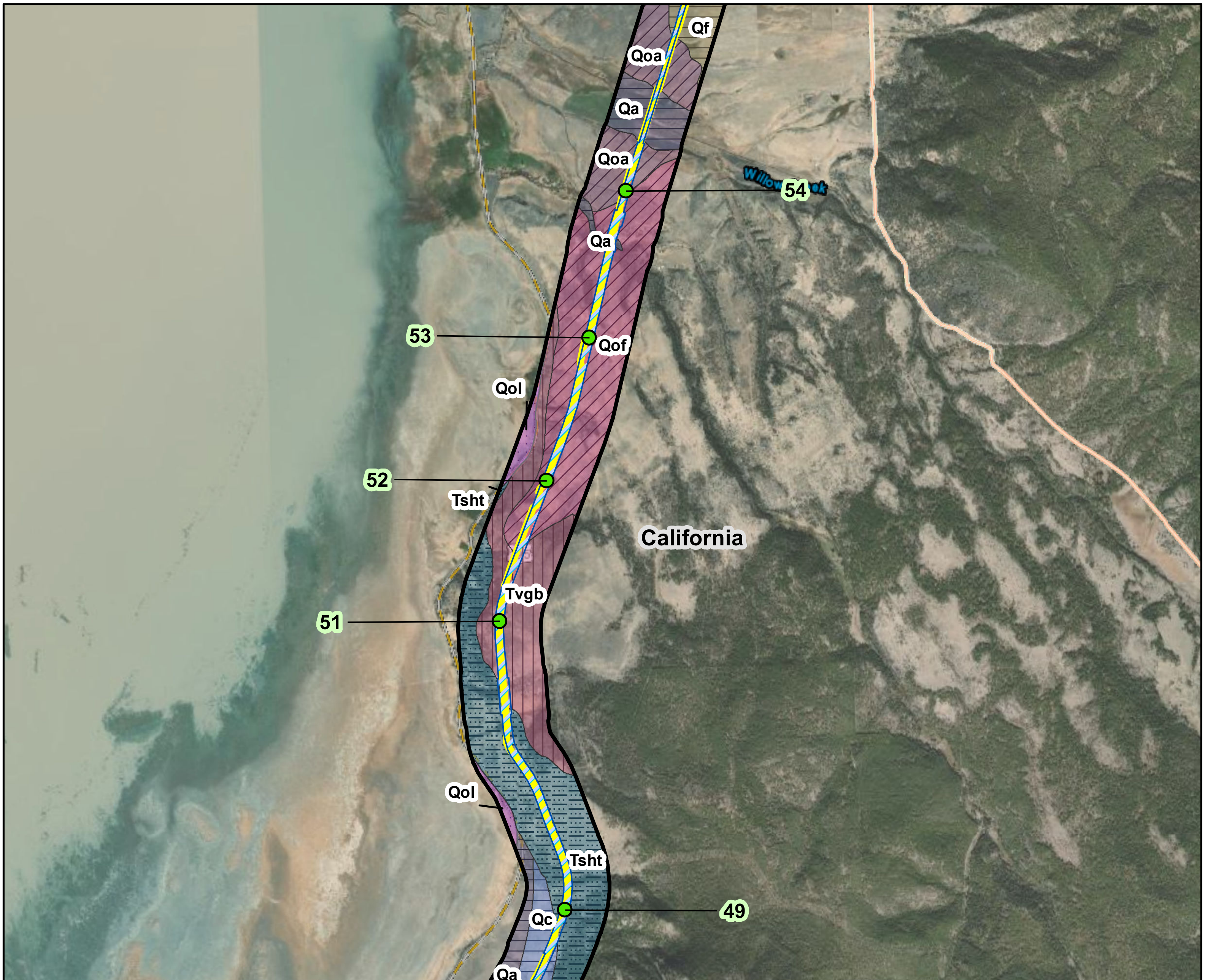

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Qa: Alluvium (Holocene)
- Qc: Colluvium (Holocene)
- Qf: Alluvial fan (Holocene)
- Qol: Older lake deposits (Holocene and Pleistocene)
- Qoa: Older alluvium (Pleistocene)
- Qof: Older fan deposits (Pleistocene)
- Tsht: Pyroclastic rocks of Sugar Hill (late Miocene)
- Tvgb: Basalt of the Vya Group (Pliocene to Late Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 1 or 2 - Very Low or Low
- Class 2 - Low
- Class 3 - Moderate
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose,Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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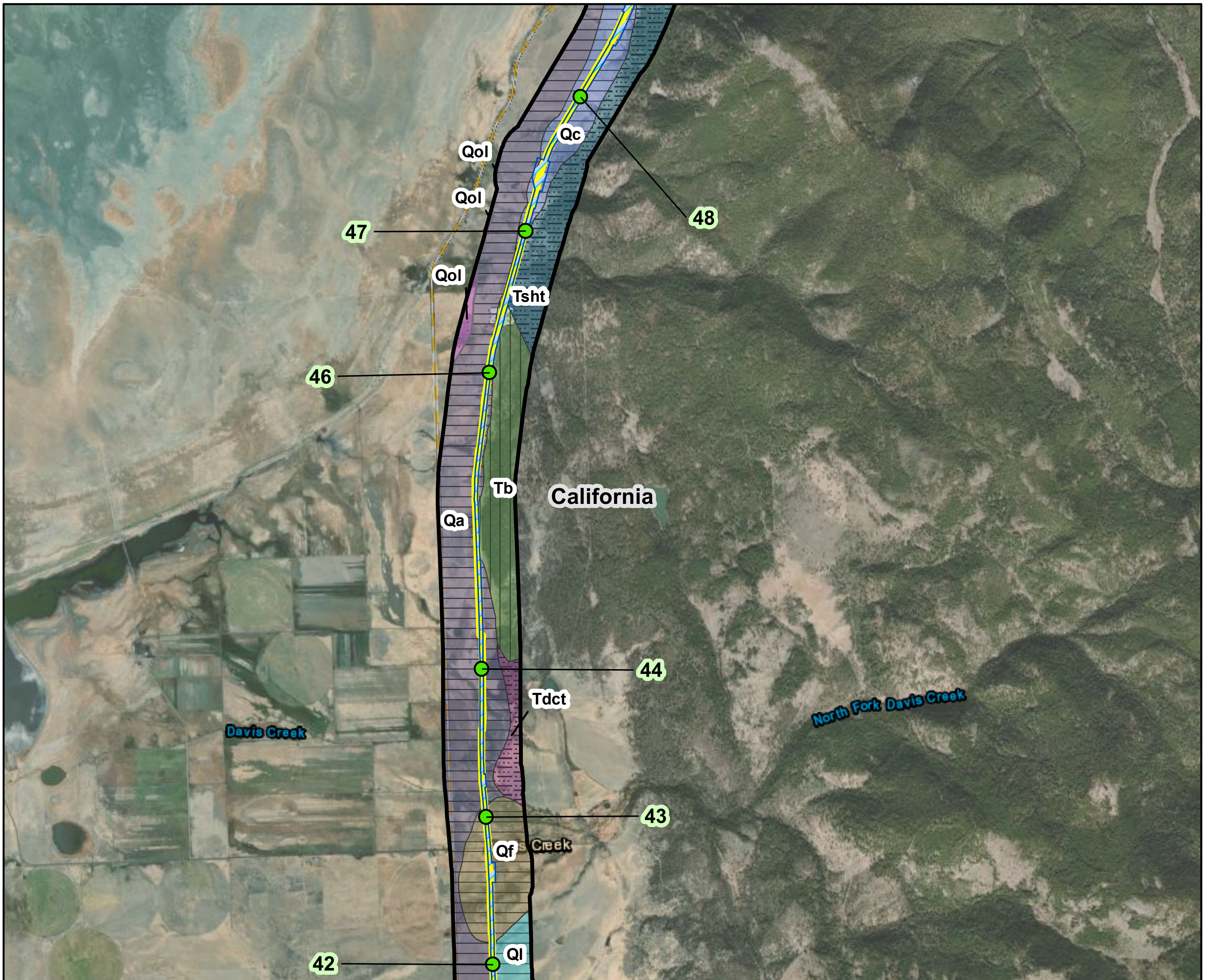

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Qc: Colluvium (Holocene)

Qf: Alluvial fan (Holocene)

Ql: Lake deposits (Holocene)

Qol: Older lake deposits (Holocene and Pleistocene)

Tb: Basalt and andesite volcanoes (Pliocene and (or) late Miocene)

Tsht: Pyroclastic rocks of Sugar Hill (late Miocene)

Tdct: Tuff of Davis Creek (Oligocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 1 or 2 - Very Low or Low

Class 2 - Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose,Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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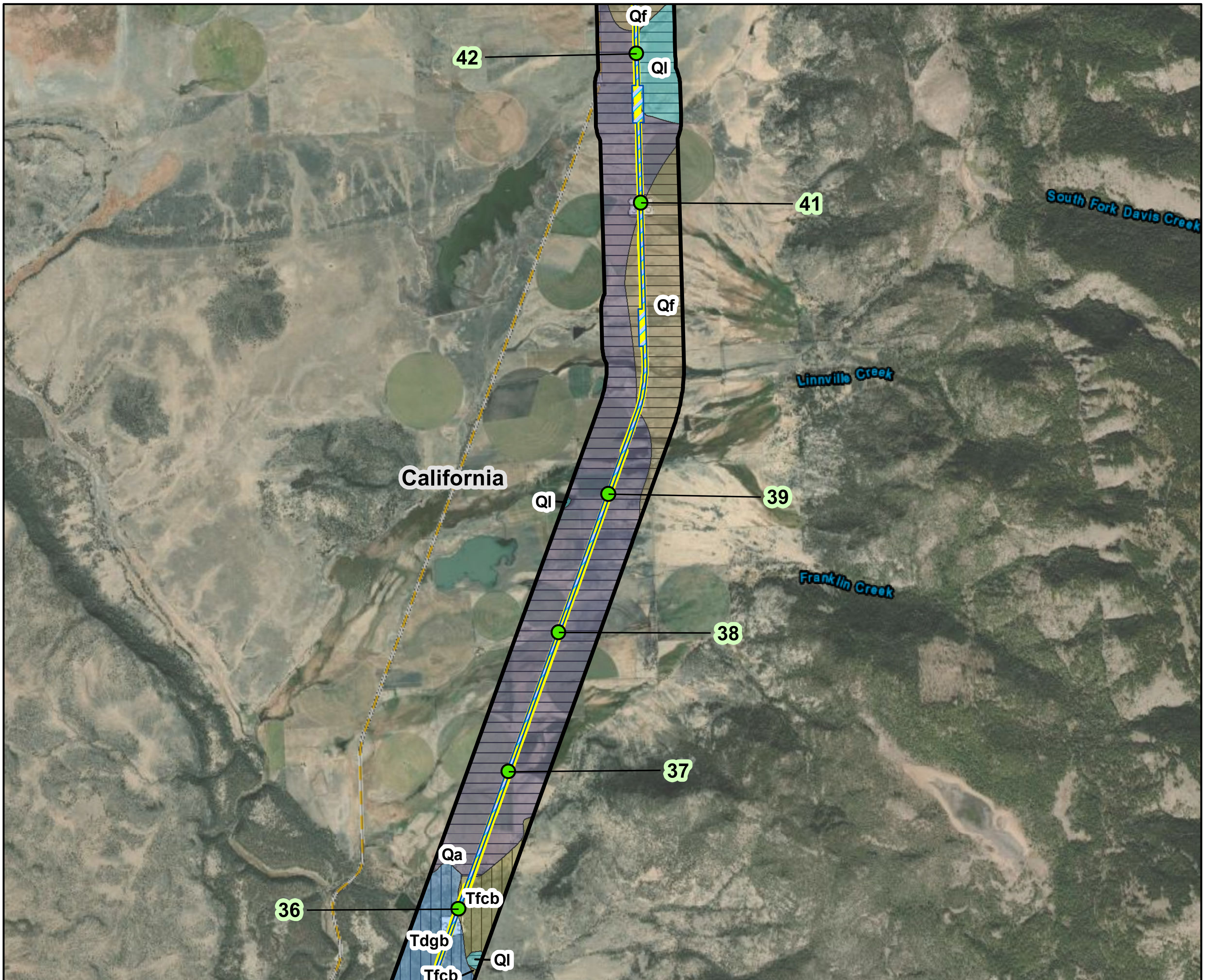

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Qf: Alluvial fan (Holocene)

Ql: Lake deposits (Holocene)

Tdgb: Devils Garden Basalt (Late Pliocene to Miocene)

Tfcb: Basalt of Franklin Creek (Miocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 2 - Low

