APPENDIX F

Paleontological Report

Prepared by

Applied EarthWorks

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Paleontological Resource Assessment for the Westlands Solar Park and Gen-Tie Project, Fresno and Kings Counties, California

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SUMMARY OF FINDINGS

At the request of Bert Verrips Environmental Consulting Services, Applied EarthWorks, Inc. (Æ) performed a paleontological resource inventory in support of the Westlands Solar Park and Gen-Tie Project (Project) in Fresno and Kings Counties, California. The Project area is south of State Route (SR) 198, west of SR 41 and the Kings River, and east of Interstate 5 (I-5) and the Coast Ranges, within the western San Joaquin Valley. This study consisted of a search of museum collections records maintained by the Natural History Museum of Los Angeles County, the University of California Museum of Paleontology online database, and the Paleobiology Database as well as a comprehensive literature and geologic map review and preparation of this technical report. This report summarizes the methods and results of a paleontological resource assessment and provides Project-specific management recommendations. This study is intended to illustrate compliance with the California Environmental Quality Act (CEQA).

The purpose of the literature review and museum records search was to identify the geologic unit(s) underlying the Project area and to determine whether previously recorded paleontological localities occur either within the Project boundaries or within the same geologic unit elsewhere. Using the results of the literature review and museum records search, the paleontological resource potential of the Project area was determined in accordance with Society of Vertebrate Paleontology guidelines.

Published geologic mapping indicates that the Project area is underlain by Pleistocene to Holocene sedimentary units, including alluvial fan, basin, and lacustrine deposits of the Great Valley. According to the museum records search results, at least six vertebrate localities have been documented from within similar Pleistocene age deposits in Kings County, within the vicinity of the Project. These localities yielded fossilized specimens of terrestrial mammals, reptiles, and fish. One locality in particular, the Witt Site near Kettleman City, yielded over 1,500 vertebrate fossil specimens. No vertebrate fossil localities have been previously recorded directly within the Project boundary.

As a result of this study, portions of the Project area are determined to have a high paleontological sensitivity and the likelihood of impacting scientifically significant vertebrate fossils as a result of Project construction is high. Therefore, it is recommended that a qualified paleontologist be retained to develop and implement a Paleontological Resource Mitigation Plan during Project construction. This plan would include mitigation measures that have been proven to be effective in reducing or eliminating adverse impacts to paleontological resources and would satisfy the requirements of CEQA. The recommended mitigation measures include a field reconnaissance survey; paleontological mitigation monitoring by a qualified paleontologist; and preparation of a Paleontological Mitigation Report, which should be submitted to the approved curation facility, accompanied by all significant fossils found during the course of construction monitoring.

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1
INTRODUCTION

At the request of Bert Verrips Environmental Consulting Services, Applied EarthWorks, Inc. (Æ) performed a paleontological resource inventory in support of the Westlands Solar Park and Gen-Tie Project (Project) in Fresno and Kings Counties, California (Figure 1-1). The assessment consisted of a museum records search; comprehensive literature and geologic map review; and preparation of this technical report, including Project-specific management recommendations. The Westlands Water District (WWD) will serve as the California Environmental Quality Act (CEQA) Lead Agency.

1.1 PROJECT LOCATION

The Project area is located south of State Route (SR) 198, west of SR 41 and the Kings River, and east of Interstate 5 (I-5) and the Coast Ranges, within the western San Joaquin Valley. The Project area encompasses approximately 21,000 acres on Westlands Water District land and privately held lands. Specifically, the Project is mapped within portions of Township 19 South, Range 19 East, Sections 31-32; Township 20 South, Range 17 East, Sections 25-26 and 33-36; Township 20 South, Range 18 East, Sections 1, 11-12, 14-16, 19-21, 24-26, and 30-36; Township 20 South, Range 19 East, Sections 3-10, 14-23, 26-28, and 31-35; Township 21 South, Range 18 East, Sections 2-3, and 12; Township 21 South, Range 19 East, Sections 2-10, 15-21, and 29-32; Township 22 South, Range 18 East, Section 1; and Township 22 South, Range 19 East, Section 6 on the Huron, Westhaven, Stratford, Kettleman City CA 7.5-minute U.S. Geological Survey quadrangles.

1.2 PROJECT DESCRIPTION

The Westlands Solar Park (WSP) Master Plan is an overall plan of development for solar generating facilities within WSP. The WSP Master Plan is intended to serve as the planning framework for a series of utility-scale photovoltaic (PV) solar energy generating facilities with a combined generating capacity of approximately 2,000 megawatts (MW). It is expected that solar PV projects developed within WSP would have varying generating capacities, with the power output from the solar facilities ranging from about 90 MW to a maximum of 250 MW. The installation of solar generating facilities is planned to occur incrementally over a 15-year build-out period extending from 2016 to 2030 (inclusive), with an average installation rate of about 133 MW per year. For planning purposes, the Master Plan area is divided into 12 subareas and includes planned locations for two large switching stations to provide interconnection to the state's power grid (Bert Verrips, Personal Communication, November 5, 2015).

The Project includes two transmission corridors to convey WSP solar generated power to the statewide electrical grid via the Gates Substation. The description of the generation tie-line (gen-tie) corridors is as follows (Bert Verrips, Personal Communication, November 5, 2015):

a. <u>WSP-North to Gates Gen-Tie Corridor</u> – This planned 230-kilovolt (kV) transmission corridor would run parallel and adjacent to the existing 230-kV Henrietta-Gates transmission line, commencing at a planned switching station in the northern portion of WSP and running southwestward for 11.5 miles to the eastern fenceline of the Gates Substation. This transmission corridor would serve as a gen-tie providing delivery of solar power generated in the northern and central portions of the WSP to the Gates Substation where it would be transferred to the State electrical grid.

b. WSP-South to Gates Gen-Tie Corridor – This planned 230-kV transmission corridor would run parallel and adjacent to the Nevada-Jayne Avenues roadway right-of-way, commencing at a planned switching station on Nevada Avenue in the southern portion of WSP and running westward for 11.5 miles to the eastern fenceline of the Gates Substation. This transmission corridor would serve as a gen-tie line providing delivery of solar power generated in the central and southern portions of the WSP to the Gates Substation where it would be transferred to the State electrical grid.

1.3 PURPOSE OF INVESTIGATION

The purpose of this investigation is to: (1) identify the geologic units within the Project area and assess their paleontological resource potential; (2) determine whether the Project has the potential to adversely affect known scientifically significant paleontological resources; and (3) provide Project-specific management recommendations for paleontological resource mitigation, as necessary. The study was conducted in accordance with professional standards and guidelines set forth by the Society of Vertebrate Paleontology (SVP, 2010) and meets the requirements of the laws and regulations described in Chapter 2.

1.4 KEY PERSONNEL

This paleontological assessment was prepared under the direction of Æ’s Paleontology Program Manager, Jessica DeBusk, who served as Senior Paleontologist and provided a quality assurance review of this report. Associate Paleontologist Heather Clifford requested the museum records searches, conducted the literature and geologic map review, produced all graphics, and served as the primary author of this report. DeBusk has more than 14 years of professional experience as a consulting paleontologist and meets the SVP’s definition of a qualified professional paleontologist.

1.5 REPORT ORGANIZATION

This report documents the results of Æ’s paleontological resource assessment of the Project area. Chapter 1 has introduced the scope of work, identified the Project location, described the Project, defined the purpose of the investigation, and presented key personnel. Chapter 2 outlines the regulatory framework governing the Project. Chapter 3 defines the paleontological significance and sensitivity of the Project. Chapter 4 describes methods, and Chapter 5 provides an overview of the geology and paleontology of the Project area. Chapter 6 presents an analysis and the results of the study. Chapter 7 provides management recommendations, while conclusions are presented in Chapter 8. Lastly, Chapter 9 lists references cited.

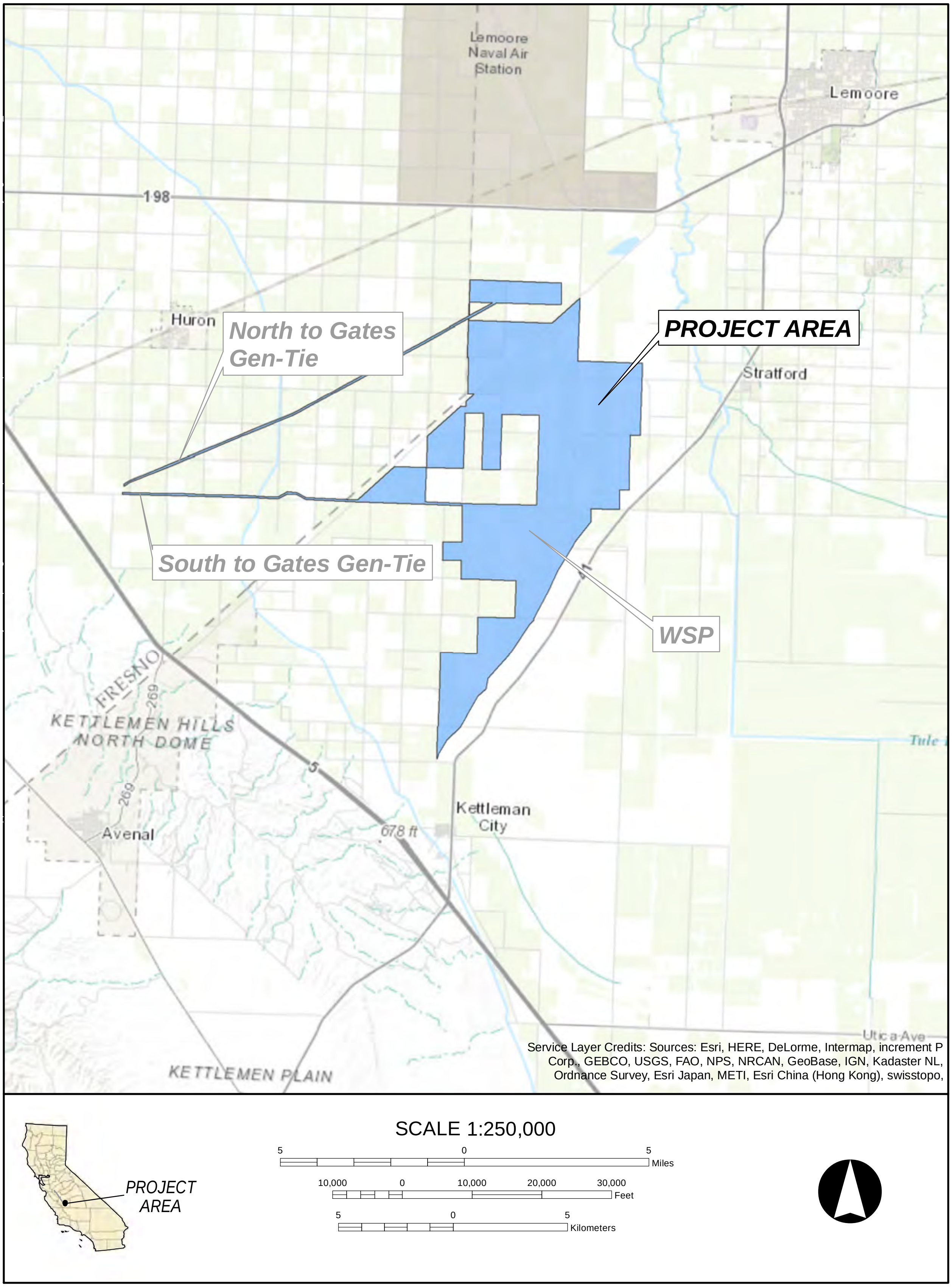

Figure 1-1 **Project vicinity map.**

2
REGULATORY FRAMEWORK

Paleontological resources (i.e., fossils) are considered nonrenewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under various federal, state, and local laws and regulations. Laws pertinent to this project are discussed below.

