3. Affected Environment

3.1 Introduction

This chapter describes existing conditions for Bureau of Land Management (BLM) resource programs, resource uses, special designations, and the social and economic environment in the Central Coast Field Office (CCFO) Planning Area. The description of the affected environment uses the best and most recent data available.

In addition to describing existing conditions, where appropriate, this chapter identifies management challenges for oil and gas development within the Planning Area. The BLM reviewed current management and reviewed the scoping comments to revise the 2007 Hollister Field Office Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California. By describing existing conditions for resource programs in the Planning Area, this chapter serves as the baseline against which Chapter 4 analyzes potential impacts of the alternatives.

The CCFO Planning Area encompasses about 6.8 million acres of land throughout San Francisco, Contra Costa, San Mateo, Alameda, San Joaquin, Santa Cruz, Santa Clara, Stanislaus, Monterey, San Benito, Merced, and Fresno Counties. Most of the acres are in private, State, or local ownership. Bounded by the Pacific Ocean to the west and the San Joaquin Valley to the east, elevations range from sea level to over 5,000 feet. This is a region of diverse topography and landscapes and extraordinary biodiversity. Major landforms include the Diablo Mountain Range, Salinas Valley, and San Joaquin Valley. Public lands are distributed across the Planning Area in numerous small parcels. The BLM CCFO is directly responsible for the management of approximately 284,000 acres of public land (less than 1% of the total) and 793,000 acres of Federal mineral estate (approximately 1.2% of the total).

3.1.1 Resources Not Considered

This chapter does not provide detail about environmental components that would not be affected or that are not essential to understanding or resolving planning issues. These include the following resources:

Back County Byways. There are no designated Back County Byways in the Planning Area.

Cave and Karst Resources. No areas of karst formation or caves are known to occur within the Planning Area.

Fire Management. No additional effects to Fire Management would result from the Oil and Gas Management not already addressed in the 2007 HFO RMP[1] (BLM, 2006). The risk of fire is addressed in Hazardous Materials and Public Safety.

Forest and Woodland Products. Forest and woodland management produces traditional market products such as lumber, plywood, and paper as well as other uses such as poles, greenery, biomass for energy production, and fuelwood for personal use while concurrently maintaining high-quality wildlife habitat. There are no forests managed for forest products on BLM lands in the Planning Area.

Livestock Grazing. The BLM CCFO administers 71 active commercial grazing leases for both sheep and cattle. Forage generally consists of annual grasses and forbs which grow during these wetter months. Rangelands are managed to ensure that enough residual mulch remains after each grazing season. No addi-

[1] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.7 (Fire Management) for the affected environment and 4.7 (Fire Management) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.7 (Fire Management) for the Resource Management Plan.

tional effects to Livestock Grazing would result of the Oil and Gas Management not already addressed in the 2007 HFO RMP,[2] the management of livestock would remain the same.

Recreation. The diverse landscapes of the CCFO Planning Area provide for a variety of recreational opportunities, including: hiking, mountain biking, and equestrian trails, hunting, and camping. There would be no additional effects to Recreation as a result of the Oil and Gas Management not already addressed in the 2007 HFO RMP.[3]

Wild Horses and Burros. There are no Wild Horses and Burros Management Areas in the CCFO Planning Area.

[2] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.11 (Livestock Grazing) for the affected environment and 4.11 (Livestock Grazing) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.11 (Livestock Grazing) for the Resource Management Plan.

[3] See Proposed RMP/Final EIS for the Southern Diablo Mountain Range and Central Coast of California Section 3.8 (Recreation) for the affected environment and 4.8 (Recreation) for the effects analysis. See Resource Management Plan for the Southern Diablo Mountain Range and Central Coast of California Record of Decision Section 3.8 (Recreation) for the Resource Management Plan.

3.2 Energy and Minerals

This section addresses exploration, development, and production for energy and mineral resources. Considering that the RFD Scenario addresses the possibility of drilling up to 37 new exploration and development oil and gas wells, the principal issue in this section is the potential interference of those operations with new or expanded mineral development. Historically, both oil and gas and mineral development have been low on public lands managed in the CCFO Planning Area (BLM, 2006). More recently, renewable energy has gained interest nationally, and the CCFO Planning Area has the potential to expand existing and new wind and solar energy production capacity on public lands.

There is little active mining on or immediately adjacent to BLM-administered land in the CCFO Planning Area. Some mining for building stone, sand and gravel, shale, and limestone has occurred in the past at the Coast Dairies, Fort Ord, and near the Griswold Hills in the Vallecitos Valley. The BLM oversees 793,000 acres of Federal mineral estate.