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose,Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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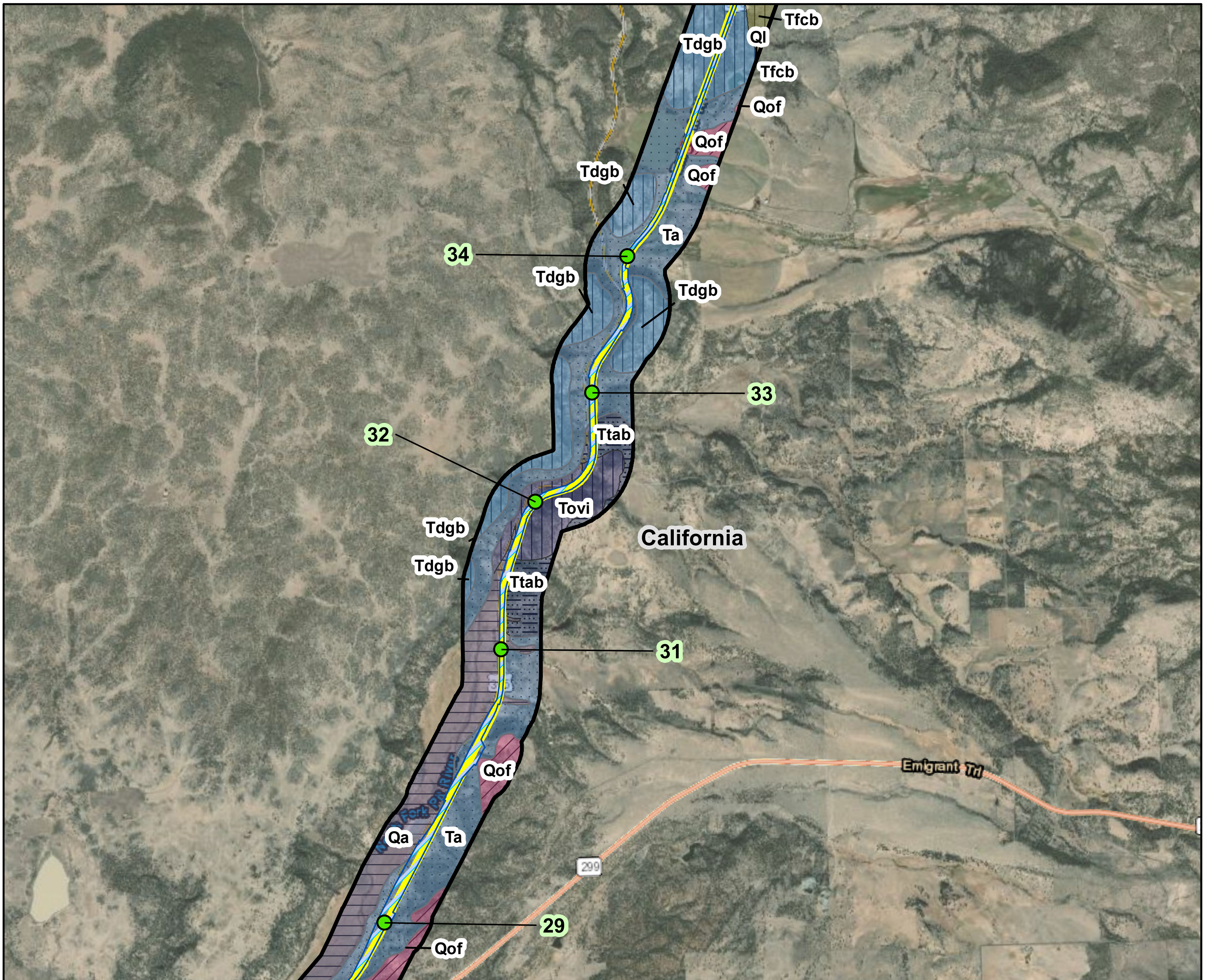

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Qa: Alluvium (Holocene)
- Ql: Lake deposits (Holocene)
- Qof: Older fan deposits (Pleistocene)
- Ta: Alturas Formation (Pliocene to Miocene)
- Tdgb: Devils Garden Basalt (Late Pliocene to Miocene)
- Tfcb: Basalt of Franklin Creek (Miocene)
- Tovi: Hypabyssal intrusions (Miocene)
- Ttab: Basalt and andesite flows and breccias (Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 1 or 2 - Very Low or Low
- Class 2 - Low
- Class 3 - Moderate
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose, Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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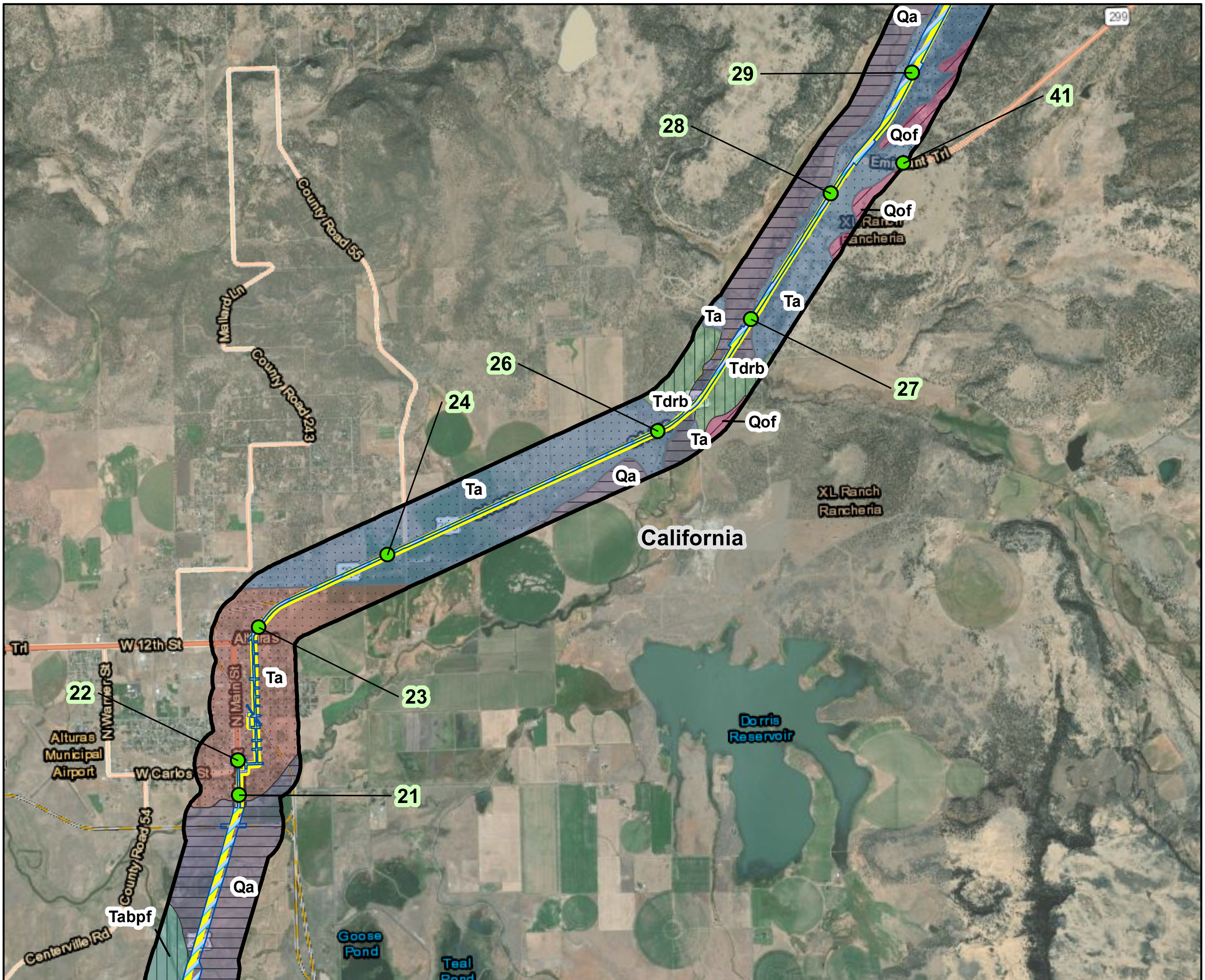

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Qof: Older fan deposits (Pleistocene)

Tabpf: Alturas Formation; Pyroclastic flow (Miocene and early Pliocene)

Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)

Ta: Alturas Formation (Pliocene to Miocene)

Tdrb: Basalt of Dorris Reservoir (Pliocene and (or) Miocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 2 - Low

Class 3 - Moderate

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30' × 60' Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale
Preliminary Geologic Map of the Cedarville 30' × 60' Quadrangle, Modoc County, California, Grose, Thomas L.T., Egger, Anne E., and O'Neal, Matt D., 1:100,000 (2017)

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Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- H2O: Water
- Qa: Alluvium (Holocene)
- Tabpf: Alturas Formation; Pyroclastic flow (Miocene and early Pliocene)
- Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)
- Tdgb: Devils Garden Basalt (Miocene and early Pliocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 2 - Low
- Class U - Unknown Potential
- Class W - Water

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30′ × 60′ Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale

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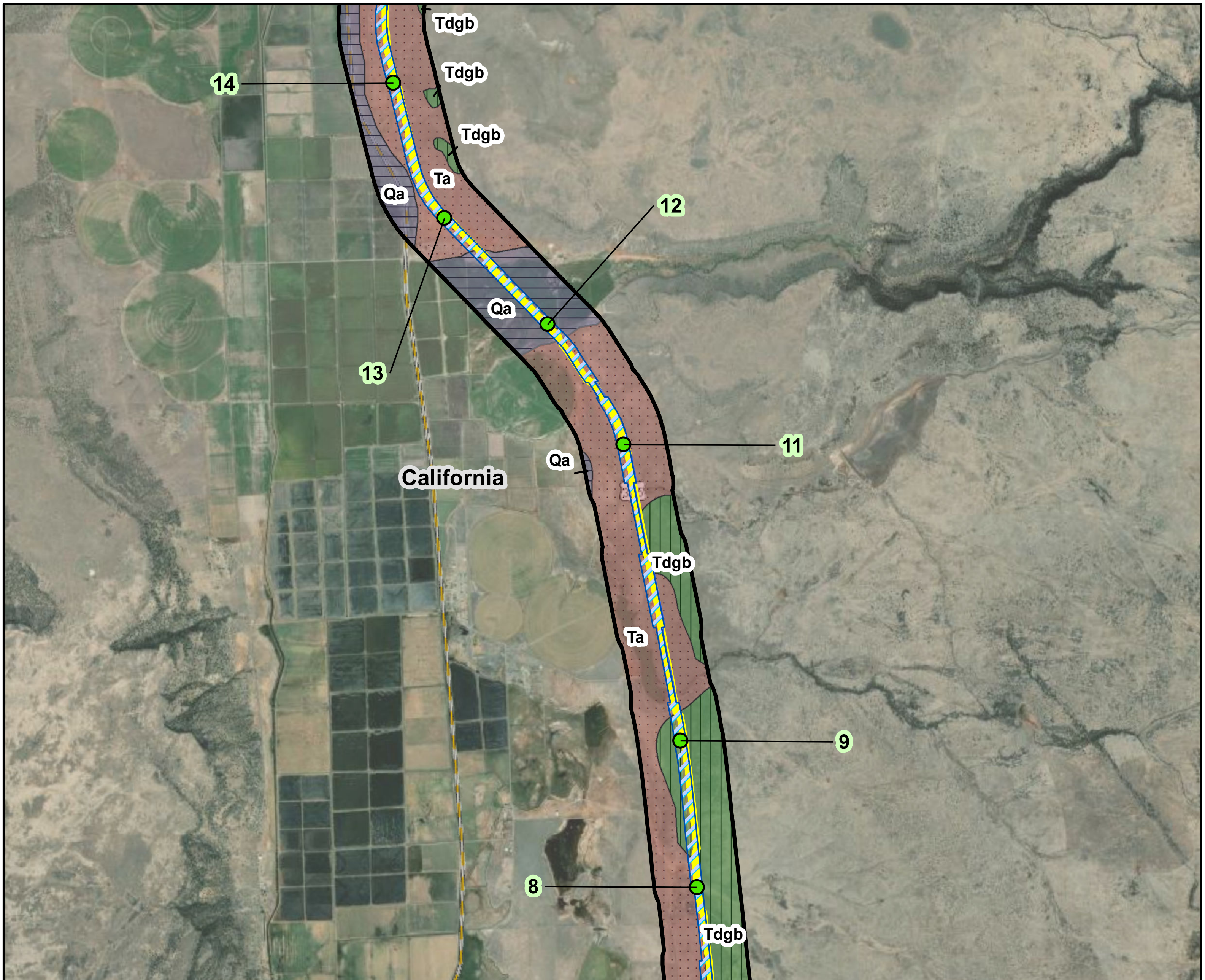

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)

Tdgb: Devils Garden Basalt (Miocene and early Pliocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 2 - Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30' × 60' Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale

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Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)

Tdgb: Devils Garden Basalt (Miocene and early Pliocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 2 - Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30′ × 60′ Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale

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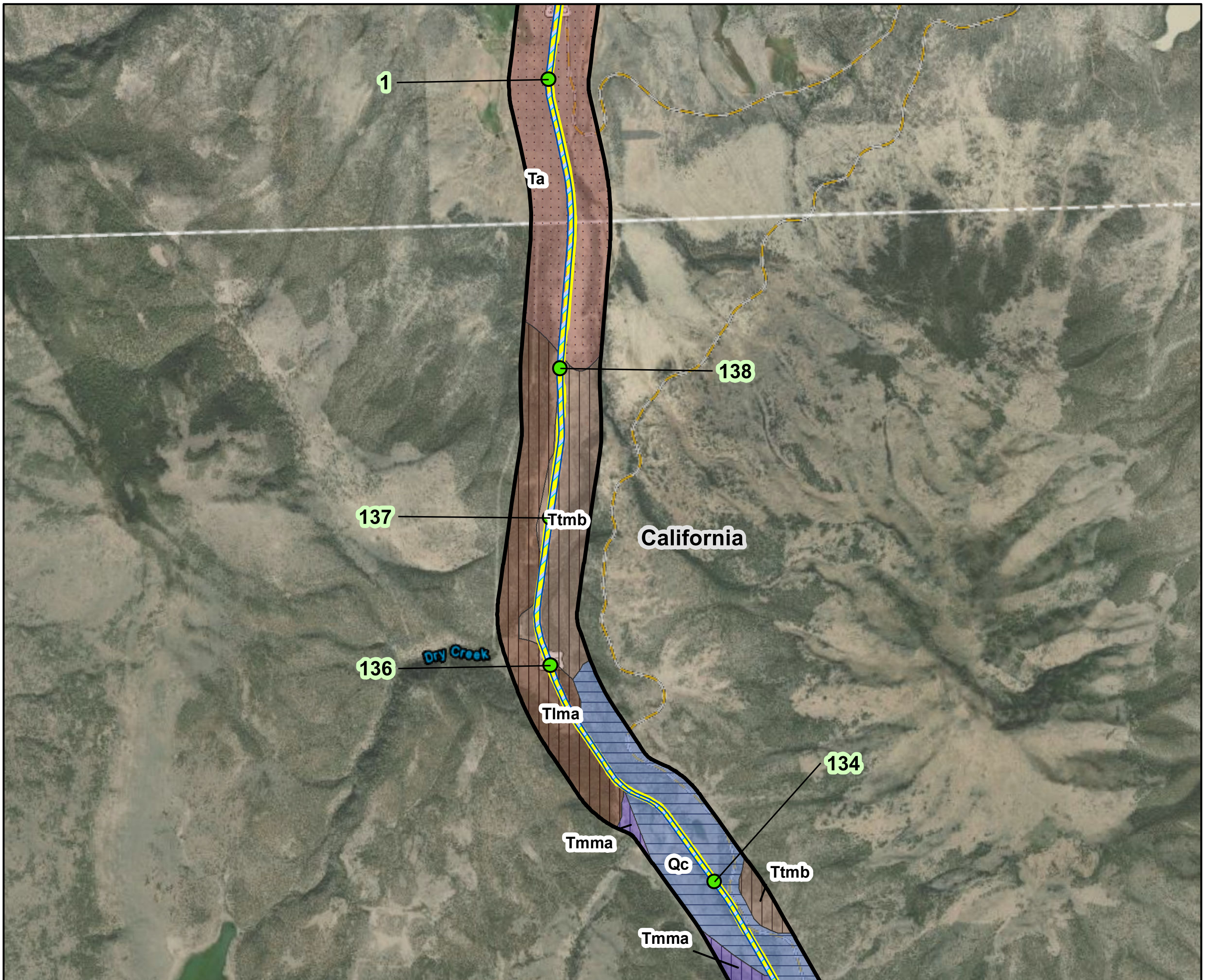