2.1 STATE

2.1.1 California Environmental Quality Act (CEQA)

Paleontological resources cannot be replaced once they are destroyed. Therefore, paleontological resources are considered nonrenewable scientific resources and are protected under the CEQA. Specifically, in Section V(c) of Appendix G of the CEQA Guidelines, the “Environmental Checklist Form,” the question is posed: “Will the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature” (Association of Environmental Professionals, 2015). In order to determine the uniqueness of a given paleontological resource, it must first be identified or recovered (i.e., salvaged). Therefore, mitigation of adverse impacts to paleontological resources is mandated by CEQA.

2.1.2 California Public Resources Code

California Public Resources Code (PRC) 5097.5 affirms that no person shall willingly or knowingly excavate, remove, or otherwise destroy a vertebrate paleontological site or paleontological feature without the express permission of the overseeing public land agency. It further states under PRC 30244 that any development that would adversely impact paleontological resources shall require reasonable mitigation. These regulations apply to projects located on land owned by or under the jurisdiction of the state or city, county, district, or other public agency (California Office of Historic Preservation, 2005).

2.2 LOCAL

2.2.1 County of Fresno

Paleontological resources are addressed in the Open Space and Conservation Element of the Fresno County 2000 General Plan Background Report (County of Fresno, 2013). Open Space and Conservation Element policy OS-J.4 specifically addresses the treatment of paleontological resources for which the following implementation policy is set forth:

> The County shall require that discretionary development projects, as part of any required CEQA review, identify and protect important historical, archeological, paleontological, and cultural sites and their contributing environment from damage, destruction, and abuse to the maximum extent feasible. Project-level mitigation shall include accurate site

surveys, consideration of project alternatives to preserve archeological and historic resources, and provision for resource recovery and preservation when displacement is unavoidable [5-31].

2.2.2 County of Kings

Kings County does not have mitigation requirements that specifically address potential adverse impacts to paleontological resources.

3
PALEONTOLOGICAL RESOURCE ASSESSMENT GUIDELINES AND SIGNIFICANCE CRITERIA

3.1 DEFINITION OF PALEONTOLOGICAL RESOURCES AND SIGNIFICANCE CRITERIA

Paleontological resources are the evidence of once-living organisms as preserved in the rock record. They include both the fossilized remains of ancient plants and animals and the traces thereof (trackways, imprints, burrows, etc.). In general, fossils are considered to be greater than 5,000 years old (older than Middle Holocene) and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks formed under certain conditions (SVP, 2010).

Significant paleontological resources are defined as “identifiable” vertebrate fossils, uncommon invertebrate, plant, and trace fossils that provide taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, or biochronological data (SVP, 2010). These data are important because they are used to examine evolutionary relationships, provide insight into the development of and interaction between biological communities, establish time scales for geologic studies, and for many other scientific purposes (Scott and Springer, 2003; SVP, 2010).

3.2 PROFESSIONAL STANDARDS AND PALEONTOLOGICAL RESOURCE SENSITIVITY

Absent specific agency guidelines, most professional paleontologists in California adhere to guidelines set forth by SVP in “Standard Procedures for the Assessment and Mitigation of Adverse Impacts to Paleontological Resources” (SVP, 2010). These guidelines establish detailed protocols for the assessment of the paleontological resource potential (i.e., “sensitivity”) of a Project area and outline measures to follow in order to mitigate adverse impacts to known or unknown fossil resources during project development. In order to prevent project delays, SVP highly recommends that the owner or developer retain a qualified professional paleontologist in the advance planning phases of a project to conduct an assessment and to implement paleontological mitigation during construction, as necessary.

Using baseline information gathered during a paleontological resource assessment, the paleontological resource potential of the geologic unit(s) (or members thereof) underlying a Project area can be assigned to one of four categories defined by SVP (2010). These categories include high, undetermined, low, and no potential. The criteria for each sensitivity classification and the corresponding mitigation recommendations are summarized in Table 3-1 below.

If a Project area is determined to have high or undetermined potential for paleontological resources following the initial assessment, then SVP recommends that a Paleontological Resource Mitigation Plan (PRMP) be developed and implemented during the construction phase of a project. The mitigation plan describes, in detail, when and where paleontological monitoring will take place and establishes communication protocols to be followed in the event that an unanticipated fossil discovery is made during project development. If significant fossil resources are known to occur within the boundary of the project and have not been collected, then the plan will outline the procedures to be followed prior to any ground-disturbing activities (i.e., preconstruction salvage efforts or avoidance measures, including fencing off a locality). Should microfossils be known to occur in the geologic unit(s) underlying the Project area or suspected to occur, then the plan will describe the methodology for matrix sampling and screening.

Table 3-1
Paleontological Sensitivity Categories

Resource Potential*	Criteria	Mitigation Recommendations
No Potential	Rock units that are formed under or exposed to immense heat and pressure, such as high-grade metamorphic rocks and plutonic igneous rocks.	No mitigation required.
Low Potential	Rock units that have yielded few fossils in the past, based upon review of available literature and museum collections records. Geologic units of low potential also include those that yield fossils only on rare occasion and under unusual circumstances.	Mitigation is not typically required.
Undetermined Potential	In some cases, available literature on a particular geologic unit will be scarce and a determination of whether or not it is fossiliferous or potentially fossiliferous will be difficult to make. Under these circumstances, further study is needed to determine the unit's paleontological resource potential (i.e., field survey).	A field survey is required to further assess the unit's paleontological potential.
High Potential	Geologic units with high potential for paleontological resources are those that have proven to yield vertebrate or significant invertebrate, plant or trace fossils in the past or are likely to contain new vertebrate materials, traces, or trackways. Rock units with high potential also may include those that contain datable organic remains older than late Holocene (e.g., animal nests or middens).	Typically, a field survey (dependent on field conditions) as well as onsite construction monitoring will be required. Any significant specimens discovered will need to be prepared, identified, and curated into a museum. A final report documenting the significance of the finds will also be required.

*Adapted from SVP (2010).

The PRMP should be prepared by a qualified professional paleontologist and developed using the results of the initial paleontological assessment and survey. Elements of the plan can be adjusted throughout the course of a project as new information is gathered and conditions change, so long as the lead agency is consulted and all parties are in agreement. For example, if after 50 percent of earth-disturbing activities have occurred in a particular unit or area, and no fossils whatsoever have been discovered, then the project paleontologist can reduce or eliminate monitoring efforts in that unit or area.

4
METHODS

Paleontological resources are not found in “soil” but are contained within the consolidated or unconsolidated geologic deposits or bedrock that underlies the soil layer. Therefore, in order to ascertain whether a particular Project area has the potential to contain significant fossil resources at the subsurface, it is necessary to review relevant scientific literature and geologic mapping to determine the underlying geology and stratigraphy of the area. Further, to delineate the boundaries of an area of paleontological sensitivity it is necessary to determine the extent of the entire geologic unit, because paleontological sensitivity is not limited to surface exposures of fossil material.

To determine whether fossil localities have been previously discovered within a Project area or a particular rock unit, a search of pertinent local and regional museum repositories for paleontological localities within and nearby the Project area should be performed. For this Project, a museum records search was conducted at the Natural History Museum of Los Angeles County (LACM). The museum records search was supplemented by a review of the University of California Museum of Paleontology’s (UCMP’s) online database and the Paleobiology Database (PDBD), which contain additional paleontological records for Fresno and Kings Counties.

5
GEOLOGY AND PALEONTOLOGY

5.1 REGIONAL GEOLOGY

The Project area is located in the San Joaquin Valley within the Great Valley (also referred to as the Central Valley) geomorphic province of California. A geomorphic province is a region of unique topography and geology that is readily distinguished from other regions based on its landforms and diastrophic history (Norris and Webb, 1976). The Great Valley is a north-northwest–trending asymmetric structural trough bisected by the Stockton Arch, a structural feature that subdivides the region into the Sacramento Valley in the north and the San Joaquin Valley to the south. The Great Valley is roughly 400 miles long and 50 miles wide and was covered by marine waters as far back as the Jurassic and into the Paleogene. Deposition into the Great Valley began during the Late Jurassic as the paleo-Sierra Nevada began to rise and deliver eroded sediments to the lowlands. Forearc (i.e., the deep marine region between a volcanic arc and the associated subduction zone) marine and nonmarine shale, sandstone, and conglomerate of the Cretaceous Central Valley Sequence were deposited during this time unconformably on top of the Franciscan Complex of the Coast Ranges and the Sierran Batholith (Bartow and Nilsen, 1990). During the late Mesozoic and much of the Cenozoic, the actively subsiding region persisted as a submerged lowland basin known as the Great Valley Sea (Harden, 1998). By the Pliocene, most of the marine waters in the Great Valley were drained (brackish and freshwater lakes remained) coincident with an orogenic (i.e., mountain-building) episode near the present-day Coast Ranges, resulting in their uplift above sea level (Weissmann et al., 2005). Subsequently, during the Quaternary period, extensive deposits of terrestrial material, including alluvial fan, fluvial, basin, and lacustrine sediments, were deposited in the Great Valley (Norris and Webb, 1976) during continued uplift and erosion of the Sierra Nevada and Temblor and Diablo Ranges within the Coast Ranges.

The present surface of the valley floor is dominated by well-developed soils formed from alluvial parent rock, including unconsolidated Pleistocene age arkosic alluvial sediments derived from the drainage of the glaciated Sierra Nevada; alluvial fan deposits originating from the metamorphic-rich Coast Ranges; and Holocene alluvial sediments deposited within the flood and delta plains of the Sacramento and San Joaquin River watersheds (Bartow, 1991; Matthews and Burnett, 1965; Norris and Webb, 1976; Weissmann et al., 2005). In general, the western side of the San Joaquin Valley, which encompasses the Project area, is characterized by steeply to gently sloping alluvial fans derived from erosion of the Coast Ranges (Bull, 1964; Jennings and Strand, 1958). These Quaternary age alluvial fan sediments interfinger with the Pleistocene to Holocene Sierran detritus along roughly the central margin of the valley floor, east of the Project area (Bartow, 1991). In the vicinity of the Project area, the geomorphology is relatively flat but also consists of minor topographic relief derived from flooding and fluvial processes, including terraces and sloughs. In general, the soils are sandy, permeable, and fertile but may consist of hardpan in some areas (Croft and Gordon, 1968).

5.2 GEOLOGY AND PALEONTOLOGY OF THE PROJECT AREA

The Project area is mapped at a scale of 1:250,000 by Matthews and Burnett (1965) and is underlain by Quaternary age deposits, including unnamed alluvial fan (Qf), basin (Qc), fluvial (Qb), and lacustrine deposits (Ql). The lithology, stratigraphy, and paleontology of these units are described in the following sections and depicted in Appendix A. An overview of the geology and paleontological sensitivity of the Project area is shown on Figure 5-1.