3.2.1 Introduction

Interference between oil well drilling and existing or future mining activities would occur if oil drilling pads, access roads, or oil field facilities overlay the minerals to be developed and thus restricted mining access. Mines and renewable energy projects operate with distinct boundaries, so-called "footprints." New well sites could be accessed via existing roads with permission to cross granted by the mine or energy operator. If new oil wells must target subsurface petroleum beneath surface mines or renewable energy projects, directional drilling will be required. Conversely, new or future oil well sites could restrict access to underlying mineral deposits. However, in general, a relatively small oil well pad and access road would not completely restrict access to potential surface deposits of sand and gravel, building stone, shale and limestone. Similarly, oil and gas could be compatible with some types of renewable energy.

3.2.2 Regulatory Framework

Federal Regulations

The BLM manages oil and gas leases under Title 43 CFR, Part 3100, and geophysical exploration is covered under Part 3150. Geothermal leasing is managed under Part 3200, mineral materials under Part 3600, mining claims and related surface disturbance for locatable minerals under Part 3800, and solid leasable minerals, other than coal or oil shale, under Part 3500.

The BLM administers three different programs (Mining Law, Mineral Leasing–Solid and Fluid Minerals, and Mineral Materials) in California that allow companies to produce solid minerals from the public land. The programs are based on laws that address how certain types of minerals can be developed. The most significant laws for mineral disposal are:

- The General Mining Law of 1872, as amended covering all minerals not specifically addressed under the Mineral Leasing Act of 1920, as amended; the Materials Act of 1947, as amended, and the Mineral Leasing Act for Acquired Lands of 1947, as amended;
- The Mineral Leasing Act of 1920, as amended covering coal, phosphate, oil, oil shale or gas, and sodium – on public land;
- The Materials Act of 1947, as amended covering sand, gravel, and other common materials; and
- The Mineral Leasing Act for Acquired Lands of 1947, as amended covering soda ash, potash, sodium sulfate, and salt, on public land.

Many significant laws important to solid mineral development have amended the key mineral disposal statutes listed above. Other laws governing the management of the public land and the protection of the environment include:

- The Federal Land Policy and Management Act of 1976,
- The National Environmental Policy Act of 1969,
- The Endangered Species Act of 1973, and
- The Clean Water Act.

The 1920 Mineral Leasing Act governs the leasing of oil and gas lands and applies to all federally owned minerals. The Mineral Leasing Act provides that all of these lands are open to oil and gas leasing unless a specific order has been issued to close the area to leasing.

BLM holds lease sales of the oil and gas resources in accordance with the Federal Onshore Oil and Gas Leasing Reform Act. Subject to the stipulations outlined in this Plan Amendment, BMPs, standard terms and conditions of the lease, an oil and gas lease gives the lessee the exclusive right to extract the resource and to occupy the appropriate size area necessary for extraction. The lessee may conduct activities necessary to develop and produce oil and gas from the lease area, including drilling wells, building roads, and constructing pipelines and related facilities. Although the initial lease term is 10 years, the lease may be extended indefinitely as long as the lessee demonstrates that the lease is capable of producing oil or gas in paying quantities. Extended leases are considered "held by production." Unleased parcels, or parcels for which the term has expired without development, may be requested by the oil and gas industry for inclusion in a new lease sale or required to undergo site restoration.

BLM jointly, with the California Division of Oil, Gas and Geothermal Resources (DOGGR), oversees the drilling, operation, maintenance, and plugging and abandonment of oil, natural gas, and geothermal wells. Applicable Federal regulations include 43 CFR 3160, Onshore Oil and Gas Operations, which are administered by the BLM and govern operations associated with the exploration, development and production of oil and gas deposits from leases issued or approved by the U.S., restricted Indian land leases and those under the jurisdiction of the Secretary of the Interior by law or administrative arrangement. The BLM Onshore Oil and Gas Orders implement and supplement the oil and gas regulations in 43 CFR 3160 for conducting oil and gas operations on Federal and Indian lands. They include the following:

- Order No. 1 – Approval of Operations provides procedures for submitting an Application for Permit to Drill and all required approvals of subsequent well operations and other lease operations.
- Order No. 2 – Drilling provides requirements and standards for drilling and abandonment.
- Order No. 3 – Site Security provides requirements and standards for site security.
- Order No. 4 – Measurement of Oil provides requirements and standards for measurement of oil.
- Order No. 5 – Measures of Gas provides requirements and standards for measurement of gas.
- Order No. 6 – Hydrogen Sulfide Operations provides the requirements and standards for conducting oil and gas operations in an environment known to or expected to contain hydrogen sulfide gas.
- Order No. 7 – Disposal of Produced Waters provides the methods and approvals necessary to dispose of produced water associated with oil and gas operations.