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qc: Colluvium (Holocene)

Tlma: Andesite and basalt (Pleistocene)

Ttmb: Basalt and andesite of Tule Mountain Volcano (Pleistocene)

Tmma: Andesite and basalt of Northwest Madeline Volcano (Pleistocene)

Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 2 - Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30′ × 60′ Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale

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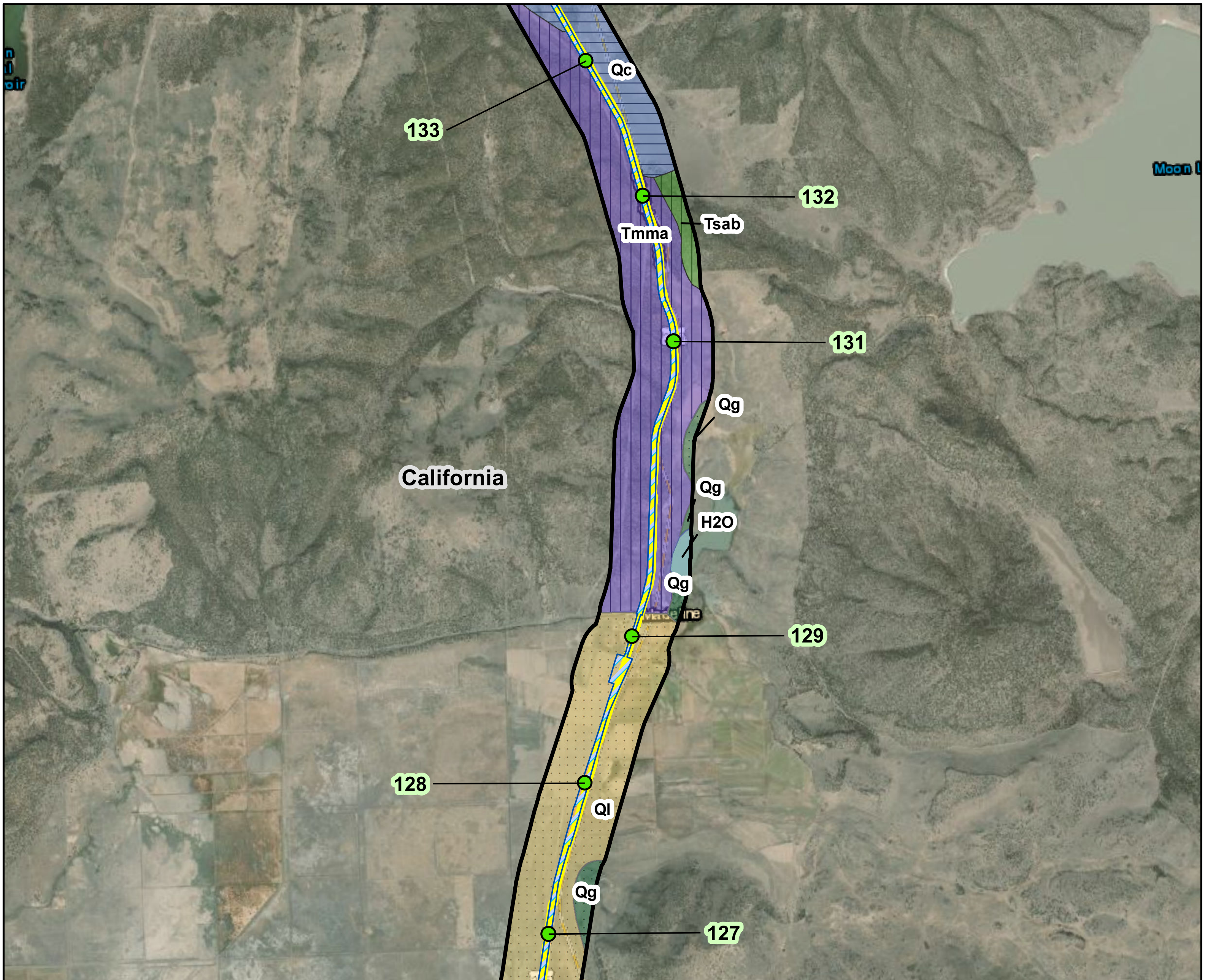

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- H2O: Water
- Qc: Colluvium (Holocene)
- Qg: Colluvial gravels (Holocene and Pleistocene)
- Ql: Lake deposits (Holocene and Pleistocene)
- Tsab: Andesite and basalt from local volcanoes (Pleistocene)
- Tmma: Andesite and basalt of Northwest Madeline Volcano (Pleistocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 2 - Low
- Class U - Unknown Potential
- Class W - Water

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30' × 60' Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale

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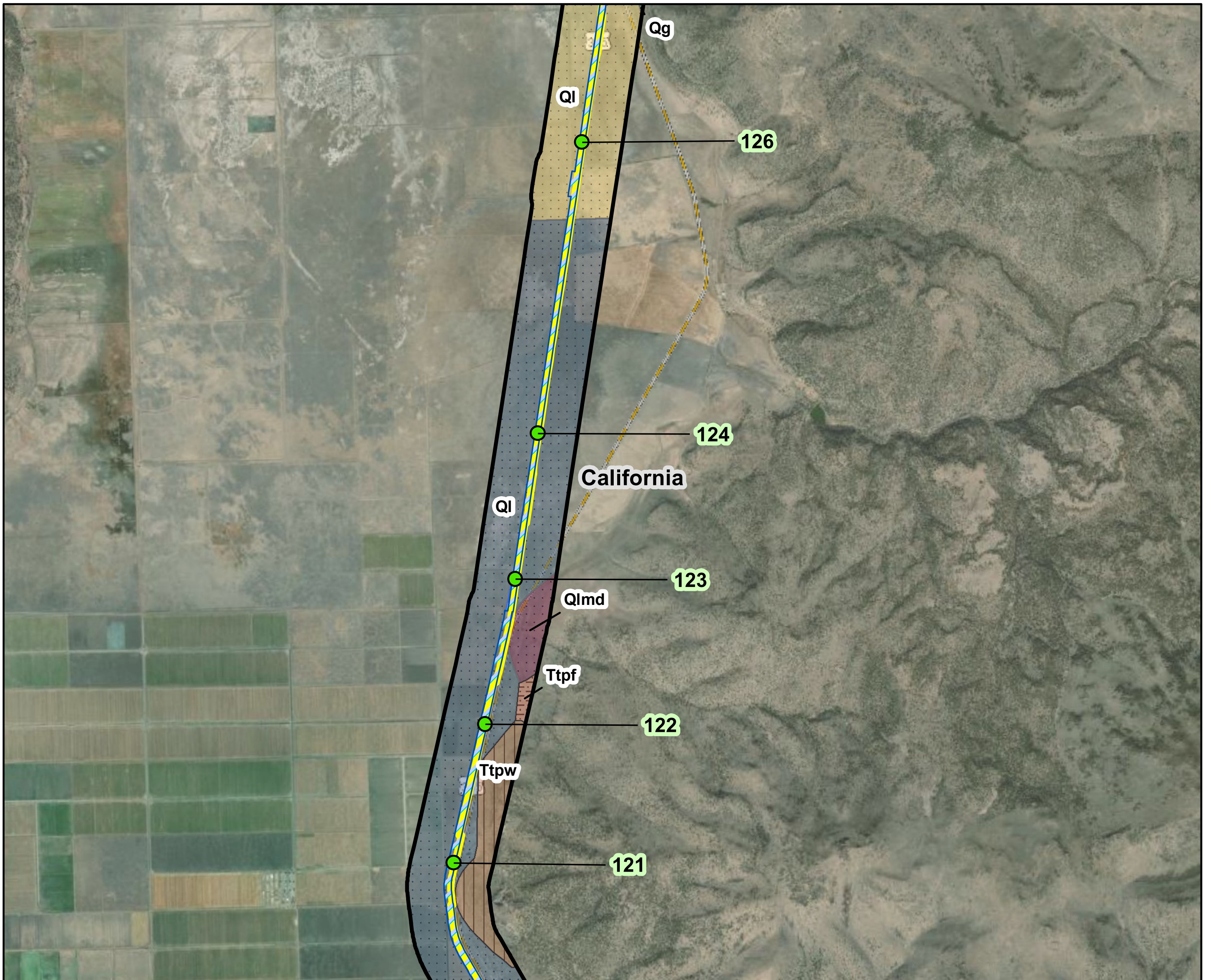

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qg: Colluvial gravels (Holocene and Pleistocene)

Ql: Lake deposits (Holocene and Pleistocene)

Ql: Older lake deposits (Holocene and Pleistocene)

Qlmd: Near-shore and deltaic deposits of Lake Madeline (Holocene and Pleistocene)

Ttpf: Basaltic flows and pyroclastics of Three Peaks (Miocene)

Ttpw: Basalt of Three Peaks West volcano (Miocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 1 or 2 - Very Low or Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Alturas 30' × 60' Quadrangle, California by Thomas L.T. Grose, Anne E. Egger, and Matt D. O'Neal (2016), 1:100,000 scale
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale

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Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Ql: Older lake deposits (Holocene and Pleistocene)
- Tdrb: Basalt and mafic andesite of Ducasse Reservoir (Pliocene)
- Ttpw: Basalt of Three Peaks West volcano (Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale

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Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- ILA
- Running Line
- Quarter Mile Buffer

Geology Description

- Ql: Older lake deposits (Holocene and Pleistocene)
- Tsbl: Basalt, mafic andesite, and tuff of Spanish Springs (Pliocene)
- Tfp: Andesitic flows and pyroclastics (Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 1 or 2 - Very Low or Low
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale

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Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

ILA

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene and Pleistocene)

Qf: Alluvial fan deposits (Holocene and Pleistocene)

Tsbl: Basalt, mafic andesite, and tuff of Spanish Springs (Pliocene)

Tsbu: Basalt of Spanish Springs (Pliocene)

Trpt: Tuff of Rye Patch Canyon (Miocene)

Tsha: Mafic andesite of Shinn Mountain (Miocene)

Tssa: Mafic andesite of Spanish Springs Peak (Miocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 1 or 2 - Very Low or Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale

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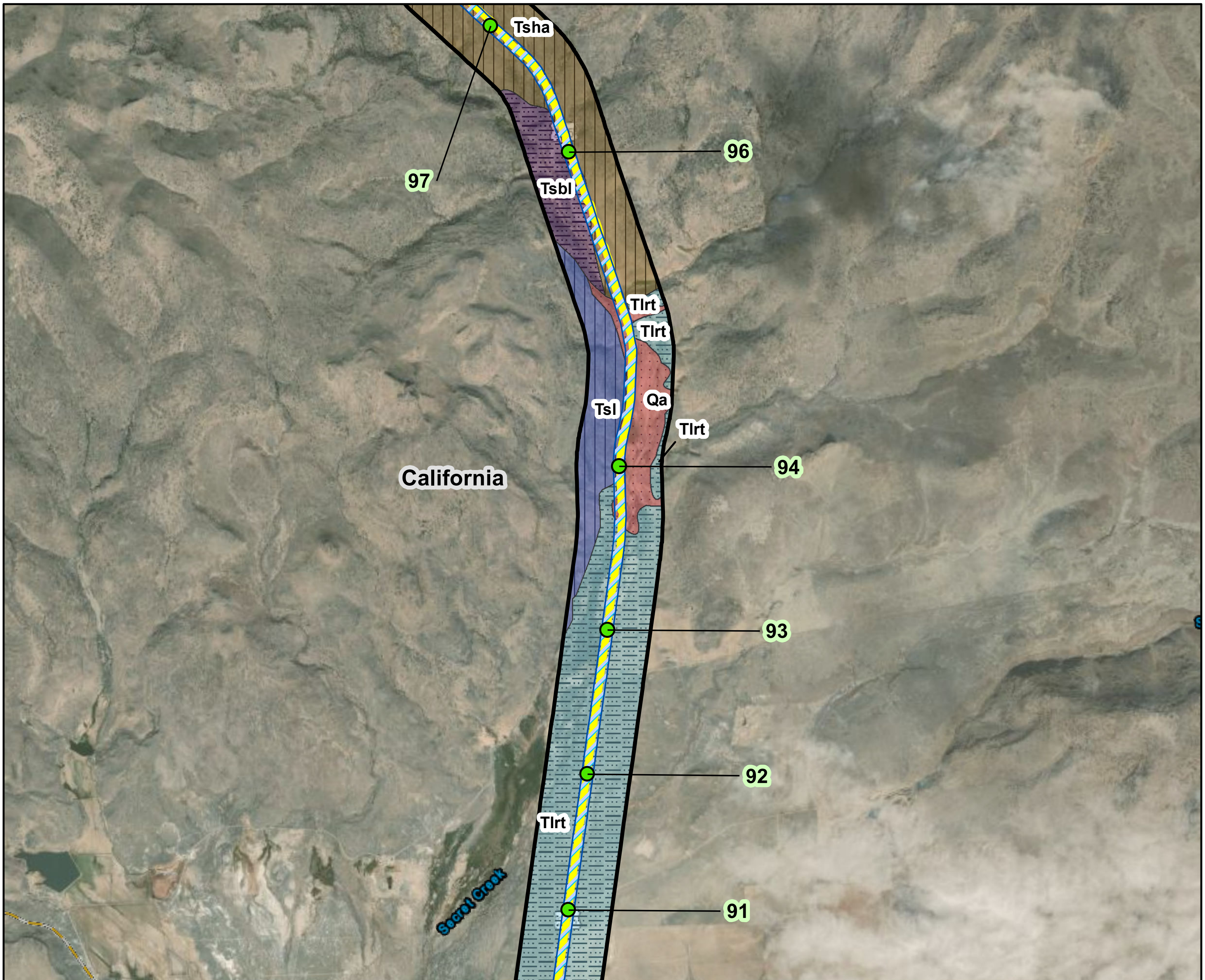