5.2.1 Quaternary Older Alluvium (Qc)

Quaternary alluvial fan and fluvial deposits of Middle to Late Pleistocene age (Qc) are exposed in a very small area (less than 5 acres) at the southern tip of the Project area (Lettis, 1982; Matthews and Burnett, 1965). The Pleistocene deposits consist of unconsolidated coarse to fine sand and silt with abundant pebbles and cobbles, which drained from the Coast Ranges during the Quaternary period. The Pleistocene age sediments typically display well-developed soil and dissection by channels that are partially filled with Holocene age alluvium (Helley and Graymer, 1997). The total thickness of the Pleistocene deposits varies locally, but is up to 150 feet thick in the vicinity of the proposed Project area (Barlock, 1988). Quaternary alluvial deposits of Pleistocene age have yielded significant vertebrate fossil localities throughout Kings County, especially within the fine-grained lacustrine sediments of the Tulare Lake deposits (UCMP, 2015). Pleistocene age alluvial sediments in Kings County have preserved a characteristic Ice Age vertebrate fauna of large land mammals, including specimens of bison, camel, mammoth, horse, wolf, sloth, and gopher. Further north, during excavations near Tranquility, California, 149 vertebrate localities were recorded, which yielded over 100 specimens of mammal, bird, reptile, and fish (UCMP, 2015). The depth of fossil recovery is unreported.

5.2.2 Tulare Lake Lacustrine Deposits (Ql)

Quaternary lacustrine deposits (Ql) of Pleistocene to Holocene age (with age increasing with depth), attributed to former Tulare Lake, are mapped along the southeastern to eastern margin of the Project area (Matthews and Burnett, 1965; McLeod, 2015). The Tulare Lake deposits underlie a large shallow depression in southeastern Kings County, which extends into neighboring Tulare and Kern Counties (Page, 1983). Former Tulare Lake formed in response to climatic changes during Pleistocene glaciation, and later evolved into a seasonal playa during the warmer Holocene. During this time, according to Page (1983), the accumulation of Tulare Lake deposits exceeded several thousand feet below ground surface (bgs). The Tulare Lake deposits, as mapped by Matthews and Burnett (1965), consist of flood-plain, lake, and marsh deposits derived from both Sierran and Coast Ranges sources, which are composed of mostly clay and silt, with subordinate sand (Page, 1983). These fine-grained sediments intercalate with the fluvio-lacustrine Late Pliocene to Early Pleistocene Tulare Formation and unconformably overlie the Pliocene San Joaquin Formation.

Pleistocene age sedimentary deposits have yielded significant vertebrate fossil localities throughout the Central Valley. Fine-grained lacustrine sediments, such as the Tulare Lake deposits, have an especially high potential for the preservation of fossilized remains (SVP, 2010; UCMP, 2015). According to Page (1983), the fine-grained deposits in the Tulare Lake bed

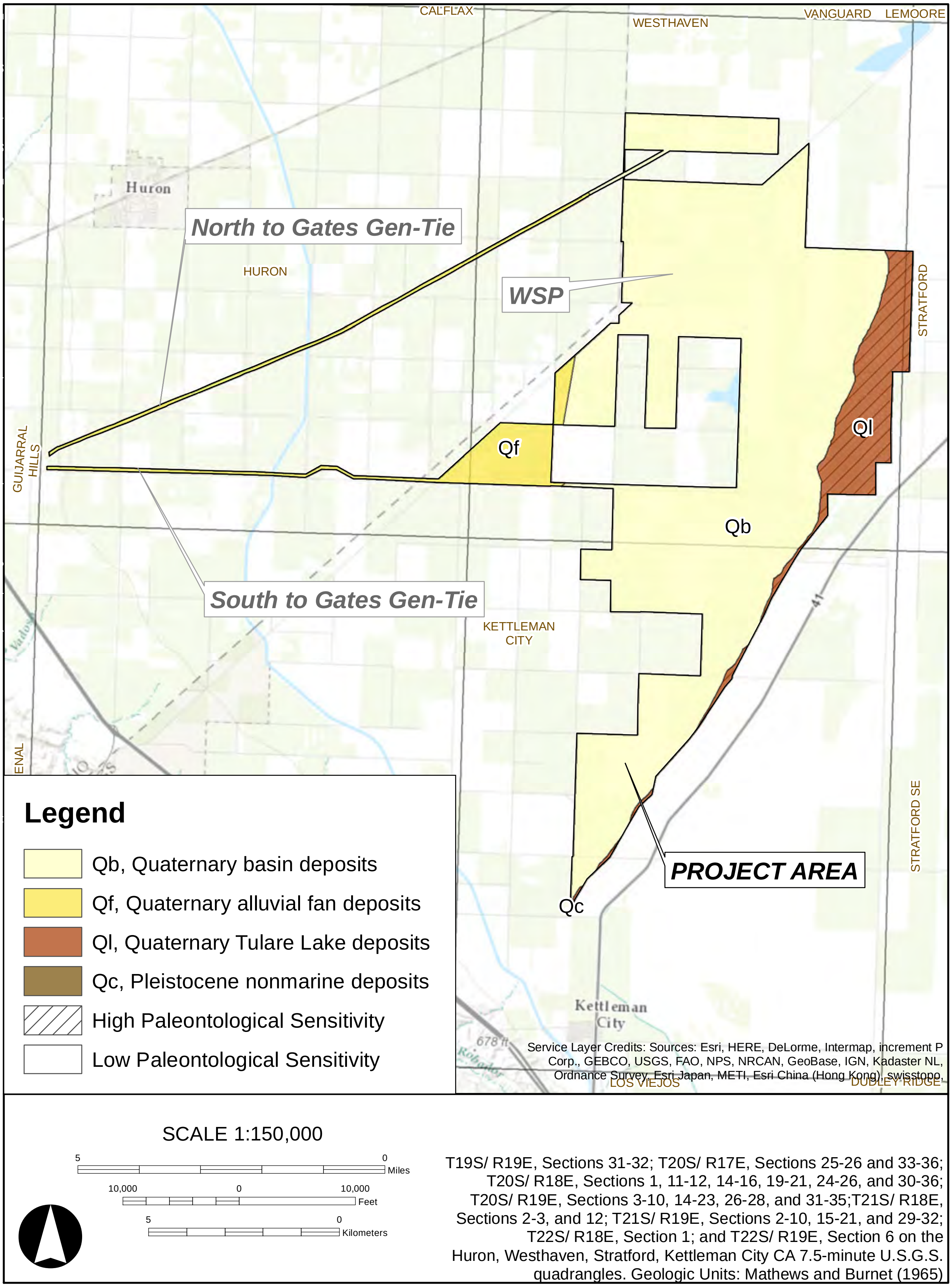

Figure 5-1 Overview of the Geologic Units and Paleontological Sensitivity in the Project Area.

"were laid down seemingly without interruption throughout the late Pliocene, the entire Pleistocene, and the Holocene. Beneath Tulare Lake bed these deposits would probably yield excellent (geologic) data in the form of fossils (11)." The UCMP online database maintains records for at least two vertebrate localities identified within Pleistocene Tulare Lake deposits from Kings County, which yielded specimens of mammoth, bison, ground sloth, turtle, and other unspecified mammals. Another UCMP locality, the Witt Site (V82055) near Kettleman City, within the boundary of former Tulare Lake, yielded over 1,500 Pleistocene age vertebrate fossil specimens, including taxa of bison, horse, mammoth, ground sloth, wolf, badger, rodent, turtle, and fish. The depth of fossil recovery is unreported.

5.2.3 Quaternary Alluvium (Qf, Qb)

Quaternary alluvial fan (Qf) and basin deposits (Qb) of Holocene to latest Pleistocene age underlie the majority of the Project area (Matthews and Burnett, 1965). These Quaternary alluvial fan deposits are poorly documented relative to other late Cenozoic sedimentary deposits in the region, especially with respect to the well-known Pleistocene Modesto and Riverbank Formations on the eastern side of the Central Valley. The alluvial fans of the western San Joaquin Valley are composed of coarse- to fine-grained alluvial sediments primarily derived from erosion of volcanic, plutonic, and metamorphic rocks of the Coast Ranges (i.e., Coast Ranges alluvium). The Quaternary basin deposits are widespread along the center and west-central margin of the San Joaquin Valley and are derived from reworked Coast Ranges alluvium, with input from Sierran-derived alluvium transported from the eastern side of the valley (Bull, 1964). The Coast Ranges alluvium was deposited as a system of coalescing alluvial fans and terrace deposits consisting of locally variable compositions of silt, sand, gravel, and larger clasts, which grade from coarse gravel in the foothills of the Temblor and Diablo ranges to finer-grained sediments toward the interior of the San Joaquin Valley (Laudon and Belitz, 1989). Deposition of the Coast Ranges alluvium occurred by both alluvial (water-transported) and mudflow processes; as a result, the Coast Ranges alluvium includes both fine- to medium-grained, well to moderately sorted deposits and very coarse, poorly sorted sediments (Bull, 1964). Holocene deposits are generally considered too young to contain fossilized remains, but may shallowly overlie older Pleistocene deposits that have the potential to yield paleontological resources.

6
ANALYSIS AND RESULTS

6.1 MUSEUM RECORDS SEARCH RESULTS

A museum records search of the Project area was conducted by the LACM on December 3, 2015 (McLeod, 2015). The LACM reports that although there are no previously recorded vertebrate fossil localities directly within the Project boundaries, at least three have been identified nearby from within similar Pleistocene age sedimentary deposits. East-southeast of the Project area, just north of city of Delano, locality LACM 1156 has yielded a fossil specimen of horse from younger Quaternary lacustrine deposits. Additionally, locality LACM 6701, located southeast of the Project area near White River, and LACM 4087, located southeast of the Project area east of Highway 65 near Terra Bella, have both yielded fossil specimens of mammoth.

A supplemental review of online museum collections records maintained by the UCMP online database and the PBDB was conducted in order to determine if any previously recorded paleontological resources occur within the Project area or vicinity. Records retrieved from the UCMP database do not provide the exact location of recovered fossil specimens; only a rough description of their general area of their recovery is given. The UCMP online database contains records for three vertebrate localities identified within Pleistocene alluvial deposits in western Kings County, which yielded fossil specimens of horse, bison, ground sloth, wolf, mammoth, camel, rodent, reptile, and fish. The UCMP localities include the Witt Site near Kettleman City (UCMP V82055), which has yielded at least 1,630 vertebrate specimens from similar Pleistocene deposits and is located approximately five miles southeast of the Project area on the southwest margin of the Tulare Lake Bed. The UCMP contained no vertebrate localities for Pleistocene alluvial deposits in western Fresno County. Further, PBDB contained no vertebrate fossil records for the Project area or vicinity. The results of the museum records search are summarized in Table 6-1.