Approval for the technical and downhole work is done for most activities by the BLM Bakersfield Field Office, while review and approval of the surface use is conducted by the multi-resources staff located in the BLM Central Coast Field Office. Approval for downhole Underground Injection Control (UIC) activities, including all injection well activities, is performed by DOGGR under primacy that was granted by the Federal government in 1982. Applicable regulations include California Public Resources Code,

Division 3, which governs the regulation of oil and gas operations; and California Code of Regulations Title 14, Division 2, Chapter 4: Development, Regulation, and Conservation of Oil and Gas Resources.

State Regulations

California's State and Surface Mining and Reclamation Act (SMARA) of 1975 was enacted in response to land use conflicts between essential mineral production and land development for other purposes. The stated purpose of SMARA is to provide a comprehensive surface mining and reclamation policy that will encourage the production and conservation of mineral resources while ensuring that adverse environmental effects of mining are prevented or minimized; that mined lands are reclaimed to a usable condition; and residual hazards to public health and safety are eliminated; and consideration is given to recreation, watershed, wildlife, aesthetic, and other related values.

The California Division of Oil, Gas, and Geothermal Resources (DOGGR) regulates production of oil and gas, as well as geothermal resources, within the State of California on private lands. DOGGR requirements in preparation of environmental documents under the California Environmental Quality Act are defined in CCR, Title 14, Division 2, Chapter 2. DOGGR regulations, which are defined in CCR, Title 14, Division 2, Chapter 4, include well design and construction standards, surface production equipment and pipeline requirements, and well abandonment procedures and guidelines. DOGGR regulates well abandonment procedures to ensure effectiveness in preventing migration of oil and gas from a producing zone to shallower zones, including potable groundwater zones. DOGGR oversees well operations. DOGGR also has regulatory authority over Class II injection wells for enhanced recovery and disposal. In California, the operation of all Class II injection wells are regulated by DOGGR, under provisions of CCR Sections 1724.6, 1724.7, 1724.9 and 1724.10, and the Federal Safe Drinking Water Act. When an operator ceases well operation or production, State law requires the well is abandoned within a reasonable time period.

3.2.3 Regional Setting

Oil and Gas

The history of activity for oil and gas exploration and development on Federal mineral estate within the planning area is extremely low compared to private lands. The Reasonable Foreseeable Development Scenario (Appendix B) provides a detailed discussion of the regional setting for oil and gas in the CCFO Planning Area on Federal and private lands.

There are 35 active oil fields and gas fields within the Planning Area. Within those administrative areas, the actual productive areas total about 195,300 acres. Twelve of the 35 active fields intersect Federal mineral estate. Since 1994, more than 1,000 wells have been drilled within the CCFO Planning Area; however, not a single well was drilled on the Federal mineral estate, and none of the wells resulted in a new field discovery. In fact, during the past 30 years, only one new field was discovered within the CCFO Planning Area (the Bixler gas field, a very small 4-well, 1.5-square-mile gas field discovered in Contra Costa County in 1993). That field was abandoned in 2002.

The most productive oil and gas fields within the CCFO Planning Area are Coalinga oil and gas field with Coalinga East Extension oil and gas field, San Ardo oil and gas field, Lynch Canyon oil and gas field, Jacalitos oil and gas field, Kettleman North Dome oil and gas field, and Sargent-Hollister oil and gas field (see Section 1; DOGGR, 2010). Of the total producing wells within the CCFO Planning Area, approximately 3 percent occur on Federal authorized leases, see Appendix B for additional details.

Minerals

Locatable minerals are those for which the right to explore, develop, and extract mineral resources on Federal lands open to mineral entry is established by the location (or staking) of lode or placer mining

claims. In general, metallic minerals are locatable; however, some nonmetallic minerals are also considered locatable. Generally, locatable minerals such as gold, silver, copper, lead, zinc, tungsten, mercury, chromium, manganese, antimony, uranium occur where a thermal heat source and mineral-bearing fluids (hydrothermal) forms a lode deposit. Typically these hydrothermal deposits do not occur directly adjacent (laterally or vertically) to petroleum resource areas. Non-metallic deposits such as diatomaceous shale, diatomite, limestone, Fuller's earth, or dimensional stone may occur near petroleum reservoirs. Potential for locatable minerals exists throughout the mountainous and coastal regions, although only limited active mining occurs on or immediately adjacent to BLM-administered land.