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Qa: Alluvium (Holocene and Pleistocene)
- Tlrt: Tuff of Lava Rock Reservoir (Pliocene)
- Tsbl: Basalt, mafic andesite, and tuff of Spanish Springs (Pliocene)
- Tsl: Andesite and mafic andesite flows (Miocene)
- Tsha: Mafic andesite of Shinn Mountain (Miocene)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 1 or 2 - Very Low or Low
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale

N 0 10,000 Feet

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)

Qhs: Sand deposits (Holocene)

Qhs: Sand sheet and sand bar deposits (Holocene)

Tlrt: Tuff of Lava Rock Reservoir (Pliocene)

Paleontological Potential (PFYC)

Class 1 or 2 - Very Low or Low

Class 2 - Low

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Eagle Lake 30' x 60' Quadrangle, Lassen County, California by Thomas L.T. Grose, George J. Saucedo, and David L. Wagner (2014), 1:100,000 scale
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

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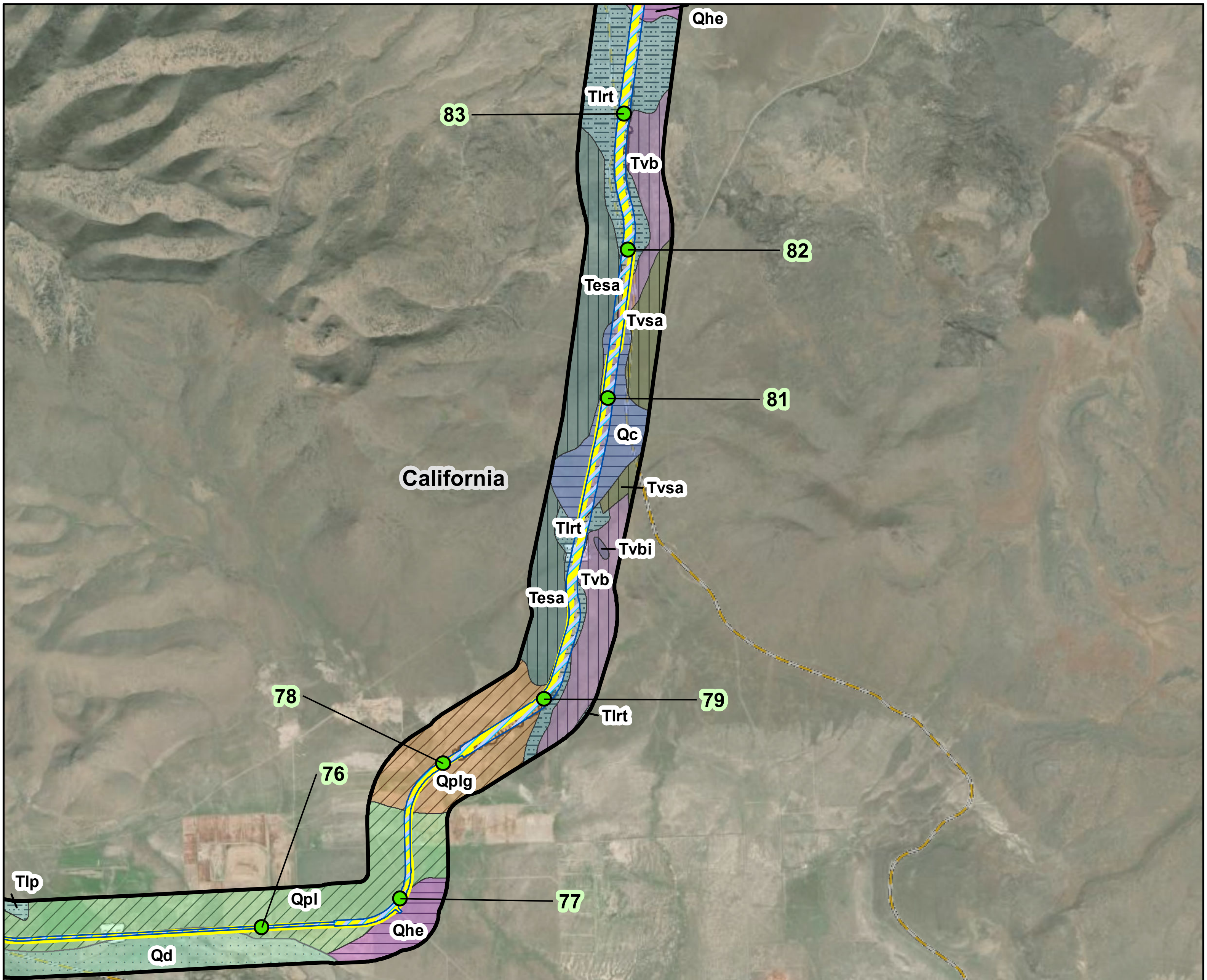

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qc: Colluvium (Holocene)

Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)

Qd: Delta deposits of the Susan River (Holocene and Pleistocene)

Qpl: Near-shore deposits of Lake Lahontan (Pleistocene)

Qplg: Gravel deposits of Lake Lahontan (Pleistocene)

Tvb: Olivine basalt of Viewland (Pliocene)

Tlrt: Tuff of Lava Rock Reservoir (Pliocene)

Tvbi: Olivine basalt intrusives of Viewland (Pliocene)

Tlp: Latitic to andesitic flow breccias and tuffs of Litchfield (Miocene)

Tvsa: Mafic andesite flows of Viewland shield (Miocene)

Tesa: Mafic andesite flows of East Shaffer shield (Cenozoic)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 1 or 2 - Very Low or Low

Class 2 - Low

Class 3 - Moderate

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California,
Grose, Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

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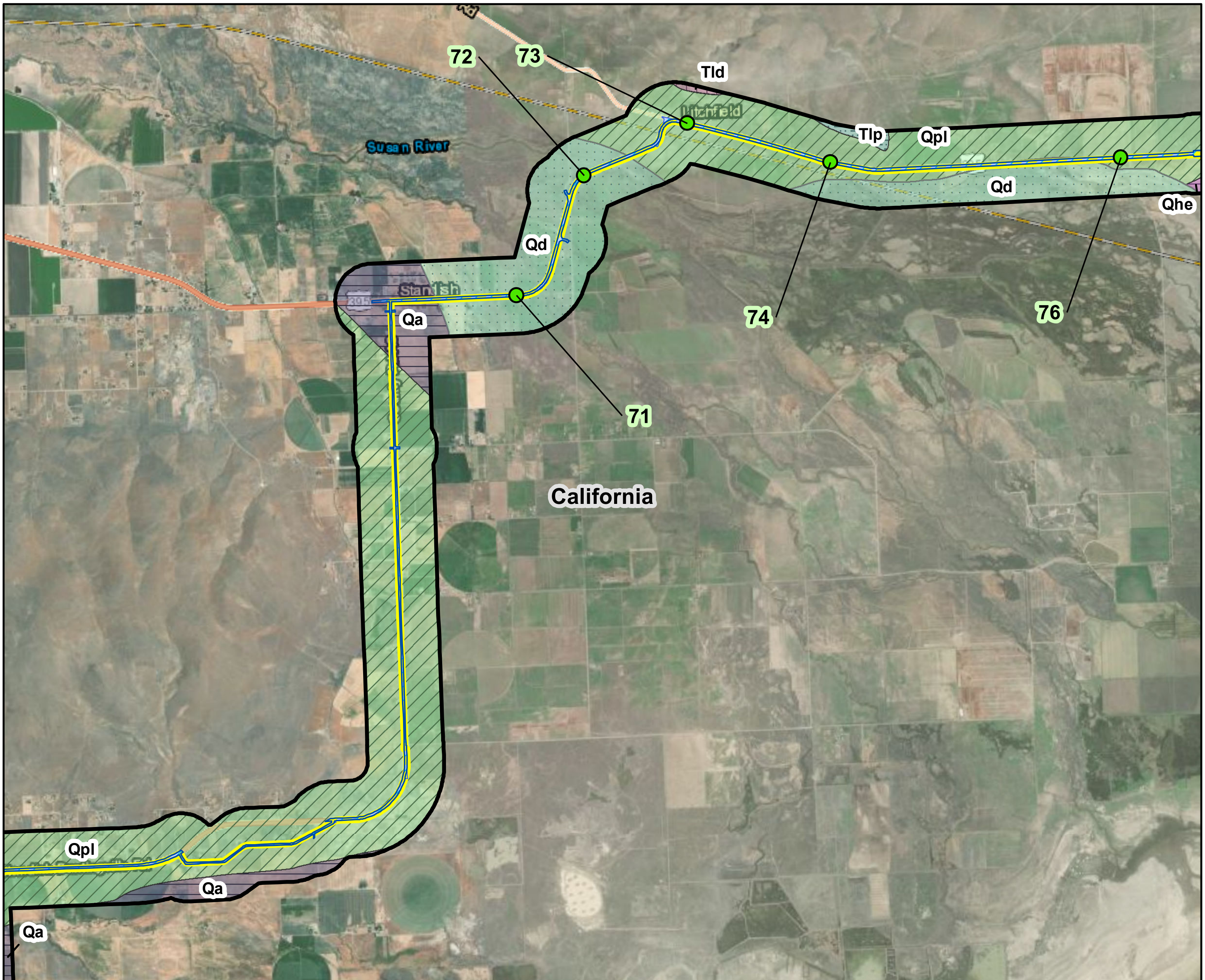

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)

Qd: Delta deposits of the Susan River (Holocene and Pleistocene)

Qpl: Near-shore deposits of Lake Lahontan (Pleistocene)

Tld: Latite domes of Litchfield (Miocene)

Tlp: Latitic to andesitic flow breccias and tuffs of Litchfield (Miocene)

Paleontological Potential (PFYC)

Class 1 - Very Low

Class 1 or 2 - Very Low or Low

Class 2 - Low

Class 3 - Moderate

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose, Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

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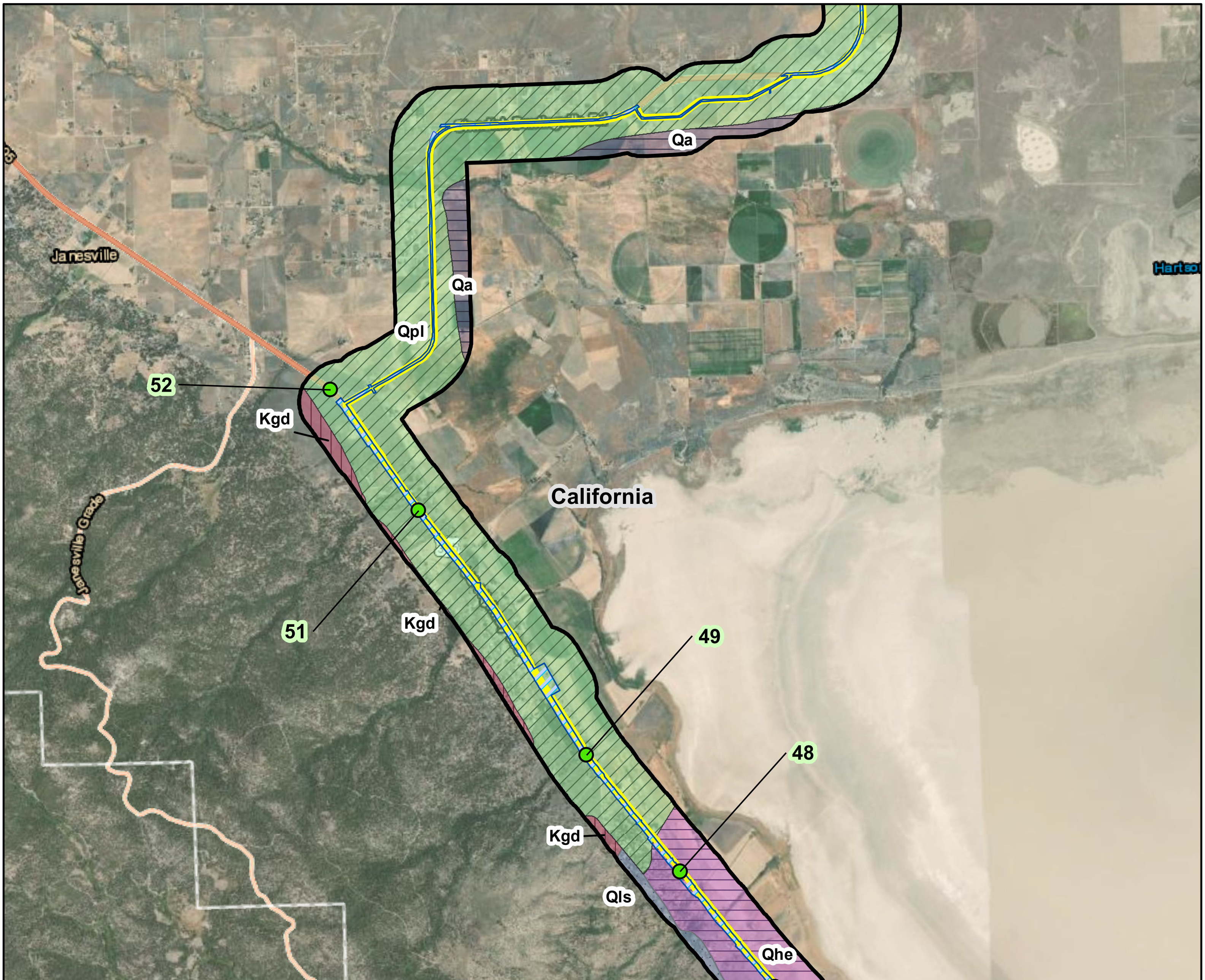


Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qa: Alluvium (Holocene)

Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)

Qls: Landslide deposits (Holocene and Pleistocene)

Qpl: Near-shore deposits of Lake Lahontan (Pleistocene)

Kgd: Hornblende-biotite granodiorite (Cretaceous)

Paleontological Potential (PFYC)

Class 1 - Very Low

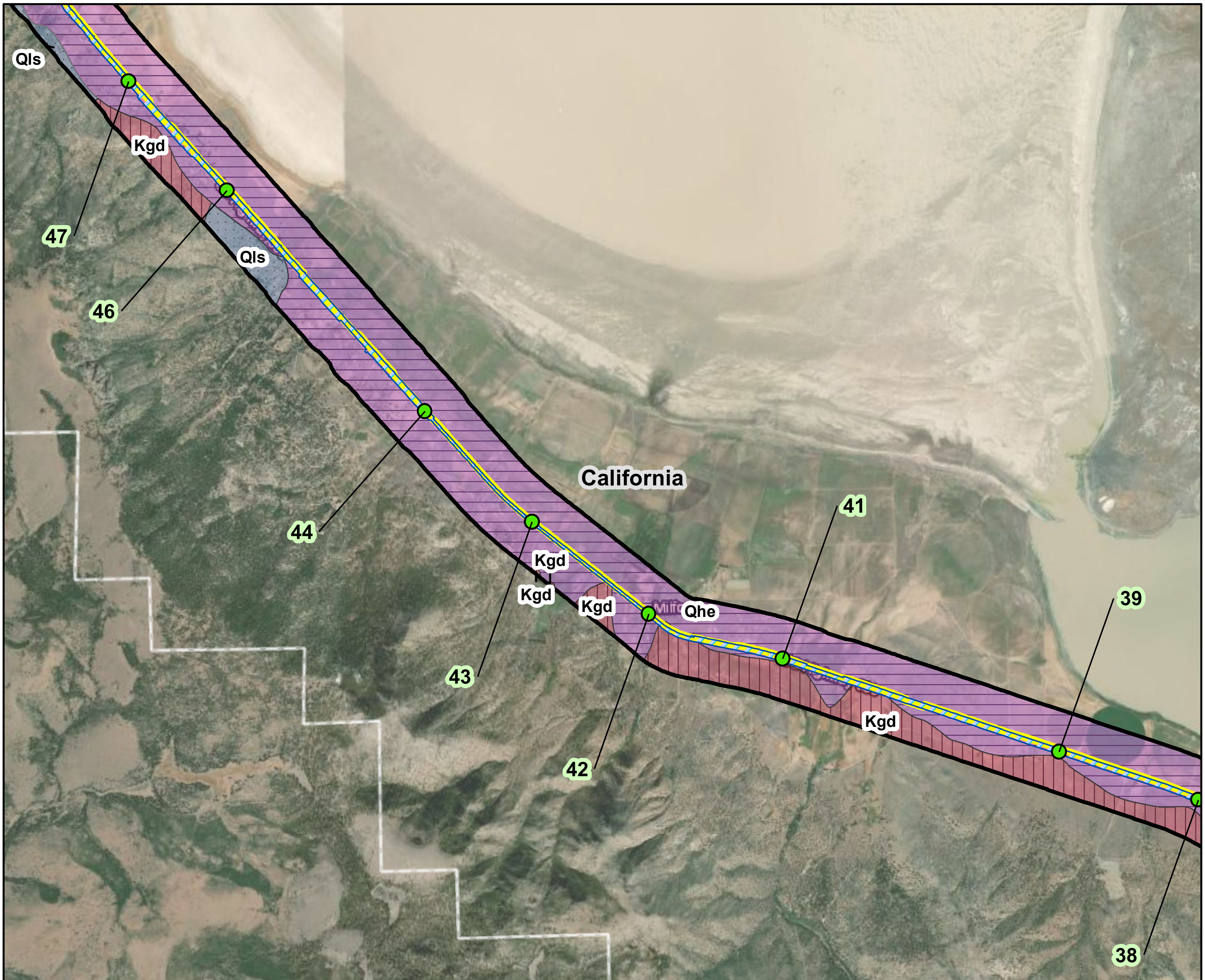
Class 2 - Low

Class 3 - Moderate

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California,
Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

N 0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

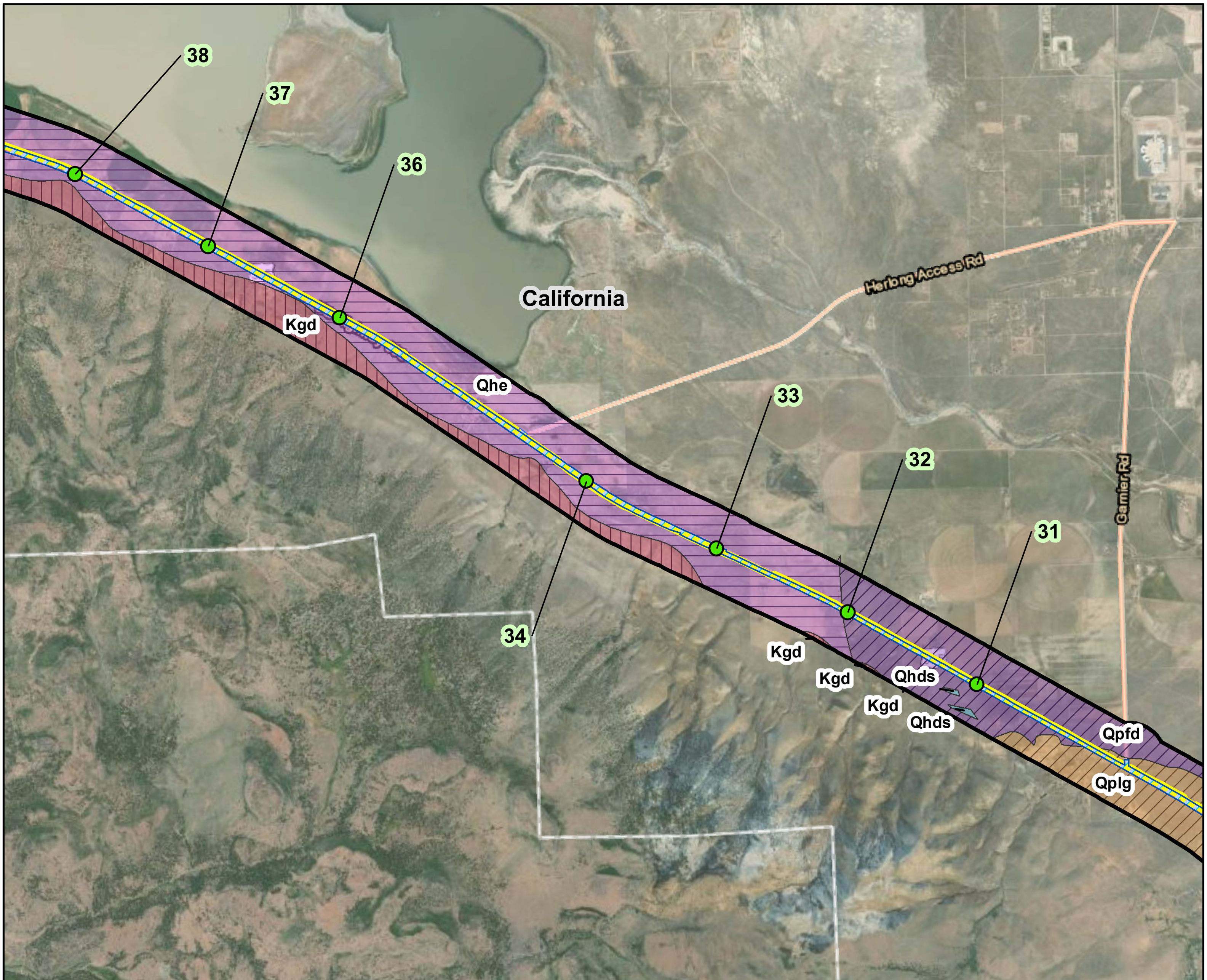
- Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)
- Qls: Landslide deposits (Holocene and Pleistocene)
- Kgd: Hornblende-biotite granodiorite (Cretaceous)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 2 - Low
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

N 0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

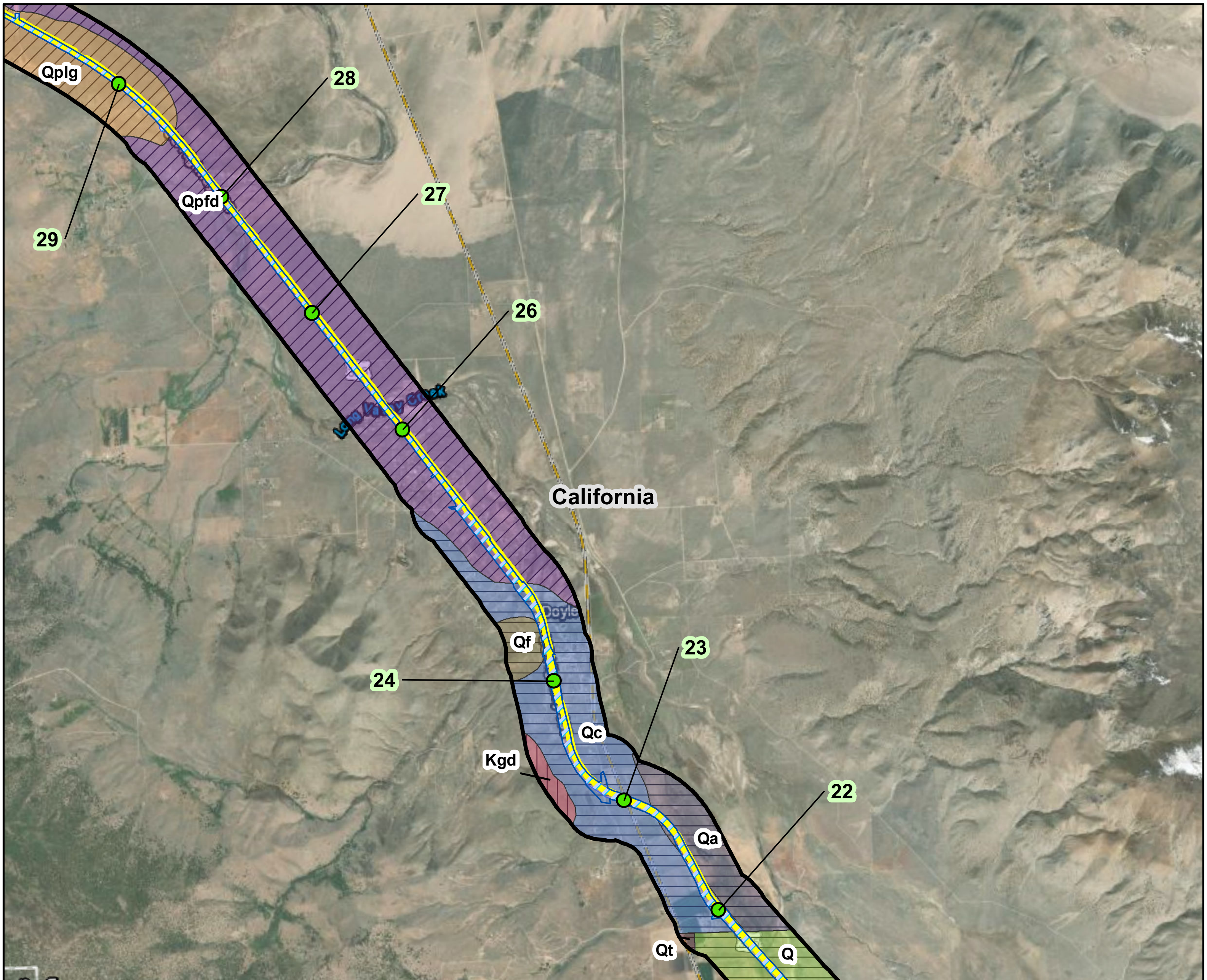
- Qhds: Dune Sand (Holocene)
- Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)
- Qpfd: Fan-delta deposits of Long Valley Creek (Pleistocene)
- Qplg: Gravel deposits of Lake Lahontan (Pleistocene)
- Kgd: Hornblende-biotite granodiorite (Cretaceous)

Paleontological Potential (PFYC)

- Class 1 - Very Low
- Class 2 - Low
- Class 3 - Moderate

Sources:
Base map from Esri ArcGIS Online World Imagery
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