Table 6-1
Vertebrate Localities Reported in the Vicinity of the Project Area

Locality No.	Geologic Unit	Age	Taxa
LACM 1156	Unnamed Pleistocene deposits	Pleistocene	*Equus* sp. (horse)
LACM 6701	Unnamed Pleistocene deposits	Pleistocene	*Mammuthus* sp. (mammoth)
LACM 4087	Unnamed Pleistocene deposits	Pleistocene	*Mammuthus* sp.
UCMP V69205 (Tulare Lake)	Unnamed Pleistocene deposits	Pleistocene	*Equus* sp., *Bison* sp. (bison), *Glossotherium* sp. (extinct ground sloth), Eutheria (placental mammal), *Clemmys marmorata* (turtle), Mammalia

Table 6-1
Vertebrate Localities Reported in the Vicinity of the Project Area in Kings County

Locality No.	Geologic Unit	Age	Taxa
UCMP V75041 (Tulare Lake W)	Unnamed Pleistocene deposits	Pleistocene	*Mammuthus* sp.
UCMP V82055 and PBDB 93249 (Witt Site)	Unnamed Pleistocene deposits	Pleistocene	*Clemmys marmorata*, *Chelonia*sp., (turtle), *Bison* sp., *Equus* sp., *Mammuthus* sp., Proboscidea (order that includes mammoths, mastodons, and elephants), *Glossotherium* sp., *Paramylodon* sp. (extinct ground sloth), Camelops sp. (camel), *Canis* sp. (genus of wolf), *Canisdirus* (extinct dire wolf), *Taxidea* sp. (badger), *Thomomys* sp. (pocket gopher), *Mylopharodon* sp. (fish), Osteichthyes (order of fish), Ungulata (clade of hooved mammals)

Sources: UCMP, 2015, and PBDB, 2015.

6.2 PALEONTOLOGICAL RESOURCE POTENTIAL FOR GEOLOGIC UNITS WITHIN THE PROJECT AREA

Based on the literature review and museum records search results, the geologic units underlying the proposed Project area have a paleontological resource potential ranging from low to high in accordance with the SVP (2010) guidelines. The Quaternary older alluvial (Qc) and former Tulare Lake deposits (Ql) are considered to have a high paleontological resource potential in accordance to the SVP sensitivity scale because they have proven to yield vertebrate fossils near the proposed Project area and throughout California. Holocene-age alluvial and basin deposits (Qf, Qb) are determined to have a low paleontological resource potential, increasing with depth, because they are generally too young or too coarse to preserve significant fossilized; however, younger alluvium may overlie the older sensitive geologic deposits at depth. The paleontological sensitivity ratings of the geologic units underlying the Project area are listed below in Table 6-2 and depicted in Appendix B. Refer to Figure 5-1 for an overview of the paleontological sensitivity of the Project area.

Table 6-2
Geologic Units in the Project Area and Their Recommended Paleontological Sensitivity

Geologic Unit*	Map Abbreviation	Age	Typical Fossils	Paleontological Resource Potential (SVP, 2010)
Quaternary alluvial fan and basin deposits of the Coast Ranges alluvium	Qf, Qb	Holocene (to latest Pleistocene at depth)	None	Low
Tulare Lake lacustrine deposits	Ql	Late Pleistocene to Holocene	Vertebrates	High
Quaternary older alluvium, fluvial and lacustrine lithologies	Qc	Middle to Late Pleistocene	Vertebrates	High

*Geology taken from Matthews and Burnett (1965).

7
MANAGEMENT RECOMMENDATIONS

The following management recommendations have been developed in accordance with SVP guidelines and, if implemented, will satisfy the requirements of CEQA. These measures have been used by professional paleontologists for many years and have proven to be effective in reducing or eliminating adverse impacts to paleontological resources as a result of private and public development projects throughout California and elsewhere.

7.1 WORKER'S ENVIRONMENTAL AWARENESS TRAINING

Prior to any ground-disturbing activities, all field personnel should receive a worker's environmental awareness training module on paleontological resources. The training should provide a description of the fossil resources that may be encountered in the Project area, outline steps to follow in the event that a fossil discovery is made, and provide contact information for the Project Paleontologist and on-site monitor(s). The training should be developed by the Project Paleontologist and may be conducted concurrent with other environmental training (e.g., cultural and natural resources awareness training, safety training, etc.).

7.2 PALEONTOLOGICAL RESOURCE MITIGATION PLAN (PRMP)

Prior to the commencement of ground-disturbing activities, a qualified and professional paleontologist should be retained to prepare and implement a PRMP for the Project. The PRMP should describe mitigation recommendations in detail, including field reconnaissance methodology; paleontological monitoring procedures; communication protocols to be followed in the event that an unanticipated fossil discovery is made during project development; and preparation, curation, and reporting requirements. The PRMP should include the following mitigation strategies described below.

7.2.1 Paleontological Reconnaissance Survey

A qualified paleontologist should be retained to conduct a field reconnaissance survey of the Project area prior to any ground-disturbing activities. The purpose of the field survey will be to inspect the ground surface visually for exposed fossils or traces thereof and to further evaluate geologic exposures for their potential to contain preserved fossil material at the subsurface. The field survey should be conducted in Project areas underlain by geologic units with a high paleontological sensitivity (e.g., Quaternary older alluvium and lacustrine deposits [Qc, Ql]); Project areas underlain by geologic units with low sensitivity should not be subject to the survey. Particular attention will be paid to rock outcrops, both inside and in the vicinity of the Project area, and any areas where geologic sediments are well exposed. Areas determined to be heavily disturbed or otherwise obscured by heavy vegetation, agriculture, or buildings, etc., may be subject to a windshield survey.

All fossil occurrences observed during the course of fieldwork, significant or not, should be adequately documented and recorded at the time of discovery. The data collected for each fossil occurrence should include, at minimum, the following information: Universal Transverse Mercator (UTM) coordinates, approximate elevation, description of taxa, lithologic description, and stratigraphic context (if known). In addition, each locality should be photographically documented with a digital camera. If feasible, with prior consent of the landowner(s), all significant or potentially significant fossils should be collected at the time they are observed in the field. If left exposed to the elements, fossil materials are subject to erosion and weathering. If the fossil discovery is too large to collect during the survey (e.g., a mammoth skeleton or bone bed) and requires a large-scale salvage effort, then it will be documented and a recovery strategy will be devised pursuant to SVP (2010) guidelines.

7.2.2 Paleontological Mitigation Monitoring

Prior to the commencement of ground-disturbing activities, a qualified and professional paleontologist should be retained to prepare and implement a PRMP for the Project. Initially, full-time monitoring may be required in the Project area during all ground-disturbing activities within the previously undisturbed geologic units with a high paleontological sensitivity (e.g., Quaternary older alluvium and lacustrine deposits [Qc, Ql]). Using the results of the field reconnaissance, together with Natural Resources Conservation Service soil data for the Project area obtained from the Web Soil Survey (The Soil Survey Staff, 2003), the depth of required monitoring may be adjusted based on the depth of soil development on sensitive geologic units. This is because paleontological resources are not found in “soil” but are contained within the consolidated or unconsolidated geologic deposits or bedrock that underlies the soil layer. In addition, spot-checking may also occur at the discretion of the Project Paleontologist in Project areas underlain by Quaternary alluvial deposits in order to determine if underlying sensitive geologic units are being impacted by construction, and at what depth.

Monitoring entails the visual inspection of excavated or graded areas and trench sidewalls. In the event that a paleontological resource is discovered, the monitor should have the authority to divert the construction equipment around the find temporarily until it is assessed for scientific significance and collected. Monitoring efforts can be reduced or eliminated at the discretion of the Project Paleontologist if no fossil resources are encountered after 50 percent of the excavations are completed.

Monitoring should include matrix screening for the presence of microfossils, the frequency of which will be determined by the Project Paleontologist. Monitoring is largely a visual inspection of sediments; therefore, the most likely fossils to be observed will be macrofossils of vertebrates (bones, teeth, tusk) or invertebrates (shells). At the discretion of the Project Paleontologist, the monitor should periodically screen sediments to check for the presence of microfossils that can be seen with the aid of a hand lens (i.e., microvertebrates). Should microvertebrate fossils be encountered during the screening process, then bulk matrix samples will be taken for processing off site. For each fossiliferous horizon or paleosol, a standard sample (4.0 cubic yards or 6,000 pounds) will be collected for subsequent wet screening per SVP (2010) guidelines.

7.2.3 Fossil Preparation, Curation, and Reporting

Upon completion of fieldwork, all significant fossils collected should be prepared in a properly equipped paleontology laboratory to a point ready for curation. Preparation should include the careful removal of excess matrix from fossil materials and stabilizing and repairing specimens, as necessary. Following laboratory work, all fossil specimens should be identified to the lowest taxonomic level possible, cataloged, analyzed, and delivered to an accredited museum repository for permanent curation and storage. The cost of curation is assessed by the repository and is the responsibility of the Project owner.

At the conclusion of laboratory work and museum curation, a final report should be prepared describing the results of the paleontological mitigation monitoring efforts associated with the Project. The report should include a summary of the field and laboratory methods, an overview of the Project area geology and paleontology, a list of taxa recovered (if any), an analysis of fossils recovered (if any) and their scientific significance, and recommendations. If the monitoring efforts produced fossils, then a copy of the report should also be submitted to the designated museum repository.

8
CONCLUSIONS

This assessment is based on the results of a museum records search and review of available geologic and paleontologic literature. Therefore, only fossils that have already been inventoried or collected are available for this analysis. In addition to unrecorded surface fossils, there is the potential for an unknown number of paleontological resources buried within those geologic units underlying the Project area. These nonrenewable scientific resources may be at risk of being adversely impacted by ground-disturbing activities during construction of the Project. By implementing the management recommendations presented in Chapter 7, adverse impacts to paleontological resources can be reduced to a less than significant level pursuant to the requirements of CEQA.