Renewable Energy

Solar and wind energy development has increased in the last decade throughout California. Within the CCFO Planning Area, large solar development is planned for Panoche Valley in San Benito County, California Flats near the borders of Monterey, San Luis Obispo, Kings and Fresno Counties, Tranquility, Fresno County, and southwestern Merced County. Smaller projects, typically less than 20 MW and 200 acres in size, may occur elsewhere in the CCFO Planning Area; however, much of the CCFO Planning Area is characterized by rolling hills making it less appropriate for larger solar energy projects.

Wind energy potential is low in much of the CCFO Planning Area except in the Altamont Pass which is characterized by numerous wind farms, many of which are from the 1970s and are in the process of being upgraded. None of the CCFO Decision Area mineral estate lands are mapped as having good wind resource potential (NREL, 2012).

3.2.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Historic and recent oil and gas exploration and development on BLM-administered land in the CCFO Planning Area have been low. The RFD Scenario outlines estimates for up to 37 new wells to be drilled primarily within high- to moderate-potential petroleum resource areas in the next 15 years.

There are various small abandoned mines and prospects, mainly for mercury, in the San Joaquin Management Area. These mines include the Red Hill/Western Mines and Gallo mercury mines in Stanislaus County. Mining of sand and gravel occurs on private lands adjacent to Fort Ord public lands. The presidential proclamation establishing the Fort Ord National Monument declared the former Fort Ord military base closed to mineral location and leasing.

RMC Pacific Materials conducted mining operations in a shale quarry and limestone quarry for cement on lands surrounded by the Coast Dairies property for the Cemex Davenport Plant. This plant was closed in 2010 (Alexander, 2010). Building stone mineral production occurs in the Williams Hill area in the Salinas Management Area.

Leases Subject to Settlement Agreement

The 14 non–no surface occupancy (NSO) leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in a historically nonproductive wildcat area west of San Ardo Field (DOGGR, 2007), and in the Vallecitos oil field. Well drilling, possibly well stimulation, and possibly field development in the Vallecitos Field may occur on these leases. Although these leases either have not been issued or have been suspended, it is possible that some or all of the 37 exploratory or development wells could be drilled on these leases in the future.

3.3 Geology

This section describes the geology, faults and slopes in the CCFO Planning Area. The analysis addresses the existing geologic and seismic hazards that may potentially impact the project, in particular slope stability in work areas defined by new access roads and new well drilling pads. Earthquakes or seismic hazards related to strong shaking should be considered for the more permanent facilities in developed oil fields such as gathering lines, staging areas with chemical storage, and tank batteries.

3.3.1 Introduction

Soil erosion and slope stability, including landslides, are the principal geologic hazards related to new oil and gas facilities in the CCFO Planning Area. Erodible soils are common to the Planning Area as are geologic units prone to landslides or slope instability where disturbed by grading. Strong to very strong ground shaking due to earthquakes along major faults in the Planning Area should be anticipated. Fault rupture of the ground surface would impact project sites where access roads and pipelines cross active faults.

In some cases, compliance with existing laws and regulations would serve to reduce or avoid certain impacts that might otherwise occur with the implementation of the project. In other cases, existing laws and regulations do not address a potential concern or practice, such as injection of various waste and material streams via Class II injection wells within active fault or seismic zones. Therefore, existing laws and regulations would not serve to reduce or avoid impacts from such practices during implementation of the project. In addition to Federal regulations that require operators to submit a permit application to BLM for new wells, California regulations also require operators to prepare and submit a permit application for new wells to DOGGR for review and approval, including any type of injection or well stimulation. DOGGR considers existing fault data in evaluating the permit and its decision to either approve or deny the permit. In addition, BLM's hydraulic fracturing rule also requires the operator to disclose any faults that may be affected by well stimulation, and requires an analysis of the potential for any seismic impacts. These processes serve to reduce the potential seismic hazard impacts of well stimulation activities or fluid disposal in injection wells.

There has been public concern regarding induced seismicity from well stimulation treatments and concern that it appears to be related to injection and not the fracturing of formations. However, researched literature indicates the potential for induced seismicity from currently practiced well stimulation treatments and wastewater injection in California is low (DOC, 2015).