N 0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Q: Alluvium (Holocene)

Qa: Alluvium (Holocene)

Qc: Colluvium (Holocene)

Qf: Alluvial fan (Holocene)

Qt: Terrace deposits (Holocene)

Qpfd: Fan-delta deposits of Long Valley Creek (Pleistocene)

Qplg: Gravel deposits of Lake Lahontan (Pleistocene)

Kgd: Hornblende-biotite granodiorite (Cretaceous)

Paleontological Potential (PFYC)

Class 1 - Very Low

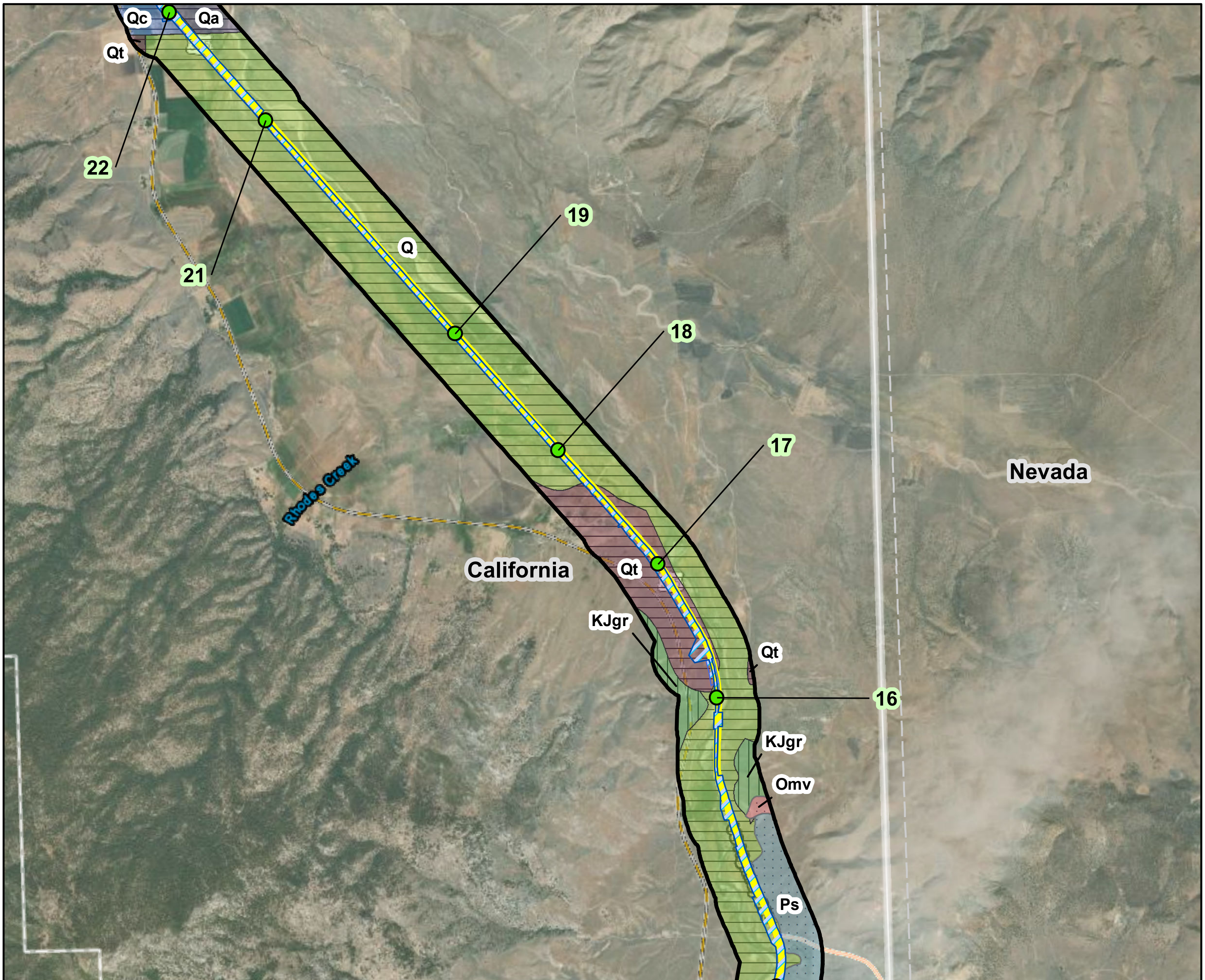
Class 2 - Low

Class 3 - Moderate

Sources:
Base map from Esri ArcGIS Online World Imagery
Geologic Map of the Chico Quadrangle, California by G.J. Saucedo and D.L. Wagner (1992), 1:250,000 scale
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

N

0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Q: Alluvium (Holocene)

Qa: Alluvium (Holocene)

Qc: Colluvium (Holocene)

Qt: Terrace deposits (Holocene)

Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene)

Omv: Ryolite tuff and sedimentary rocks (Oligocene and Miocene)

KJgr: Granite, granodiorite (Mesozoic)

Paleontological Potential (PFYC)

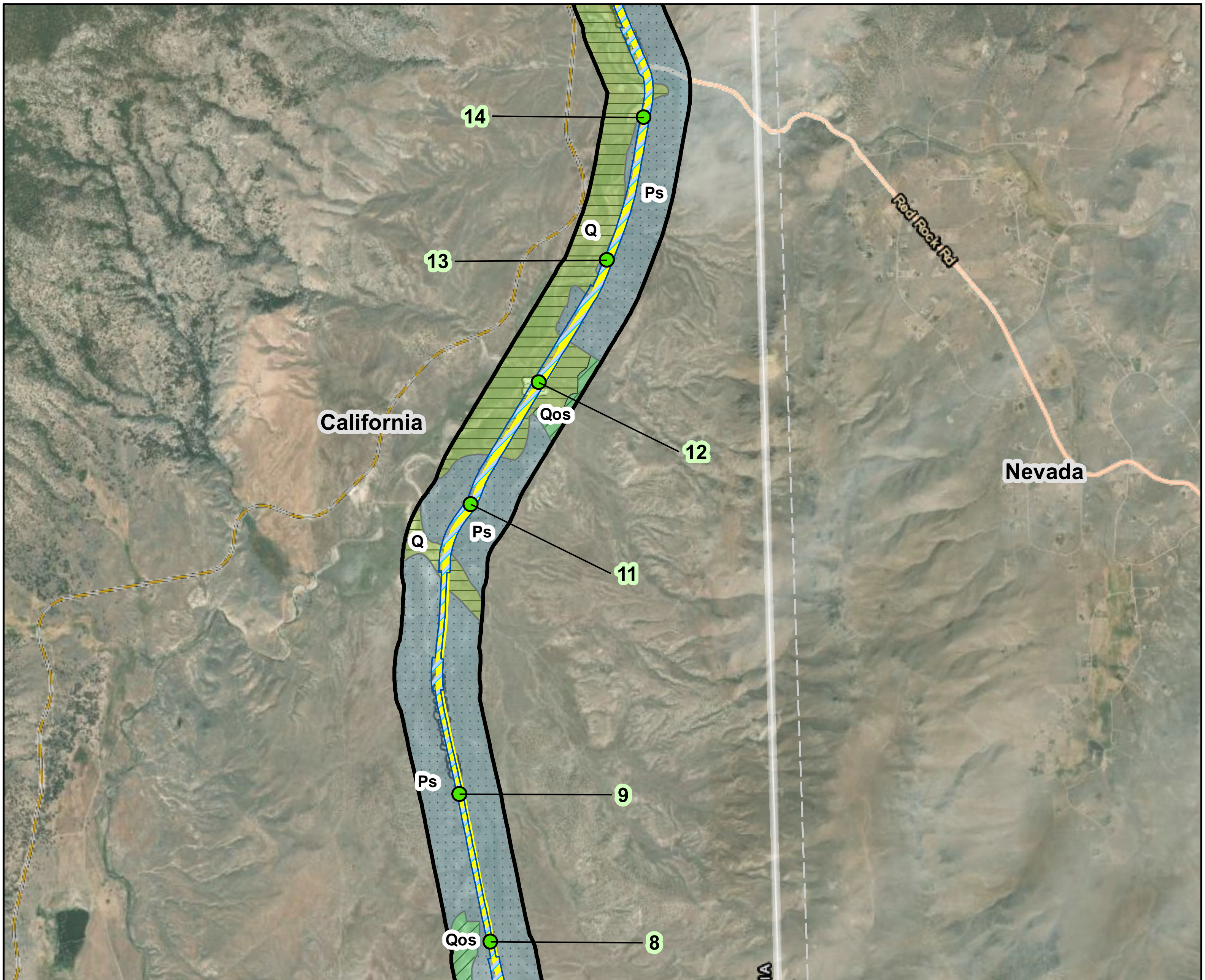
Class 1 - Very Low

Class 2 - Low

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Geologic Map of the Chico Quadrangle, California by G.J. Saucedo and D.L. Wagner (1992), 1:250,000 scale
Preliminary Geologic Map of the Susanville 30' x 60' Quadrangle, California, Grose,Thomas L.T., Saucedo, George J., and Wagner, David L., 1:100,000 (2014)

N 0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

- Q: Alluvium (Holocene)
- Qos: Nonmarine sedimentary rocks (Pleistocene)
- Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene)

Paleontological Potential (PFYC)

- Class 2 - Low
- Class 3 - Moderate
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Geologic Map of the Chico Quadrangle, California by G.J. Saucedo and D.L. Wagner (1992), 1:250,000 scale

N 0 10,000 Feet

Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

- Mile Post
- State Boundary

Project Area

- APE
- DOT ROWs
- Running Line
- Quarter Mile Buffer

Geology Description

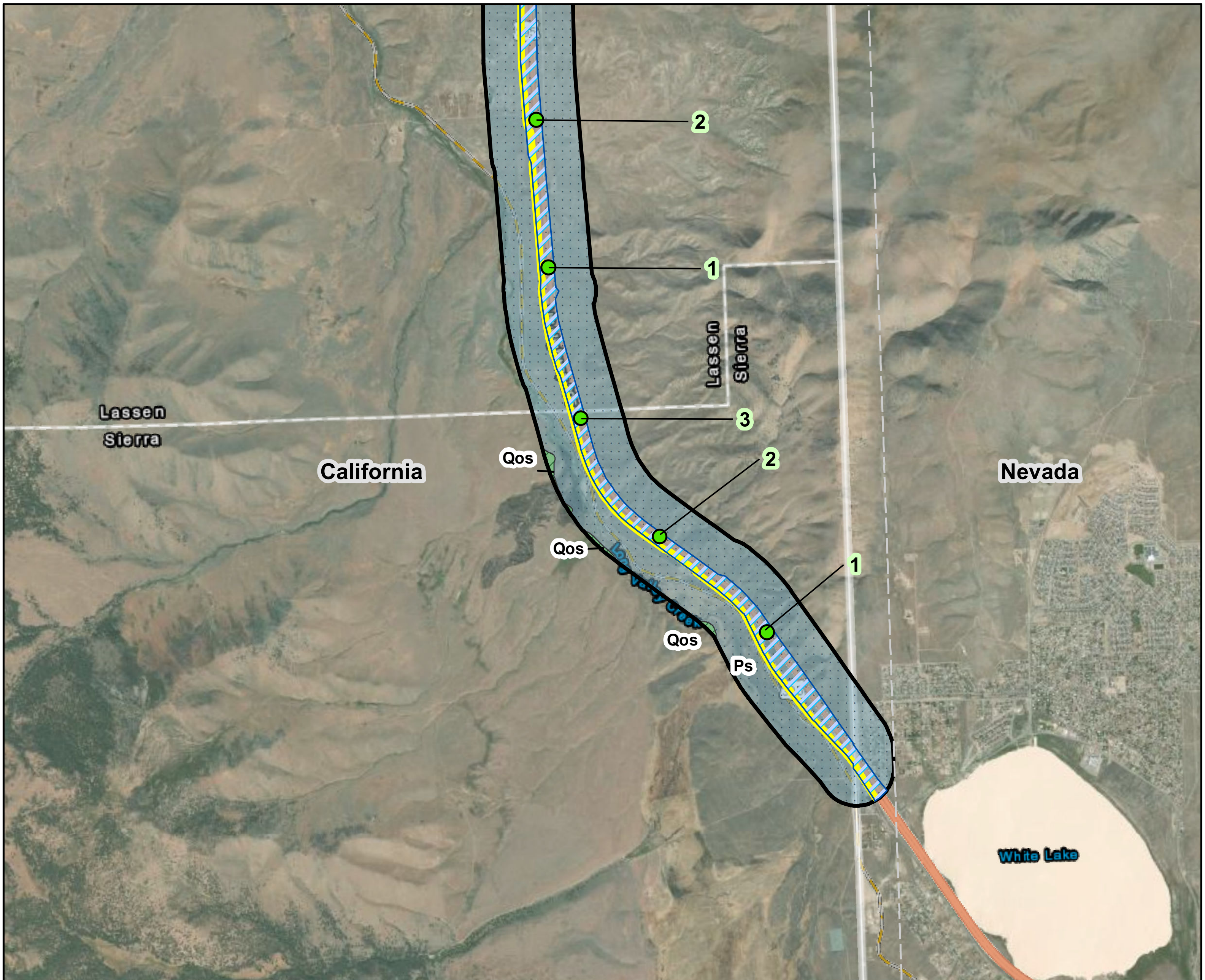
- Qos: Nonmarine sedimentary rocks (Pleistocene)
- Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene)

Paleontological Potential (PFYC)

- Class 3 - Moderate
- Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Geologic Map of the Chico Quadrangle, California by G.J. Saucedo and D.L. Wagner (1992), 1:250,000 scale

N 0 10,000 Feet



Zayo Group Prineville-to-Reno Fiber-Optic Interconnect Project: California Segments