9
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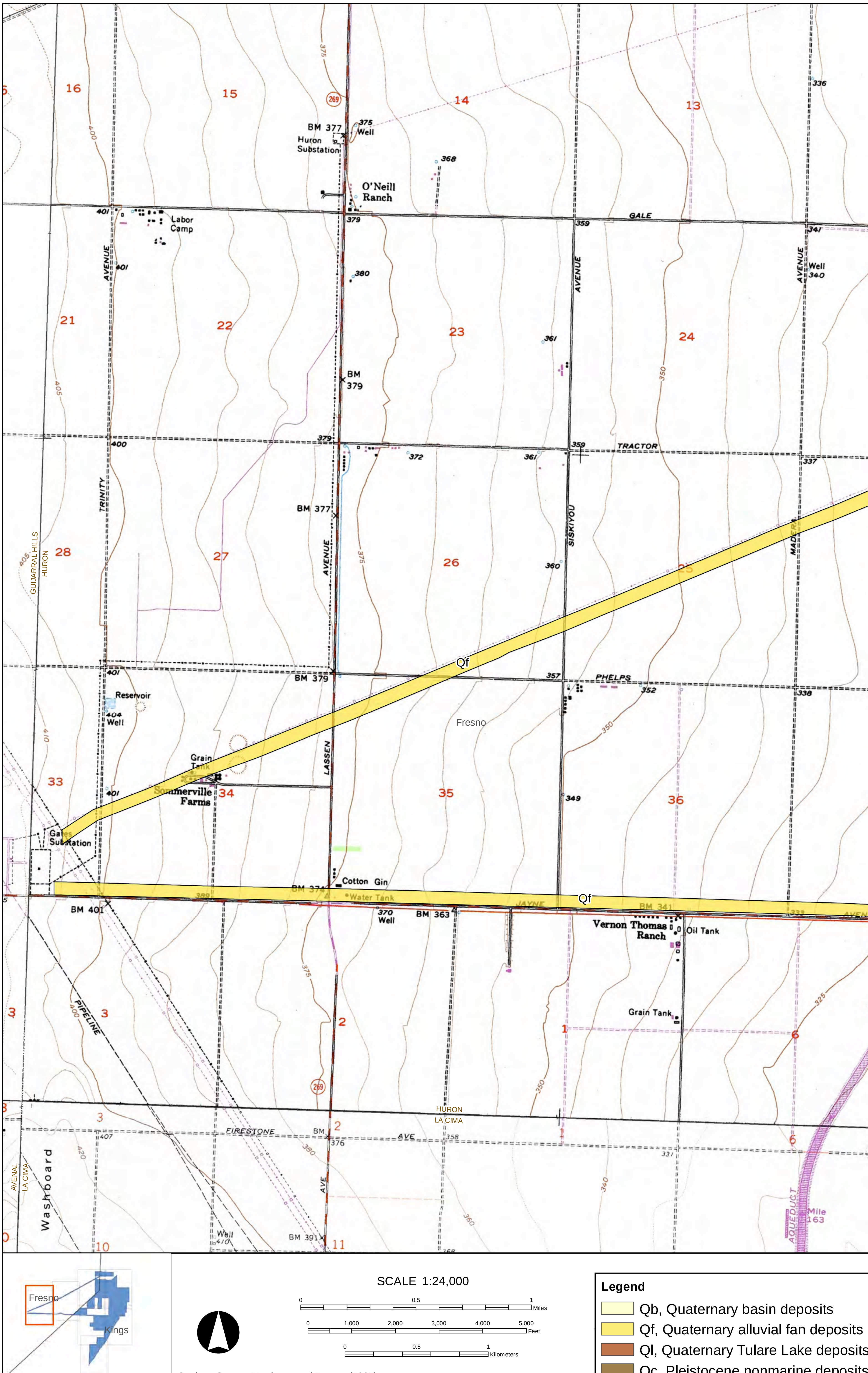
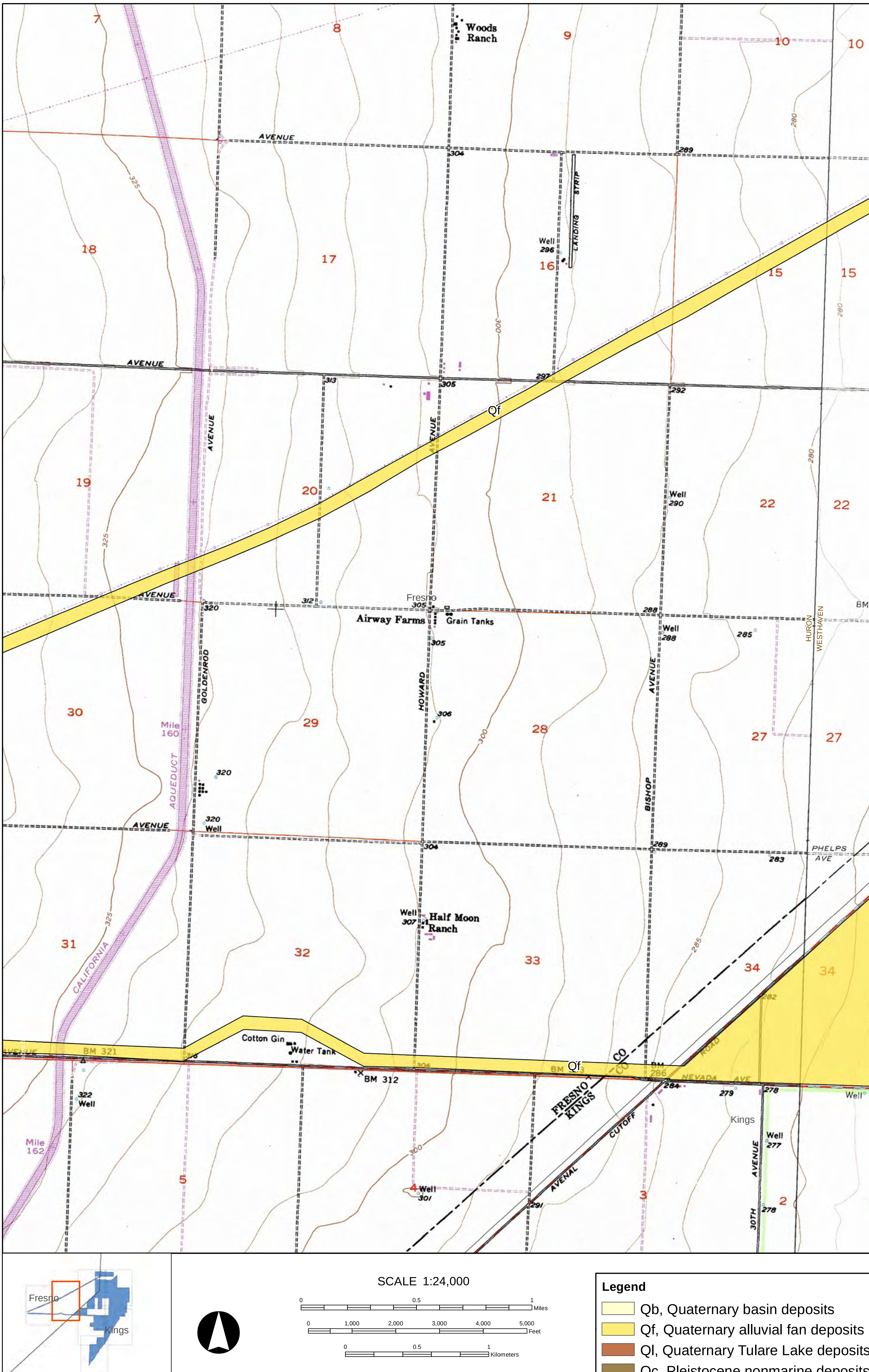


Appendix A-1 Geologic Units in the Project area.



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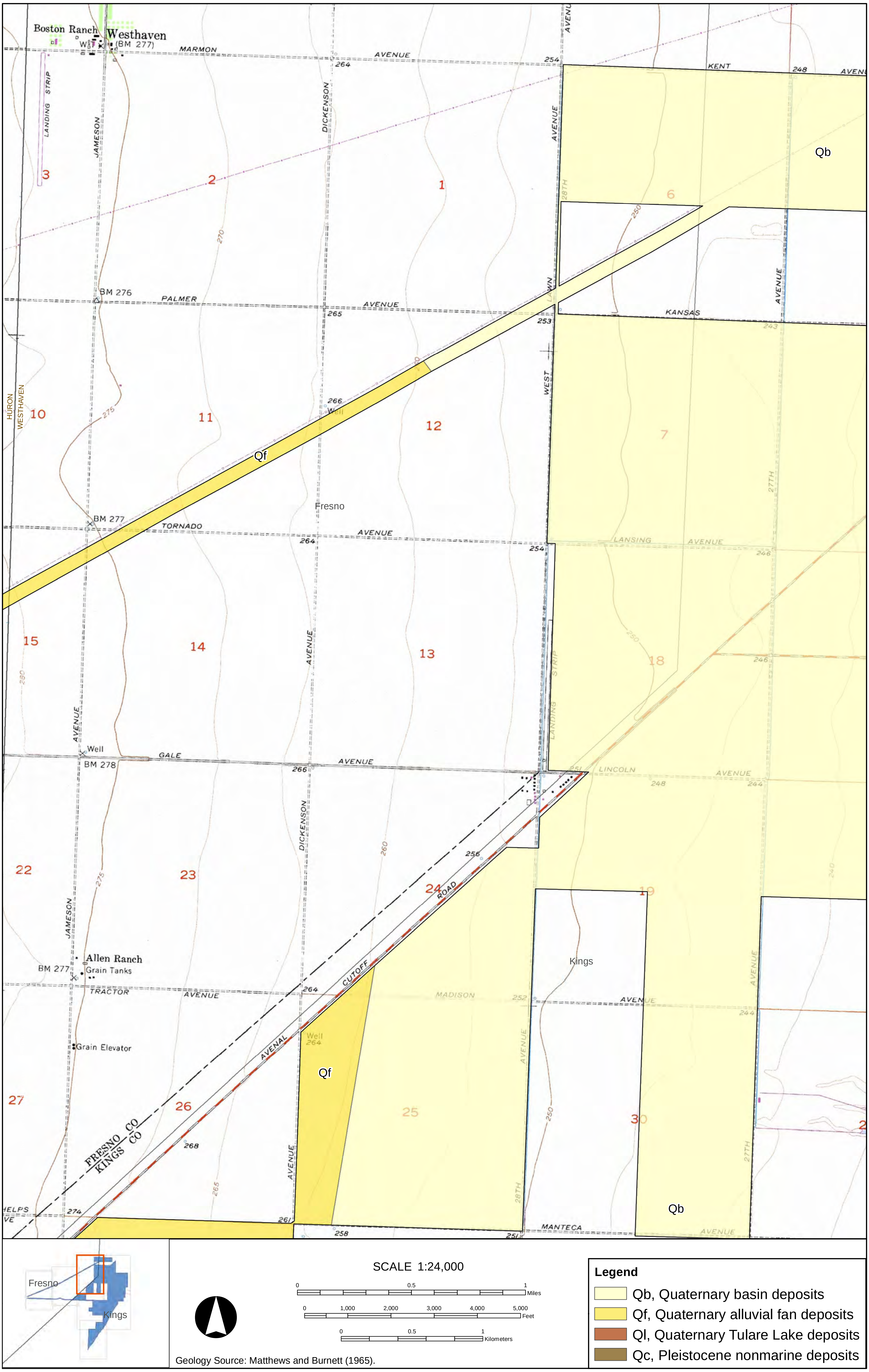