In California and the CCFO Planning Area, the injection/disposal of wastewater, flowback of stimulation fluids, produced water, and other oilfield process waters (collectively referred to as injected fluids) is considered Class II injection, and is regulated by DOGGR under its Underground Injection Program (URIC), which is monitored and audited by the EPA under the Federal Safe Drinking Water Act (SDWA). In California, the volume of flowback water from well stimulation is a very small percentage of total fluid produced from a field, so the impacts from the disposal of flowback fluids are anticipated to be negligible (CCST, 2014). Also, the volume of material injected for well stimulation represents a small fraction of the total injected fluids in any given petroleum field in California (DOC, 2015), so the additional impact from injecting the small volume of stimulation material is anticipated to be negligible. There has been no direct link of induced seismicity caused by oil and gas operations wastewater disposal in California and the overall seismic hazard is low (CCST, 2014).

3.3.2 Regulatory Framework

Federal

Mineral Leasing Act. The Mineral Leasing Act of 1920, as amended, gives the BLM the responsibility for oil and gas leasing on about 564 million acres of BLM, national forest, and other Federal lands, as

well as State and private surface lands where mineral rights have been retained by the Federal government, for a total of 700 million acres of mineral estate. As such, the BLM reviews and approves permits and licenses from companies to explore, develop, and produce oil and gas resources on both Federal and Native American lands. The BLM is responsible for inspection and enforcement of oil, gas, and other development operations to ensure that lessees and operators comply with the lease requirements and BLM's regulations.

Bureau of Land Management: Onshore Oil and Gas Operations (43 CFR Part 3160 et seq.). Regulations administered by the BLM to govern oil and gas operations require that operators conduct operations in a manner which protects the mineral resources, other natural resources, and environmental quality. Before approving any application for permit to drill, the BLM evaluates and considers environmental impacts. BLM has strict standards for well construction and design, well abandonment operations, and safety requirements. As part of BLM's oversight responsibilities, operators are required to exercise care and diligence to assure that leasehold operations would not result in undue damage to surface or subsurface resources or surface improvements. All produced water must be disposed of by injection into the subsurface, by approved pits, or by other methods which have been approved by the authorized officer. Upon the conclusion of operations, the operator must reclaim the disturbed surface in a manner approved or reasonably prescribed by the BLM. Spills or leakages of oil, gas, produced water, toxic liquids, or waste materials, and blowouts are reported to the BLM. Operators are required to control and remove pollutants that could affect surface waters. Federal regulations require operators to maintain and provide detailed copies of all drilling, production, and abandonment activities conducted on Federal mineral estate, and for California those operational records are maintained in the BLM Bakersfield Field Office.

The BLM rule on hydraulic fracturing complements existing regulations (set out at 43 CFR 3162.3–1 and Onshore Oil and Gas Orders 1, 2 and 7) designed to ensure the environmentally responsible development of oil and gas resources on Federal and Indian lands. Existing regulations establish that the BLM has authority to regulate oil and gas operations within its administrative areas and set forth rules for the approval and conduct of these operations. The rule requires a map showing suspected faults or fractures within 0.5 miles of a wellbore.

Earthquake Hazards Reduction Act. The Earthquake Hazards Reduction Act (EHRA) of 1977 established the National Earthquake Hazards Reduction Program (NEHRP) as a long-term earthquake risk reduction program for the United States. The four basic NEHRP goals are: develop effective practices and policies for earthquake loss reduction and accelerate their implementation; improve techniques for reducing earthquake vulnerabilities of facilities and systems; improve earthquake hazards identification and risk assessment methods, and their use; and improve the understanding of earthquakes and their effects. There are four Federal agencies participating in NEHRP: the Federal Emergency Management Agency (FEMA), the National Institute of Standards and Technology (NITS), the National Science Foundation (NSF), and the U.S. Geological Survey (USGS) (NEHRP, 2015).

Clean Water Act/National Pollutant Discharge Elimination System. Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat and high volumes of runoff can cause stream bank erosion. Under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Stormwater program requires operators of construction sites 1 acre or larger (including smaller sites that are part of a larger common plan of development) to obtain authorization to discharge stormwater under a NPDES construction stormwater permit and the development. Implementation of stormwater pollution prevention plans (SWPPPs) is the focus of NPDES stormwater permits for regulated construction activities.

Most states are authorized by the United States Environmental Protection Agency (EPA) to implement the Stormwater NPDES permitting program. Project operators must meet the requirements of the EPA Con-

struction General Permit (CGP). In California, Stormwater NPDES permits on non-tribal and non-Federal land are overseen by the State of California EPA (CalEPA). As stated by the California State Water Resource Control Board (SWRCB), a SWPPP should be prepared for each project involving more than 1 acre of ground disturbance. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect stormwater runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for non-visible pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body.