Mile Post

State Boundary

Project Area

APE

DOT ROWs

Running Line

Quarter Mile Buffer

Geology Description

Qos: Nonmarine sedimentary rocks (Pleistocene)

Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene)

Paleontological Potential (PFYC)

Class 3 - Moderate

Class U - Unknown Potential

Sources:
Base map from Esri ArcGIS Online World Imagery
Geologic Map of the Chico Quadrangle, California by G.J. Saucedo and D.L. Wagner (1992), 1:250,000 scale

N 0 10,000 Feet

APPENDIX B

Monitoring Requirement by Mile Posts

Lassen County			
Mile Post (Lassen County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
0 to 10	Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene); Qos: Nonmarine sedimentary rocks (Pleistocene)	Class U - Unknown Potential; Class 3 - Moderate	Monitor
10 to 16	Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene); Q: Alluvium (Holocene)	Class U - Unknown Potential; Class 2 - Low	Monitor Ps areas
16 to 24	Q: Alluvium (Holocene); Qt: Terrace deposits (Holocene); Qc: Colluvium (Holocene)	Class 2 - Low	No Monitoring
24	Qc: Colluvium (Holocene)	Class 2 - Low	No Monitoring
24-25	Qc: Colluvium (Holocene); Qf: Alluvial Fan (Holocene); Qpfd: Fan-delta deposits of Long Valley Creek (Pleistocene)	Class 2 - Low; Class 3 - Moderate	Monitor Qpfd areas
25 to 32	Qpfd: Fan-delta deposits of Long Valley Creek (Pleistocene); Qplg: Gravel deposits of Lake Lahontan (Pleistocene)	Class 3 - Moderate	Monitor
33 to 43	Qhe: Eolian, fluvial, and lacustrine deposits (Holocene); Kgd: Hornblende-biotite granodiorite (Cretaceous)	Class 2 - Low; Class 1 - Very Low	No Monitoring
44 to 48	Qhe: Eolian, fluvial, and lacustrine deposits (Holocene)	Class 2 - Low	No Monitoring
48 to 49	Qhe: Eolian, fluvial, and lacustrine deposits (Holocene); Qpl: Near-shore deposits of Lake Lahontan (Pleistocene)	Class 2 - Low; Class 3 - Moderate	Monitor Qpl areas
49 to 70	Qpl: Near-shore deposits of Lake Lahontan (Pleistocene)	Class 3 - Moderate	Monitor
70 to 71	Qa: Alluvium (Holocene); Qpl: Near-shore deposits of Lake Lahontan (Pleistocene); Qd: Delta deposits of the Susan River (Holocene and Pleistocene)	Class 2 - Low; Class 3 - Moderate; Class U - Unknown Potential	Monitor Qpl and Qd areas
71 to 79	Qpl: Near-shore deposits of Lake Lahontan (Pleistocene); Qplg: Gravel deposits of Lake Lahontan (Pleistocene); Qd: Delta deposits of the Susan River (Holocene and Pleistocene)	Class 3 - Moderate; Class U - Unknown Potential	Monitor
79 to 93	Qc: Colluvium (Holocene); Qhe: Eolian, fluvial, and lacustrine deposits (Holocene); Qhs: Sand deposits (Holocene); Qhs: Sand sheet and sand bar deposits (Holocene); Tlrt: Tuff of Lava Rock Reservoir (Pliocene); Tesa: Mafic andesite flows of East Shaffer shield (Cenozoic); Tvb: Olivine basalt of Viewland (Pliocene)	Class 2 - Low; Class 1 or 2 - Very Low or Low; Class 1 - Very Low	No Monitoring

Lassen County			
Mile Post (Lassen County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
93 to 95	Qa: Alluvium (Holocene and Pleistocene); Tlrt: Tuff of Lava Rock Reservoir (Pliocene); Tsl: Andesite and mafic andesite flows (Miocene)	Class U - Unknown Potential; Class 1 or 2 - Very Low or Low; Class 1 - Very Low	Monitor Qa areas
95 to 104	Tlrt: Tuff of Lava Rock Reservoir (Pliocene); Tsbl: Basalt, mafic andesite, and tuff of Spanish Springs (Pliocene); Trpt: Tuff of Rye Patch Canyon (Miocene) Tsl: Andesite and mafic andesite flows (Miocene); Tsha: Mafic andesite of Shinn Mountain (Miocene); Tssa: Mafic andesite of Spanish Springs Peak (Miocene)	Class 1 or 2 - Very Low or Class 1 - Very Low	No Monitoring
104 to 105	Ql: Older lake deposits (Holocene and Pleistocene); Tsbl: Basalt, mafic andesite, and tuff of Spanish Springs (Pliocene)	Class U - Unknown Potential; Class 1 or 2 - Very Low or Low	Monitoring in Ql areas
105 to 129	Ql: Older lake deposits (Holocene and Pleistocene); Ql: Lake deposits (Holocene and Pleistocene)	Class U - Unknown Potential	Monitor
129 to 130	Ql: Lake deposits (Holocene and Pleistocene); Tmma: Andesite and basalt of Northwest Madeline Volcano (Pleistocene)	Class U - Unknown Potential; Class 1 - Very Low	Monitor Ql areas
130 to 138	Tmma: Andesite and basalt of Northwest Madeline Volcano (Pleistocene); Tlma: Andesite and basalt (Pleistocene); Ttmb: Basalt and andesite of Tule Mountain Volcano (Pleistocene) Qc: Colluvium (Holocene)	Class 1 - Very Low; Class 2 - Low	No Monitoring
138/1 (Modoc County)	Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)	Class U - Unknown Potential	Monitor

Modoc County			
Mile Post (Modoc County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
0 to 3	Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)	Class U - Unknown Potential	Monitor
3 to 5	Qa: Alluvium (Holocene); Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene); Tdgb: Devils Garden Basalt (Miocene and early Pliocene)	Class 2 - Low; Class U - Unknown Potential Class 1 - Very Low	Monitor Ta areas
5 to 9	Tdgb: Devils Garden Basalt (Miocene and early Pliocene)	Class 1 - Very Low	No Monitoring

Modoc County			
Mile Post (Modoc County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
9 to 13	Qa: Alluvium (Holocene); Tdgb: Devils Garden Basalt (Miocene and early Pliocene); Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)	Class 2 - Low Class 1 - Very Low; Class U - Unknown Potential	Monitor Ta areas
13 to 16	Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)	Class U - Unknown Potential	Monitor
16 to 17	Qa: Alluvium (Holocene); Tabpf: Alturas Formation; Pyroclastic flow (Miocene and early Pliocene)	Class 2 - Low Class 1 - Very Low	No Monitoring
17 to 19	Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene)	Class U – Unknown	Monitor
19 to 21	Qa: Alluvium (Holocene); Tabpf: Alturas Formation; Pyroclastic flow (Miocene and early Pliocene)	Class 2 - Low Class 1 - Very Low	No Monitoring
21 to 26	Ta: Alturas Formation; Tuff and volcaniclastic rocks (Miocene and early Pliocene); Ta: Alturas Formation (Pliocene to Miocene)	Class U - Unknown Potential	Monitor
26 to 27	Qa: Alluvium (Holocene); Tdrb: Basalt of Dorris Reservoir (Pliocene and/or Miocene)	Class 2 - Low; Class 1 - Very Low	No Monitoring
27 to 31	Ta: Alturas Formation (Pliocene to Miocene)	Class U - Unknown Potential	Monitor
31 to 32	Qa: Alluvium (Holocene); Tovi: Hypabyssal intrusions (Miocene); Ttab: Basalt and andesite flows and breccias (Miocene)	Class 2 - Low; Class 1 - Very Low; Class 1 or 2 - Very Low or Low	No Monitoring
32 to 33	Tovi: Hypabyssal intrusions (Miocene); Ttab: Basalt; Ta: Alturas Formation (Pliocene to Miocene)	Class 1 - Very Low Class U - Unknown Potential	Monitoring in Ta areas
33 to 35	Ta: Alturas Formation (Pliocene to Miocene); Qof: Older fan deposits (Pleistocene)	Class U - Unknown Potential Class 3 - Moderate	Monitor
35 to 36	Ta: Alturas Formation (Pliocene to Miocene); Tdgb: Devils Garden Basalt (Late Pliocene to Miocene); Tfcb: Basalt of Franklin Creek (Miocene); Qof: Older fan deposits (Pleistocene)	Class U - Unknown Potential; Class 1 - Very Low; Class 3 - Moderate	Monitor Ta and Qof areas

Modoc County			
Mile Post (Modoc County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
36 to 51	Qa: Alluvium (Holocene); Qf: Alluvial fan (Holocene); Ql: Lake deposits (Holocene); Qc: Colluvium (Holocene); Tdgb: Devils Garden Basalt (Late Pliocene to Miocene); Tfcb: Basalt of Franklin Creek (Miocene) Tb: Basalt and andesite volcanoes (Pliocene and/or late Miocene); Tsht: Pyroclastic rocks of Sugar Hill (late Miocene); Tvgb: Basalt of the Vya Group (Pliocene to Late Miocene);	Class 2 - Low; Class 1 - Very Low; Class 1 or 2 - Very Low or Low	No Monitoring
51 to 52	Tvgb: Basalt of the Vya Group (Pliocene to Late Miocene); Qof: Older fan deposits (Pleistocene)	Class 1 - Very Low; Class 3 - Moderate	Monitor Qof areas
52 to 54	Qoa: Older alluvium (Pleistocene)	Class 3 - Moderate	Monitor
54 to 55	Qa: Alluvium (Holocene); Qoa: Older alluvium (Pleistocene);	Class 1 - Low; Class 3 - Moderate	Monitor Qoa areas
55 to 61	Qf: Alluvial fan (Holocene)	Class 2 - Low	No Monitoring

Sierra County			
Mile Post (Sierra County)	**Geologic Formation and Map Symbol**	**PFYC Sensitivity**	**Monitoring Recommendation**
0 to 3	Ps: Fluvial and lacustrine shale, sandstone, and ash (Pliocene)	Class U - Unknown Potential	Monitor

APPENDIX C

Public Land Survey System Data

Quarter-Quarter	Section	Township	Range	Land Ownership
SESW, SWSE, SESE, NWSW, NESW, NWSE, SWNW, SENW, NWNW	Sec.01	T21N	R17E	Undetermined
SENE, NWNE, NENE	Sec.12			
SESW, SWSE, NWSW, NESW, SENW, SWNW, NWNW	Sec.18		R18E	Undetermined, Private
SWNE, SENE, NENW, NWNE, NENE	Sec.19			
SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.02	T22N	R17E	Undetermined, DOI
SESE, NESE, SWNE, SENE, NWNE, NENE	Sec.11			
SESE, NESE, SENE, NENE	Sec.14			
SESE, NESE, SENE, NENE	Sec.23			
SESE, NESE, SENE, NENE	Sec.26			
SESE, NESE, SENE, NENE	Sec.35			
SWSW, NWSW, SWNW	Sec.36			
NWSW, SENW, SWNW, NENW, NWNW	Sec.01	T23N	R17E	Undetermined, DOI
SESE, NESE	Sec.02			
SWSE, NWSE, SWNE, NENE, NWNE	Sec.11			
SWSE, NWSE, SWNE, NWNE	Sec.14			
SESE, NWSE, NESE, SWNE, SENE, NWNE	Sec.23			
SWSW, NWSW	Sec.25			
SESE, NESE, SENE, NENE	Sec.26			
SESE, NESE, SENE, NENE	Sec.35			
SWNW, NWNW	Sec.36			
SESE, SESE, NWSE, NESW, SWNE, SENW, SWNW, NENW, NWNW	Sec.02	T24N		Undetermined, DOI, State
NENE	Sec.11			
NWNW, SWNW, SENW, NESW, NWSE, SESW, SWSE	Sec.12			
SESE, SWSE, NESE, NWSE, SENE, SWNE, NWNE	Sec.13			
SESE, NESE, SENE, NENE, NWNE	Sec.24			
SESE	Sec.25			
SWSE, SESW, NESE, NWSE, SENE, SWNE, NENE	Sec.36			
Not Recorded	Sec.30		R18E	DOI
Not Recorded	Sec.31			

SENE, NWNE, NENE	Sec.01	T25N	R16E	Undetermined
SESW, SWSE, NWSW, NESW, SWNW	Sec.06		R17E	Undetermined
SESE, NESE, SWNE, SENE, NENW, NWNE	Sec.07			
SWSW, NWSW	Sec.08			
SWSE, SESW, SWSW, NWSW, SWNW, NWNW	Sec.17			
NENE	Sec.18			
SENE, NWNE, NENE	Sec.20			
SWSW, SESW, NWSW, NESW, SWNW	Sec.21			
SWSW, SESW, NWSW	Sec.27			
NESE, SENE, SWNE, NENW, NWNE	Sec.28			
SESE, NWSE, NESE, SENW, SWNE, NWNW, NENW	Sec.34			
SWSW	Sec.35			
SWSE, SESW, SWSW, NWSW	Sec.02	T26N	R15E	Undetermined, State
NESE, NWSE, SWNE, SENW, SWNW, NWNW	Sec.03			
NENE, NWNE	Sec.04			
SENE, NENE, NWNE, NENW	Sec.11			
SESE, SWSE, NWSE, NESW, NWSW, SWNW	Sec.12			
NENESESE, SWSE, SESW, NESW, NWSW, SWNW	Sec.13			
SWSW	Sec.07		R16E	Undetermined, State
SESE, SWSE, SESW, NESW, NWSW, SWNW	Sec.17			
NESE, SENE, SWNE, SENW, NWNE, NENW, NWNW	Sec.18			
NENE	Sec.20			
NESE, NWSE, SENE, SWNE, SWNW, NENW, NWNW, SWSE	Sec.21			
SWSE, SESW, SWSW, NWSW	Sec.22			
SESW, SWSW, NESW, NWSW, SWNW	Sec.26			
SENE, NENE, NWNE	Sec.27			
NESE, SWNE, SENE, NWNE, NENW	Sec.35			
SWSW, NWSW	Sec.36			
SWSW, NWSW	Sec.05	T27N	R14E	Undetermined
SESE, NESE, SWNE, SENE, NENW, NWNE	Sec.06			
SESE, NWSE, NESE, SENW, SWNE, NWNW, NENW	Sec.08			