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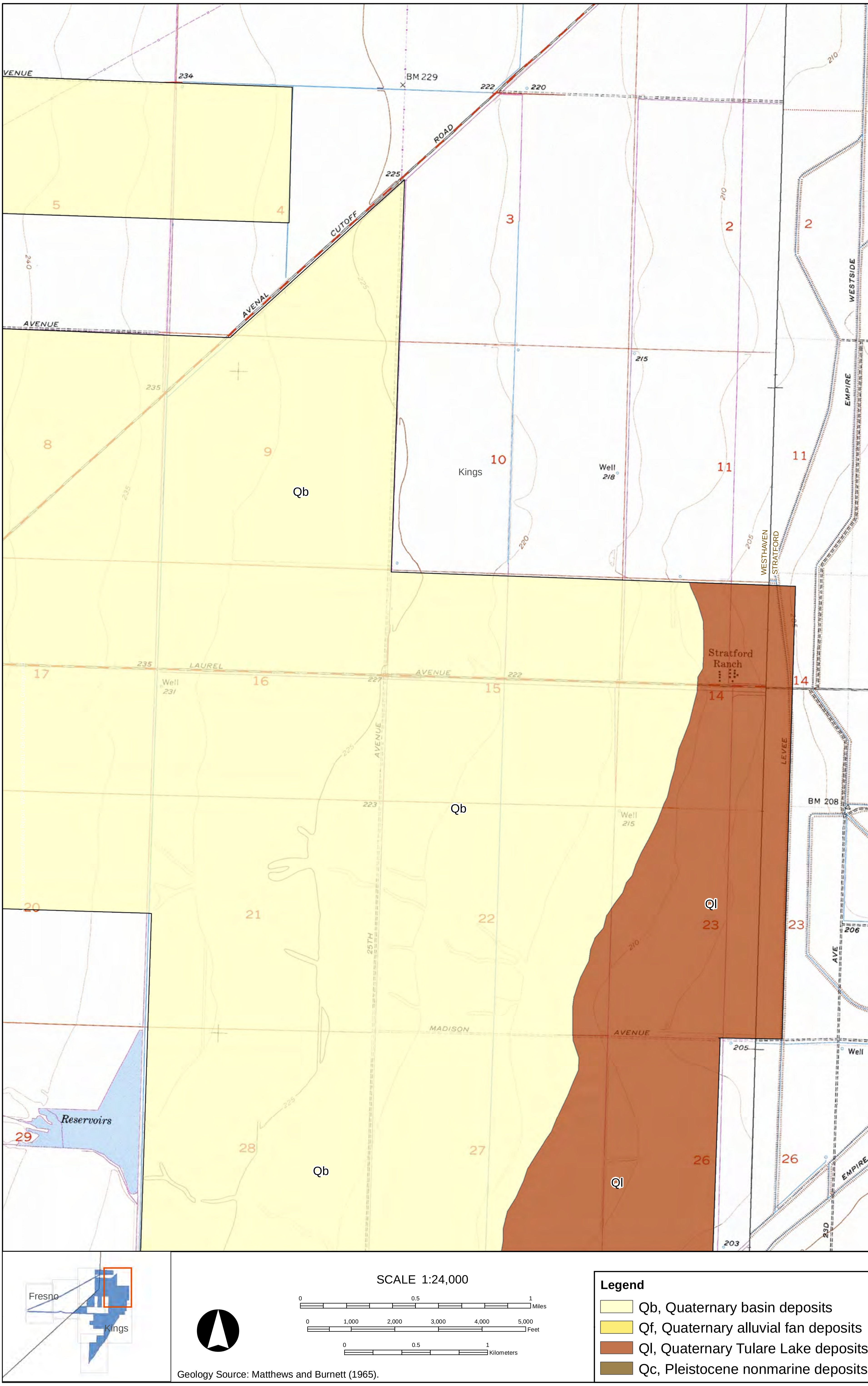

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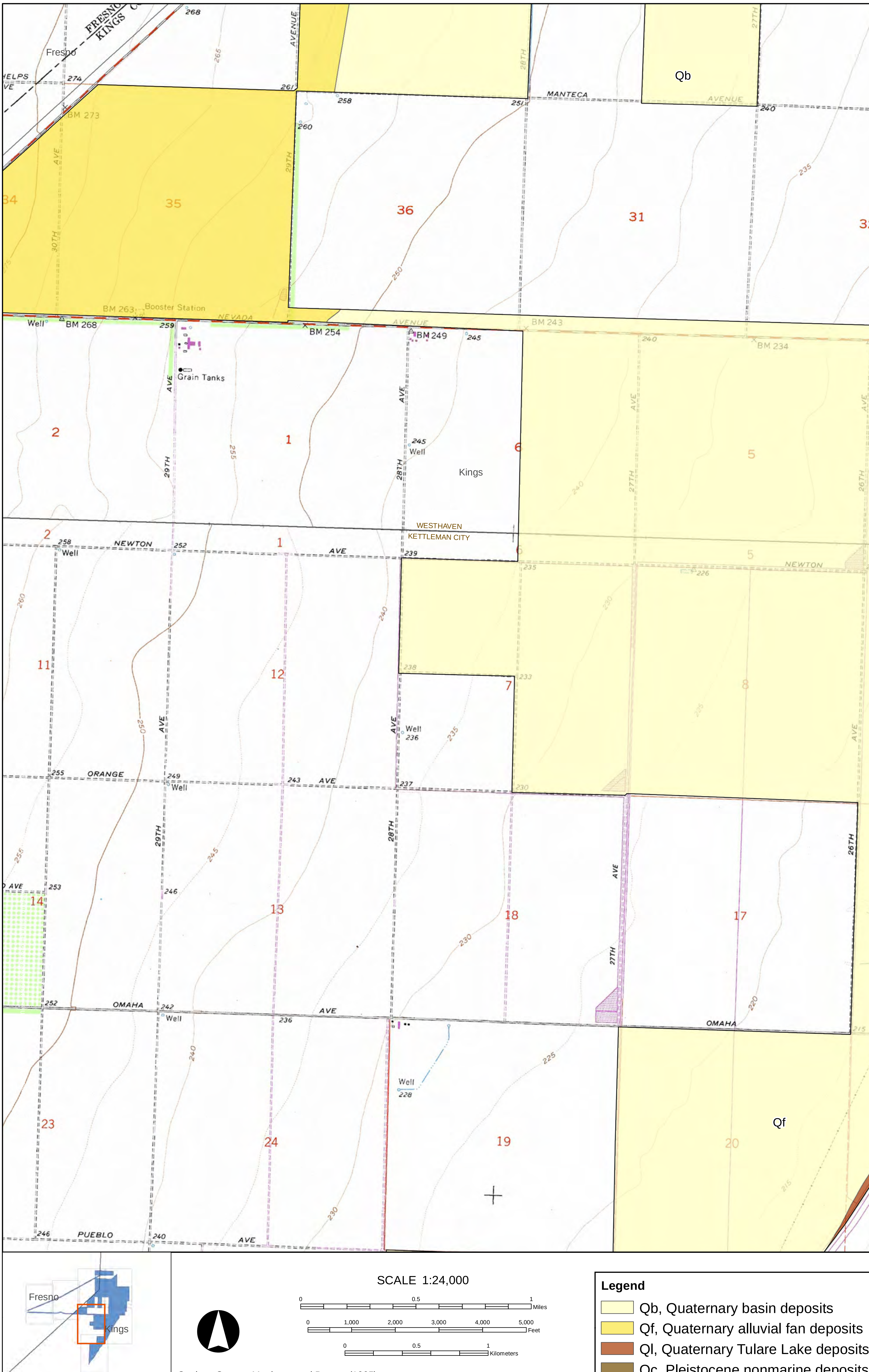

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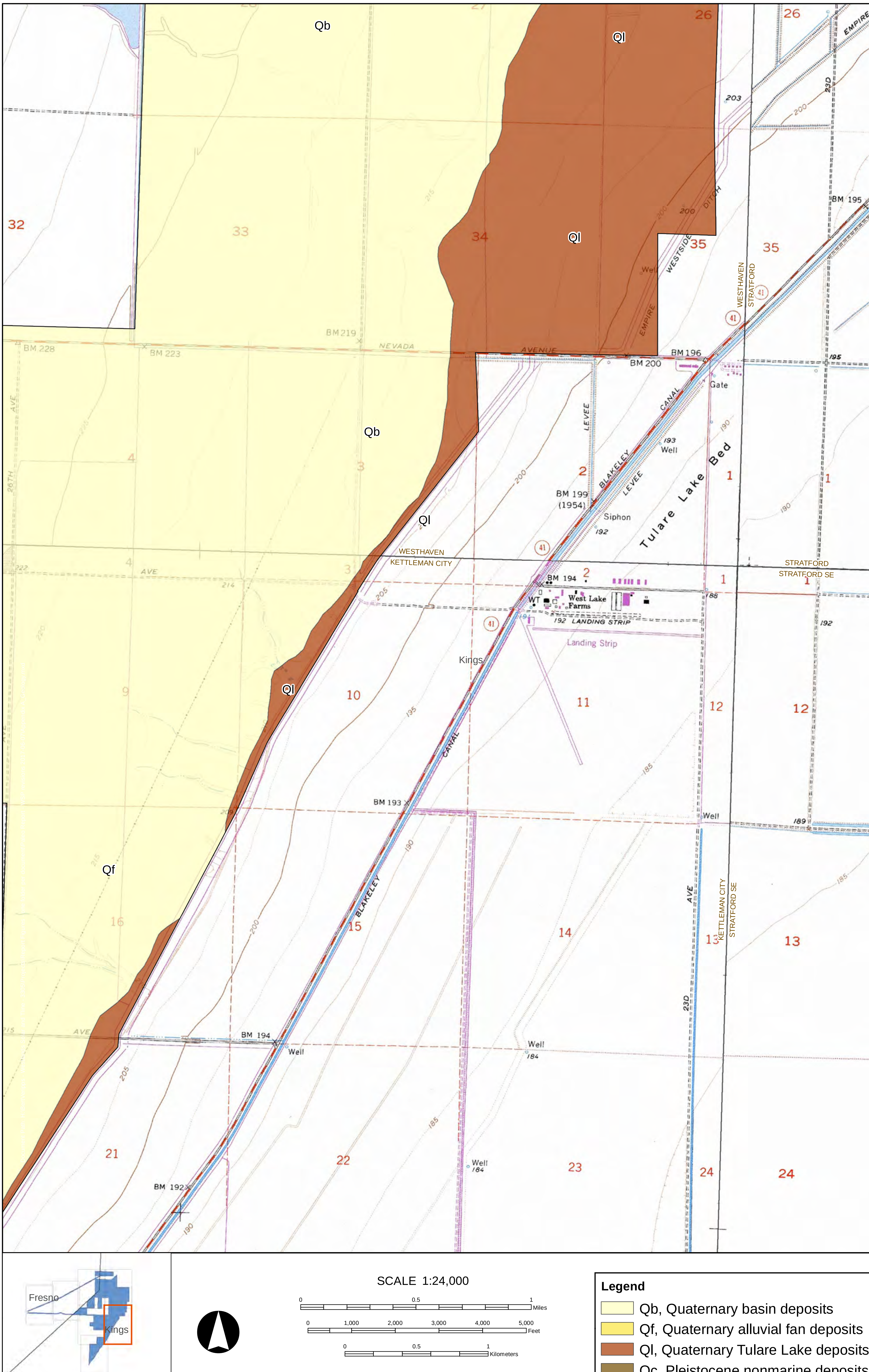