Federal Safe Drinking Water Act. According to U.S. Environmental Protection Agency (EPA) regulations, produced water injection wells are classified as Class II wells, and subdivided into II-R wells for enhanced recovery and II-D wells for disposal. In California, the operation of all Class II injection wells are regulated by DOGGR, under provisions of CCR Sections 1724.6, 1724.7, 1724.9 and 1724.10, and the Federal Safe Drinking Water Act. Under a Primacy Agreement with the EPA, DOGGR has oversight over Class II underground injection in California.

State

Alquist-Priolo Earthquake Fault Zoning Act, PRC, Section 2621–2630. The Alquist-Priolo Earthquake Fault Zoning Act (APEFZA) of 1972 (formerly the Special Studies Zoning Act) regulates development and construction of buildings intended for human occupancy to avoid the hazard of surface fault rupture. While this Act does not specifically regulate development of facilities such as oil fields and pipelines, it does help define areas where fault rupture is most likely to occur. Faults that display evidence of rupture within Holocene time are considered "active." A fault must be shown to be "sufficiently active" and "well defined" by detailed site-specific geologic explorations in order to determine whether building setbacks or other mitigation measures should be established.

Seismic Hazards Mapping Act, PRC, Section 2690–2699. The Seismic Hazards Mapping Act (SHMA) of 1990 directs the California Department of Conservation, California Geological Survey (CGS), to delineate Seismic Hazard Zones. The purpose of the Act is to reduce the threat to public health and safety and to minimize the loss of life and property by identifying and mitigating seismic hazards to buildings intended for human occupancy. Seismic Hazard Zone maps created under this act are available for select quadrangles throughout California and pertain to liquefaction hazards and earthquake-induced landslide hazards. Cities, counties, and State agencies are directed to use seismic hazard zone maps developed by CGS, where available, in their land-use planning and permitting processes. The Act requires that site-specific geotechnical investigations be performed prior to permitting applicable projects within seismic hazard zones.

California Building Code. The California Building Code, Title 24, Part 2 (CBC, 2013) provides building codes and standards for design and construction of structures in California, and may be relevant to the geology and soils within the project. The 2013 CBC is based on the 2012 International Building Code with the addition of more extensive structural seismic provisions. Certain facilities for the project may be subject to the requirements of Chapters 16 and 18 of the CBC, which contain provisions for soil lateral loads, earthquake loads, geotechnical investigations, excavations, grading, fill, and foundations. Chapter 33 of the CBC contains requirements for safeguards during construction that may apply to grading for new facilities. Appendix J of the CBC contains requirements for grading.

California Geological Survey. The CGS, formerly known as the California Division of Mines & Geology, provides scientific products and services regarding the State's geology, seismology and mineral resources that affect the health, safety, and business interests of the people of California. Their Seismic Hazards Program (SHP) provides technical information and advice to the Division of the State Architect (DSA) and the Office of Statewide Health, Planning, and Development (OSHPD) regarding geologic hazards. The Building Official for public schools is the Division of the State Architect (DSA). Hospitals and

Skilled Nursing Facilities in California are under the jurisdiction of the Office of Statewide Health Planning & Development (OSHPD). CGS serves under contract with these two State agencies. The Seismic Hazards Program (SHP) provides technical information and advice regarding geologic hazards to local jurisdictions to aid in the preparation of environmental review documents and/or the hazard element of a given region's general plan.

California Division of Oil, Gas, and Geothermal Resources. The California Division of Oil, Gas, and Geothermal Resources (DOGGR) regulates production of oil and gas, as well as geothermal resources, within the State of California. DOGGR requirements in preparation of environmental documents under CEQA are defined in CCR, Title 14, Division 2, Chapter 2. DOGGR regulations, which are defined in CCR, Title 14, Division 2, Chapter 4, include well design and construction standards, surface production equipment and pipeline requirements, and well abandonment procedures and guidelines. DOGGR regulates well abandonment procedures to ensure effectiveness in preventing migration of oil and gas from a producing zone to shallower zones, including potable groundwater zones. DOGGR oversees well operations. DOGGR also has regulatory authority over Class II injection wells for enhanced recovery and disposal. In California, the operation of all Class II injection wells are regulated by DOGGR, under provisions of CCR Sections 1724.6, 1724.7, 1724.9 and 1724.10, and the Federal Safe Drinking Water Act. When an operator ceases well operation or production, State law requires the well is abandoned within a reasonable time period. Regulations require well operators to maintain detailed records of abandonment operations and file copies with the DOGGR. In addition, DOGGR regulates environmentally sensitive pipelines and production facilities, which are defined under CCR Title 14, Sections 1760(e), 1760(j), and 1760(k).