SWSW	Sec.09			
SESE, SWSE, NWSE, NESW, SWNE, SENW, SWNW, NENW, NWNW	Sec.16			
NENE	Sec.21			
SESE, SWSE, NWSE, NESW, SENW, SWNW, NWNW	Sec.22			
SESE, SWSE, SESW, NWSE, NESW, NWSW	Sec.25			
NESE, NWSE, SENE, SWNE, SENW, SWNW, NENW, NWNW	Sec.26			
NENE	Sec.27			
SESW, SWSW	Sec.30		R15E	Undetermined
SENE, NENE, NWNE, NENW, NWNW	Sec.31			
NESE, NWSE, SENE, SWNE, SENW, SWNW, NWNW	Sec.32			
SESE, SWSE, SESW, SWSW, NESW, NWSW	Sec.33			
SWSW, SESW, SWSE, SESE, NWSW, NESW, NWSE, NESE	Sec.01	T28N	R13E	Undetermined
SWSE, SESE, NESE	Sec.02			
SWSE, SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.11			
SWSW, SESW, NWSW, NESW, SWNW, SENW, SWNE, NWNE, NENE	Sec.14			
SESE, NESE, NWSE, SWNE, NENW, NWNE	Sec.23			
SWSW	Sec.24			
SESW, SWSE, NESW, NWSE, SWNW, SENW, NWNW	Sec.25			
NESE, SENE, NWNE, NENE	Sec.36			
NESW, NWSW, SWNE, SENW, SWNW, NENE, NWNE	Sec.05		R14E	Undetermined, State
SWSE, SESW, SWSW, NESE, NWSE, NESW, NWSW	Sec.06			
SWSW, SESW, NWSW, SWNW	Sec.31			
SWSE, SESE	Sec.10	T29N		Undetermined
SWSW	Sec.11			
SENE, SWNE, SENW, SWNW, NENE, NWNE, NENW, NWNW	Sec.13			

SENE, NWNW, NENW, NWNE, NENE	Sec.14			
SWNW, NWNW, NENW, NWNE	Sec.15			
SWSW, SESW, SWSE, SESE, NESE, SENE	Sec.16			
SWSE, SESE	Sec.17			
SESE, SWSE, NWSE, SENE, SWNE, NWNE, NENE	Sec.20			
NENW, NWNW, NWNE	Sec.21			
SESE, SWSE, NWSE, SWNE, NWNE	Sec.29			
SESE, NESE, NWSE, SENE, SWNE, NENE, NWNE	Sec.32			
SESW, SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.04		R15E	Undetermined, DOI
SWSE, SESE, NESE, NWSE, SWNE, SENE, NENE	Sec.08			
NENW, NWNW	Sec.09			
SWNW, SENW, SWNE, NWNW, NENW, NWNE, NENE	Sec.17			
SWNW, SENW, SWNE, SENE, NWNW, NENW, NWNE, NENE	Sec.18			
SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.03	T30N		Undetermined, DOI
SESW, SWSE, NWSE, SWNE, NWNE	Sec.10			
SESW, NESW, SENW, SWNE, NENW, NWNE	Sec.15			
SESW, NESW, SENW, NENW	Sec.22			
SWSW, SESW, NWSW, NESW, SWNW, SENW, NENW	Sec.27			
SESE, NESE	Sec.33			
SWSW, NWSW, SWNW, NWNW	Sec.34			
SESW, SWSW, NESW, NWSW, SENW, SWNW, NENW	Sec.02	T31N		Undetermined, State, DOI
SESE	Sec.10			
SWSW, NWSW, SWNW, NWNW	Sec.11			
NWNW	Sec.14			
SESE, NESE, SENE, NENE	Sec.15			
SWSE, NESE, NWSE, SWNE, SENE, NWNE, NENE	Sec.22			

SWSE, SESW, NWSE, NESW, SWNE, NWNE	Sec.27			
SESW, NESW, SENW, NWNE, NENW	Sec.34			
SWSW	Sec.03	T32N	R15E	Undetermined, DOI
SESE, NESE, NWSE, SWNE, NWNE, NENW	Sec.04			
NENE	Sec.09			
SESE, SWSE, NESW, NWSE, NESE, SWNW, SENW, SWNE, NWNW, NENW	Sec.10			
SWSW	Sec.11			
SESW, SWSW, NESW, NWSW, SWNW, NWNW	Sec.14			
NENE	Sec.15			
SWSE, NWSE, NESW, SWNE, SENW, NENW	Sec.23			
SESW, SWSE, NESW, NWSE, SENW, SWNE, NWNE	Sec.26			
SESW, NESW, SENW, NENW, NWNE	Sec.35			
SENE	Sec.01	T33N	R14E	DOI
SESW, NESW, NWSW, SWNW, NWNW	Sec.06		R15E	Undetermined, DOI
SESE, NESE, NWSE, SENE, SWNE, NENW, NWNE	Sec.07			
SWSW	Sec.08			
SESW, NESW, SENW, SWNW, NWNW	Sec.17			
NENE	Sec.18			
SESE, SWSE, NWSE, SWNE, NWNE, NENW	Sec.20			
SWSW, NWSW, SWNW	Sec.28			
NESE, SENE, NENE	Sec.29			
SWSE, NESW, SWNW, SENW, NWNW	Sec.33			
SWSE, SESW, NESW, NWSW, SWNW	Sec.05	T34N	R14E	Undetermined, DOI
SENE, NENE, NENW, NWNE	Sec.06			
SENE, NENE, NWNE	Sec.08			
SESE, SWSE, NWSE, NESW, SENW, SWNW, NWNW	Sec.09			
SESW, SWSE, SESE, NESW, NWSE, SWNW, SENW, NWNW	Sec.15			
NENE	Sec.16			
NENE	Sec.22			
SESW, SWSE, NESW, SWNW, SENW, NWNW	Sec.23			

SWSW, NWSW	Sec.25			
NESE, SWNE, SENE, NWNE, NENE	Sec.26			
SWSE, NESW, NWSE, SENW, NWNW, NENW	Sec.36			
SWSE, SESW	Sec.10	T35N	R13E	Undetermined, DOI
SWSW	Sec.14			
SESE, NESE, SENE, SWNE, NWNE, NENW	Sec.15			
SWSE, SESW, NWSE, NESW, SENW, SWNW, NWNW	Sec.23			
SWSE, NWSW, NESW, SWNW	Sec.25			
SENE, NENE, NWNE	Sec.26			
SENE, NWNE, NENE	Sec.36			
SESW, SWSE, NWSW, NESW, SWNW	Sec.31		R14E	Undetermined
SESE, SWSE, NESE, NWSE, SENE, NENE	Sec.05	T36N	R13E	Undetermined
SWSE, SESW, NWSE, SWNE, NWNE	Sec.08			
SESW, SWSW, NESW, SENW, NENW, NWNE	Sec.17			
SESE	Sec.19			
SWSW, NWSW, SWNW, NENW, NWNW	Sec.20			
SESW, NESW, NWSW, SWNW, NWNW	Sec.29			
NENE	Sec.30			
SESE, NESE, NWSE, SENE, NWNE, NENW	Sec.32			
SWSW	Sec.33			
SWSW, NWSW, SWNW, NENW, NWNW	Sec.03	T37N		Undetermined
SESE, NESE, SENE	Sec.09			
NWSW, SWNW, NWNW	Sec.10			
SESW, NWSE, SENE, SWNE, NENE, NWNE	Sec.16			
SESW, SWSW, NESW, SENW, NWNE, NENW	Sec.21			
SWSW, NWSW, SWNW, NWNW, NENW	Sec.28			
SESE, NESE, SENE, NENE	Sec.32			
SWNW, NWNW	Sec.33			
SWSW, NESW, NWSW, SENW	Sec.05	T38N		Undetermined, DOI
SWSW, SESW, NWSW, SWNW, NWNW	Sec.08			
SWSW	Sec.16			

SESE, NWSE, NESE, SENW, SWNE, NENW	Sec.17			
SWSE, NESW, NWSE, SENW, NENW, NWNW	Sec.21			
SWSW, NWSW	Sec.27			
SESE, NESE, SENE, NWNE, NENE	Sec.28			
SESW, SWSW, NWSW, SWNW, NWNW	Sec.34			
SWNW, NENW, SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.05	T39N		Undetermined, DOI
SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.08			
SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.17			
SESW, NESW, SENW, NENW	Sec.20			
SESW, NESW, SENW, NENW	Sec.29			
SESW, NESW, SENW, NENW	Sec.32			
SWNW, NENW, SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.05	T40N		Undetermined, DOI
SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.08			
SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.17			
SESW, NESW, SENW, NENW	Sec.20			
SESW, NESW, SENW, NENW	Sec.29			
SESW, NESW, SENW, NENW	Sec.32			
SWSW, SESW, NWSW, NESW, SWNW, NWNW	Sec.05	T41N	R12E	Undetermined, DOI
SESW, NESW, SENW, NWNW, NENW	Sec.08			
SESW, NESW, SENW, NENW	Sec.17			
SESW, SWSE, NESW, NWSE, SENW, SWNE, NENW	Sec.20			
SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE	Sec.29			
SWSE, NESW, NWSE, SENW, SWNE, NENW, NWNE, SESW	Sec.32			
SWSW, NWSW, SWNW, NWNW	Sec.01		R13E	Undetermined

SESE, NESE, SENE, NENE	Sec.02			
NENE	Sec.11			
SWSW, NWSW, SWNW, NWNW	Sec.12			
SWSW, NWSW, SWNW, NWNW, NENW	Sec.13			
SWSW, SESW, NWSW, NESW, SWNW, NWNW	Sec.24			
SESE, NWSE, NESE, SENW, SWNE, NENW	Sec.25			
SWSW	Sec.30	T42N		Undetermined
SWSE, NESW, NWSE, SENW, NWNW, NENW	Sec.31			
SESE	Sec.01		R12E	Undetermined, DOI
SWSW, SESW, NESW, NWSW, SENW, SWNW, NENE, NWNE, NENW	Sec.12			
SWSW, NWSW, SWNW, SENW, NWNW, NENW	Sec.13			
SESE, NESE	Sec.14			
SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.23			
NWNW	Sec.24			
SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.26			
SESE, NESE, SENE, NENE	Sec.35			
NWNW	Sec.04		R13E	Undetermined
NWSW, SENE, SWNE, SENW, SWNW, NENE, NWNE	Sec.05			
SWSW, SESW, SWSE, NWSE, NESE	Sec.06			
NWNW	Sec.07			
SWSW, NWSW, NESW, SENW, SWNW, NENW, NWNW	Sec.01	T43N		Undetermined, DOI
SESE	Sec.02			
SWSE, NWSE, SWNE, NENE, NWNE	Sec.11			
SESW, SWSW, NESW, SWNE, SENW, NWNE	Sec.14			
SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.22			
SWNW, NWNW	Sec.23			
SWSW, NWSW, NESW, SWNW, SENW, NENW, NWNE	Sec.27			
SESE	Sec.28			

SESW, SWSW, NWSE, NESW, SENE, SWNE, NENE, NWNE	Sec.33			
SWSE, SESE, NESE, SENE	Sec.25	T44N		Undetermined, State
SWSE, SESW, NWSE, NESW, SENW, SWNE, NWNE, NENE	Sec.36			
SESW, NESW, NWSE, SWNE, NWNE	Sec.05		R14E	Undetermined
SESE	Sec.07			
SWSW, NWSW, SWNW, SENW, NWNW, NENW	Sec.08			
SWSE, NWSE, NESE, SWNE, SENE, NENE	Sec.18			
SWSW, SESW, NWSW, NESW, SENW, NENW, NWNE	Sec.19			
SWNW, NWNW	Sec.30			
SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.05	T45N		Undetermined, DOI
SWSE, SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.08			
SWSE, SESE, NWSE, NESE, SWNE, NWNE, NENE	Sec.17			
SWSE, SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.20			
SWSE, SESE, NWSE, NESE, SWNE, SENE, NWNE, NENE	Sec.29			
SWSE, NWSE, SWNE, NWNE, NENE	Sec.32			
NWNW	Sec.03	T46N		Undetermined, USDA, DOI
SWSE, SESE, NWSE, NESE, SENE, NENE	Sec.04			
SWSE, NWSE, SWNE, NWNE	Sec.09			
SWSW, NWSW	Sec.15			
SESE, NESE, SENE, NWNE, NENE	Sec.16			
SWSE, NWSE, NESE, SENE, NENE	Sec.21			
NWNW	Sec.22			
SWSW, NESW, NWSW, SENW, SWNW, NENW, NWNE	Sec.28			
SESE, NESE, SENE	Sec.32			
SWNW, NWNW	Sec.33			
NWNW	Sec.01	T47N		Undetermined
SWSE, SESE, NESE, SENE, NENE	Sec.02			
SESW, NESW, NWSE, SWNE, NWNE	Sec.11			
SWSW, NWSW, SWNW, SENW, NENW	Sec.14			
SESE	Sec.15			

SESE, SWSE, NESE, NWSE, SENE, NENE	Sec.22			
NWNW	Sec.23			
SESW, NWSE, NESW, SWNE, SENW, NWNE	Sec.27			
SWSW, NESW, NWSW, SENW, SWNW, NENW	Sec.34			
SWSE, SESE, NESE, SENE	Sec.24	T48N		Undetermined
SESW, SWSE, NESW, NWSE, SWNE, NWNE, NENE	Sec.25			
SWSW, NWSW, NESW, SWNW, SENW, NENW	Sec.36			