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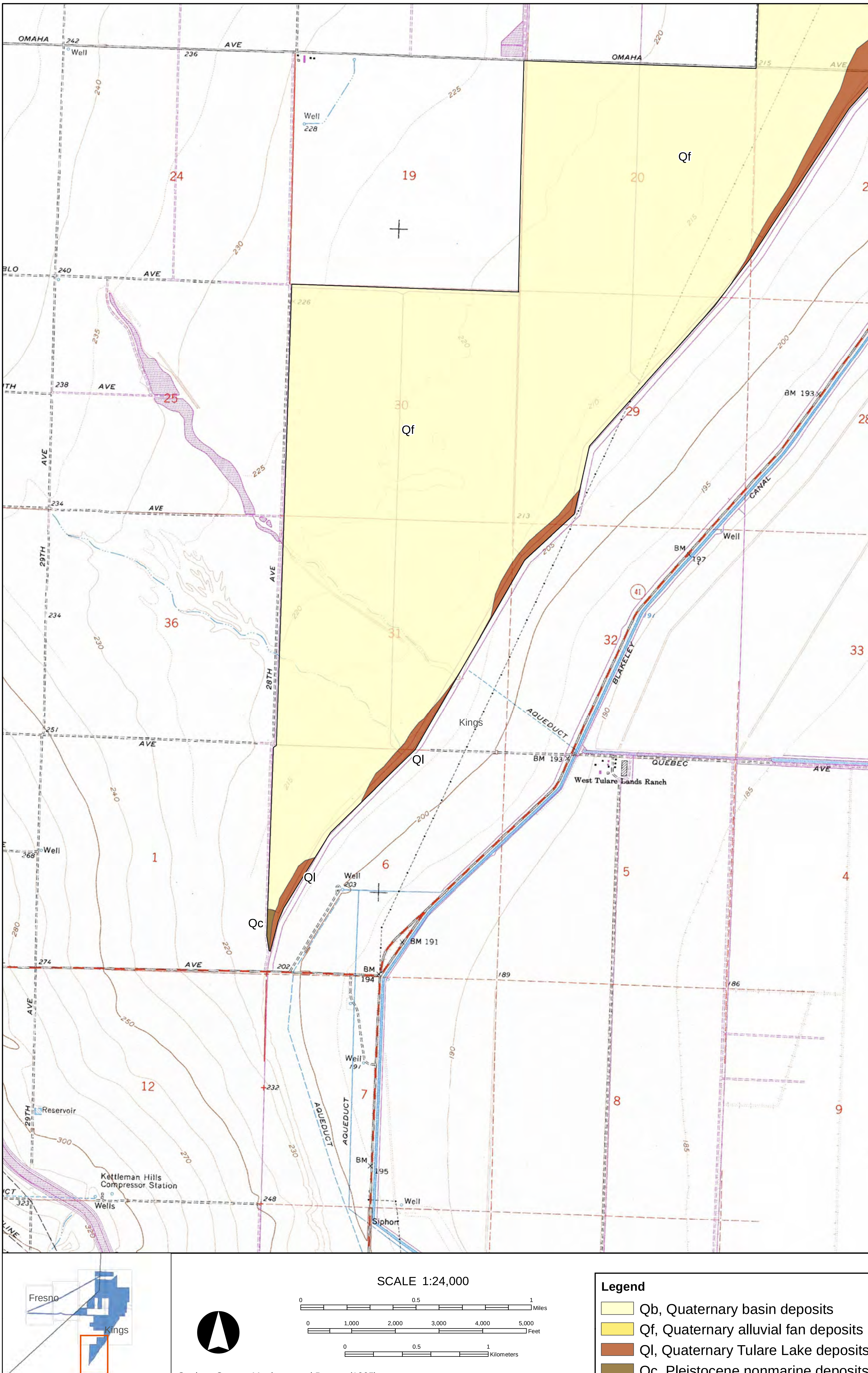
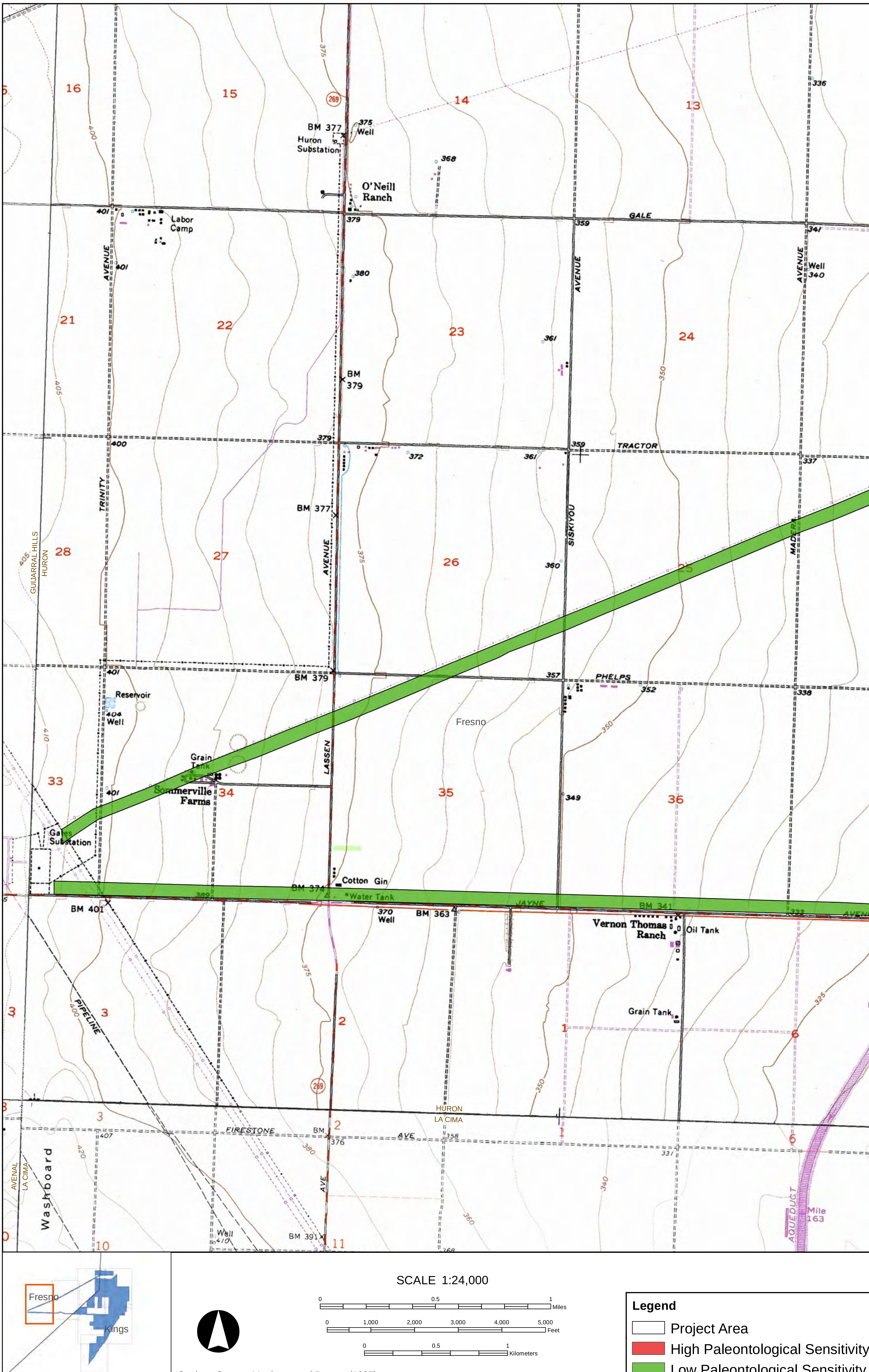
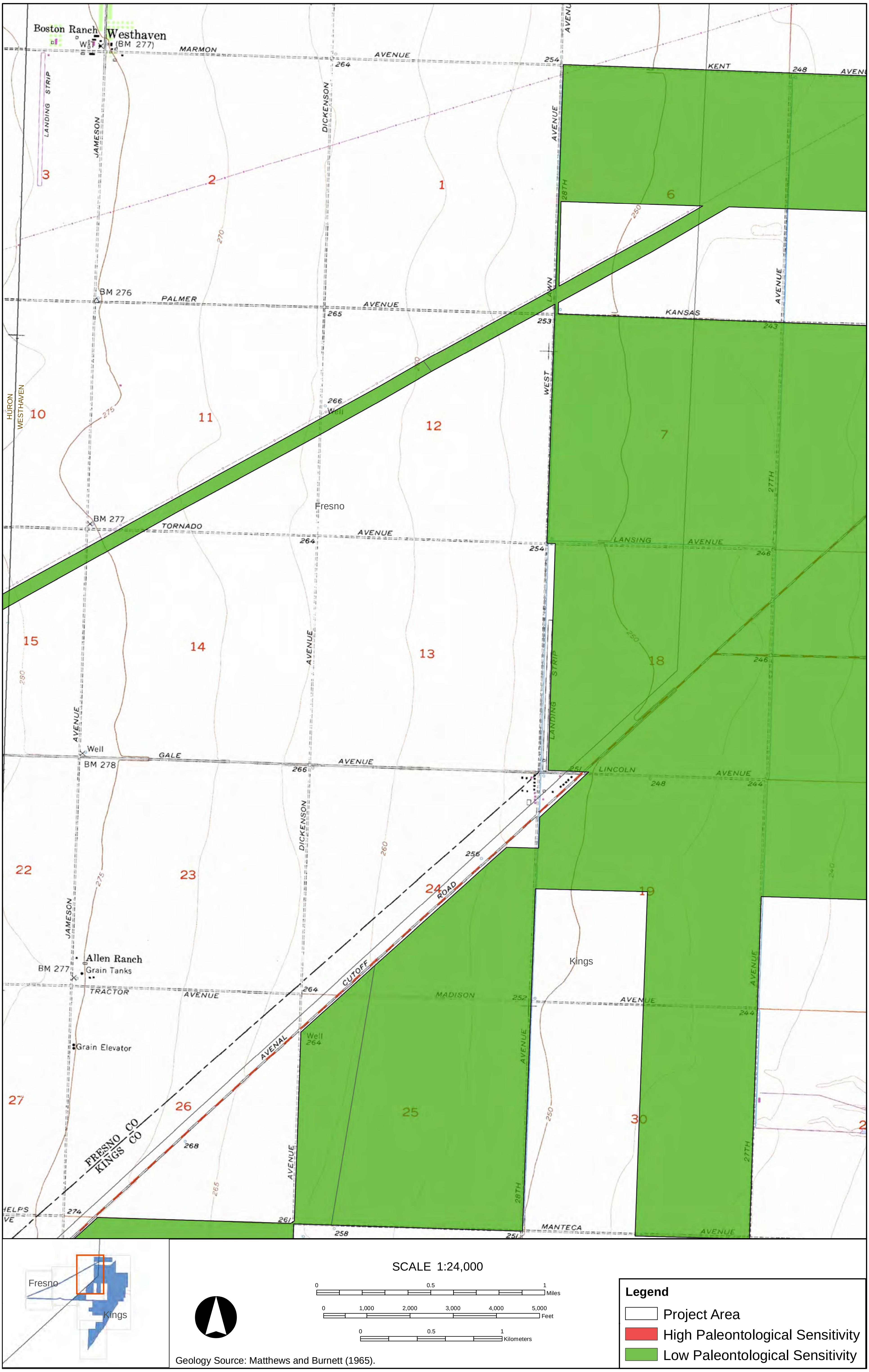


Appendix A-7 Geologic Units in the Project area.



Appendix B-1 Paleontological Sensitivity in the Project area.

Appendix B-2 Paleontological Sensitivity in the Project area.