Under Senate Bill 4, hydraulic fracturing and fluid disposal are regulated by DOGGR through permit applications for well stimulation. Oil and gas developers are required to comply with DOGGR's Well Stimulation Treatment Regulations, Section 1785.1, to monitor and cease hydraulic fracturing activities if an earthquake of Magnitude 2.7 or greater occurs within a radius of five times the fracture length from each point of fracture (DOC, 2015).

Local

City and county planning and building departments may have requirements for geotechnical and engineering geology investigations for hillside projects requiring grading and slope stability analysis. City and County General Plans are required to have a "safety element" that is intended to protect the community by identifying seismic hazards, (seismically induced surface rupture, ground shaking, and ground failure), and other geologic hazards including landslides and potentially unstable slopes.

Local jurisdictions typically regulate construction activities through a process that may require the preparation of a site-specific geotechnical investigation, as required in the CBC, Title 24, Part 2, Chapter 18. The purpose of a site-specific geotechnical investigation is to provide a geologic basis for the development of appropriate construction design. Geotechnical investigations typically assess bedrock and Quaternary geology, geologic structure, soils, and the previous history of excavation and fill placement. Proponents of specific improvements in the project that require design of earthworks and foundations for proposed structures will need to prepare geotechnical investigations on the physical properties of soil and rock at the site prior to project design.

Many counties and cities in the CCFO Planning Area have grading and erosion control ordinances. These ordinances are intended to control erosion and sedimentation caused by construction activities. A grading permit is typically required for construction-related projects. As part of the permit, applicants usually must submit a grading and erosion control plan, vicinity and site maps, and other supplemental information. Standard conditions in the grading permit include a description of SWPPP related BMPs.

3.3.3 Regional Setting

Regional Geologic Setting

The CCFO Planning Area in situated in the southern portion of the Coast Ranges Geomorphic Province, characterized by northwest trending mountain ranges and intervening valleys; the eastern edge of the San Joaquin Management Area extends into the Great Valley Geomorphic Province. Franciscan assemblage rocks mapped as mélange, metavolcanic rock, greenstone, serpentinite, and gabbro form the basement terrane east of the San Andreas Fault. Granitic rock of the Salinian block form the basement west of the fault. The Salinian Block is comprised of Mesozoic granitic rock and Paleozoic to Mesozoic age meta-sedimentary rock (Norris & Webb, 1976). A narrow, far western basement terrane, again comprised of Franciscan Complex rocks, is located along the coast west of the Sur-Nacimiento fault,

Two main fault systems in the Coast Ranges juxtapose the basement terranes of different origins. The east part of the province is dominated by the San Andreas Fault and further west by the Sur-Nacimiento and Hosgri fault system, including the Rinconada fault. The Hayward and Calaveras faults, part of the San Andreas fault system, dominate the structural geology east of San Francisco Bay. A thick series of Jurassic-age through Tertiary-age sedimentary strata overlie much of the Franciscan basement and the Salinian block, and were deposited during marine transgressions and regressions during this timeframe. Several episodes of volcanism, indicative of crustal extension and normal faulting, occurred in some areas of the Coast Ranges during late Oligocene, Miocene, and Pliocene time, and produced shallow intrusive and volcanic deposits. Pinnacles National Park presents exposures of Miocene age shallow volcanic intrusives and pyroclastic breccia of rhyolitic composition. During Quaternary time, the region was uplifted to its current elevation and a combination of tectonic and geomorphic processes have shaped the present landscape, including the exposure of marine terraces, deposition of dune sand, and alluvial deposition which predominate in the large valleys (Salinas, San Joaquin, and Santa Clara).

3.3.4 Current Conditions and Trends

Faulting and Seismicity

The CCFO Planning Area is located in a seismically active area, as is the majority of southern California. The numerous faults in southern California include active, potentially active, and inactive faults. Active faults have ruptured during the Holocene (approximately last 11,000 years), potentially active or Quaternary faults show evidence of movement in the last 1.6 million year; and inactive or pre-Quaternary age faults show no displacement in the last 1.6 million years (CGS, 2010).

Within the CCFO Planning Area and BLM jurisdictional lands active faults are designated as Alquist-Priolo Fault Zones include the San Andreas, Calaveras, Hayward, San Gregorio, San Simeon, and Ortigalita faults. Also, there are many Quaternary and pre-Quaternary faults present within the CCFO Planning Area. Fault geometries in the Planning Area are mainly strike slip, reverse, and oblique. The 1906 San Francisco and 1989 Loma Prieta earthquakes are associated with the San Andreas fault system and were responsible for extensive damage in and around San Francisco Bay area. The San Simeon 2003 earthquake occurred on a previously unknown blind thrust fault (Hardebeck et al., 2004).