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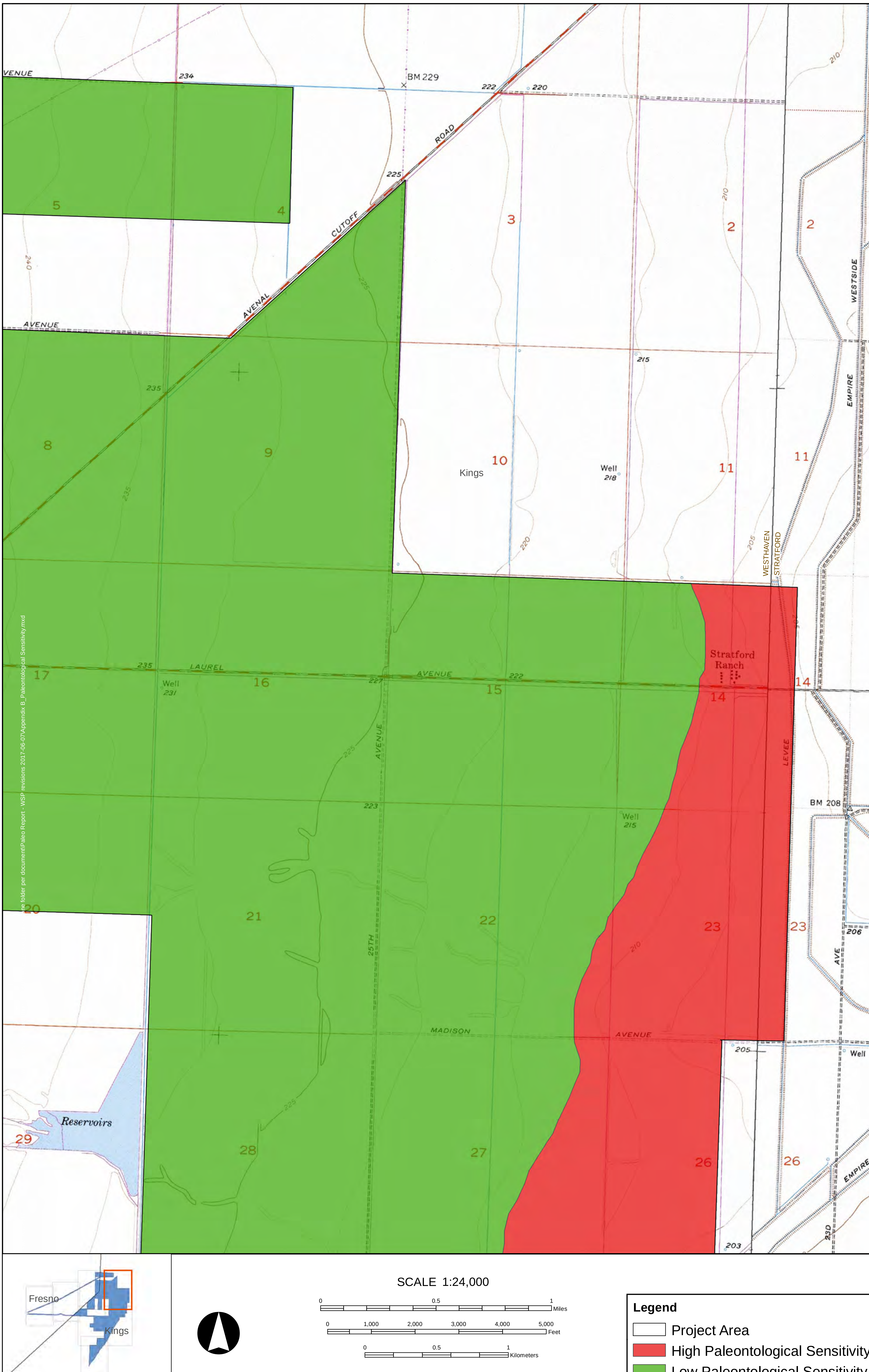
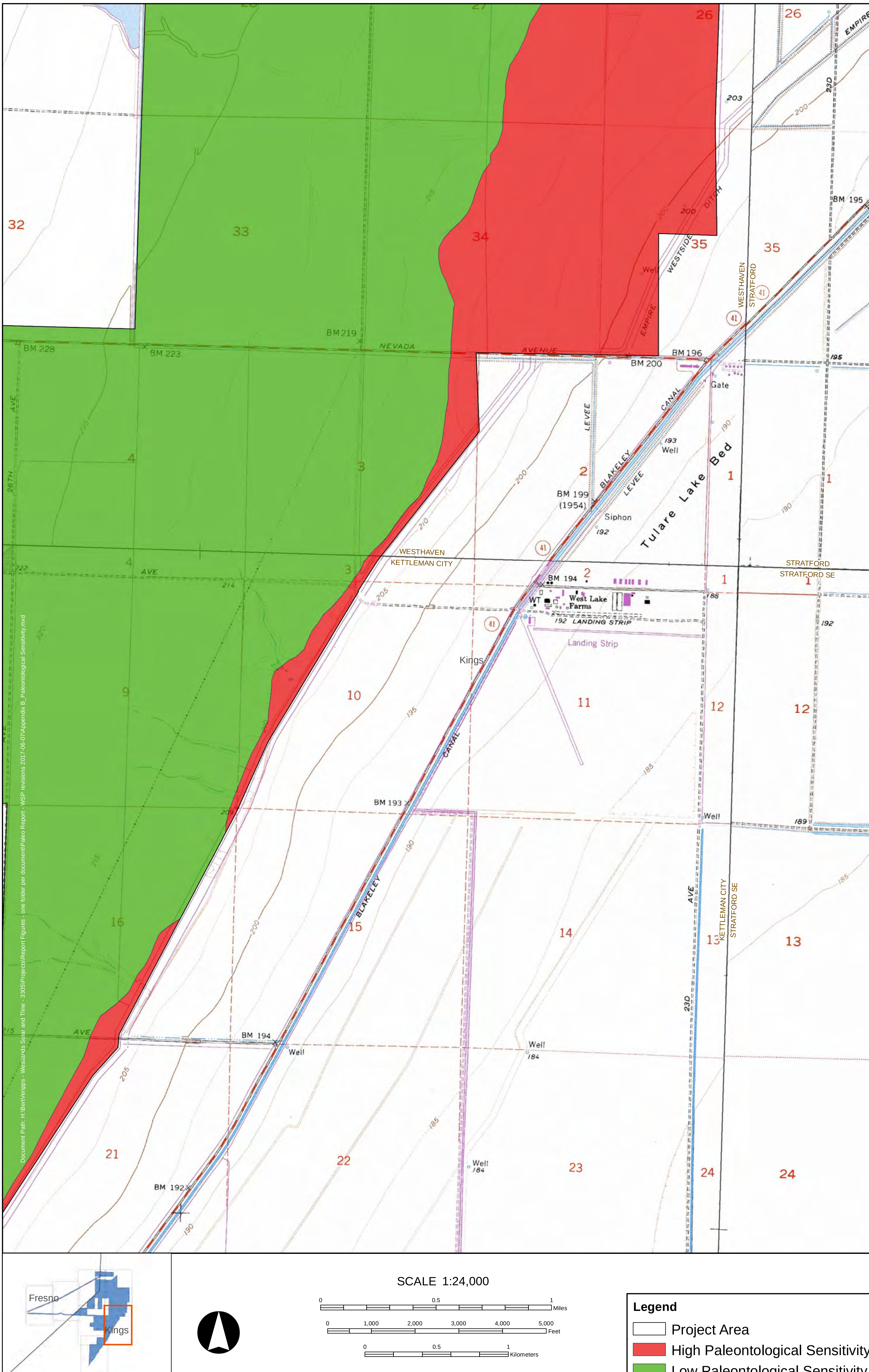


Appendix B-4 Paleontological Sensitivity in the Project area.

Appendix B-5 Paleontological Sensitivity in the Project area.



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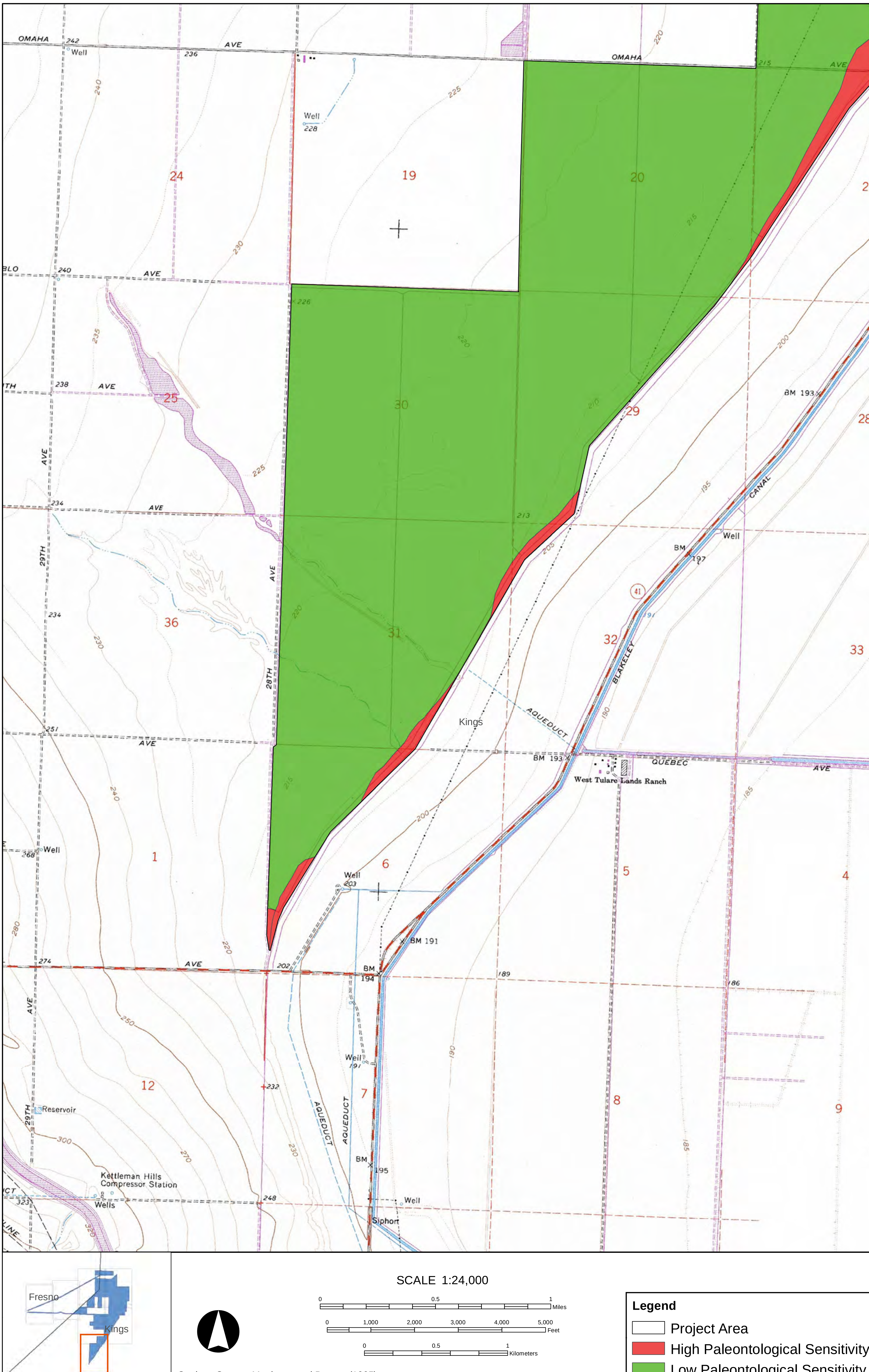

Appendix B-7 Paleontological Sensitivity in the Project area.