Faults can either act as traps for hydrocarbons or they can act as conduits for flow depending upon the nature of the fault. Consequently, oil fields and exploratory targets in California are frequently associated with faults (active and inactive).

Geologic & Seismic Hazards

Surface Rupture. Fault rupture hazard is based on recency of faulting and recurrence interval between earthquakes capable of causing surface rupture. Historically active faults (activity during the past 200 years) are more likely to have future activity and surface rupture than Holocene active or Quaternary

faults. In general, future faulting and surface rupture is most likely to occur on active faults. Many earthquakes occur without surface rupture and can result in significant damage to buildings and infrastructure. Surface rupture along faults could result in significant damage to oil field facilities including access roads, pipelines, and storage tank batteries.

Seismic Ground Shaking. Seismic ground shaking is the response to earth ground motions caused by the release of energy at the earthquake epicenter. The duration and intensity of the ground shaking is a function of the earthquake magnitude and distance from the earthquake epicenter. Large magnitude earthquakes on active faults in the CCFO Planning Area would result in strong and locally very strong ground shaking. Probabilistic determination of Peak Ground Acceleration (PGA) for the Planning Area ranging from 0.30 to 1.00g (30 to 100 percent of the acceleration due to gravity) should be anticipated during an earthquake in the next 50 years (2 percent probability of exceedance in 50 years). The largest PGAs are likely to occur along the San Andreas fault zone (USGS, 2015).

Liquefaction. Liquefaction is the phenomenon in which saturated granular sediments temporarily lose their shear strength during periods of earthquake-induced strong ground shaking. The susceptibility of a site to liquefaction is a function of the depth, density, pressure, and water content of the granular sediments and the magnitude and frequency of earthquakes in the surrounding region. Saturated, unconsolidated silts, sands, and silty sands within 50 feet of the ground surface are most susceptible to liquefaction. Liquefaction-related phenomena include lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects (Youd and Perkins, 1978). In addition, densification of the soil resulting in vertical settlement of the ground can also occur.

In order to determine liquefaction susceptibility of a region, three major factors must be analyzed. These include: (a) the density and textural characteristics of the alluvial sediments; (b) the intensity and duration of ground shaking; and (c) the depth to groundwater. Potentially liquefiable granular sediments of loose to medium density likely occur in the alluvium-filled valleys throughout the CCFO Planning Area. Salinas Valley and Santa Clara Valley present a liquefaction hazard, although no oil drilling activities are anticipated in these areas. Potential liquefaction hazard is not a consideration for portions of the Planning Area underlain by shallow bedrock, which is typical of the elevated areas in mountain ranges.

Landslides. Landslides and other seismically induced ground failures which may affect the CCFO Planning Area site include ground cracking, shattered ridgetops, and seismically induced landslides. Landslides triggered by earthquakes have been a considerable cause of earthquake damage; in central California large earthquakes such as the 1906 San Francisco and 1989 Loma Prieta earthquakes triggered landslides or slope failures that were responsible for destroying or damaging numerous structures, blocking major transportation corridors, and damaging life-line infrastructure. Areas that are most susceptible to earthquake-induced landslides are steep slopes in poorly cemented or highly fractured rocks, areas underlain by loose, weak soils, and areas on or adjacent to existing landslide deposits. Areas that are underlain by landslide prone units with moderate to steep slopes, and previously existing landslides, both mapped and unmapped, are particularly susceptible to this type of ground failure. Shattered ridgetop features consist of fractures, fissures, and minor slumps that are concentrated on narrow ridgelines. Studies suggest that amplification of ground motion at ridge tops is frequency dependent, potentially leading to differential motion at the top of the ridge, which produces cracks and fissures at the crest.

Oil well sites located in hillside areas within the CCFO Planning Area could be located in landslide and seismically induced landslide areas.

Expansive Soils. Expansive soils are characterized by their ability to undergo significant volume change (shrink and swell) due to variation in soil moisture content. Changes in soil moisture could result from a number of factors, including rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soils are typically fine grained with a high percentage of clay particles (particularly smectite clay). The heaving pressures associated with soil expansion can damage structures, flatwork, and pipe-

lines. Clayey soils may be encountered throughout the CCFO Planning Area. The expansion characteristics of clayey soils may vary locally and should thus be evaluated on a site-specific basis. Such an evaluation may include laboratory testing.

Land Subsidence. Land subsidence can be induced by any one of several different activities that involve large volume extraction of underground resources (water, oil and gas, sulfur, salt). Land loss associated with induced subsidence is common, especially where large volumes of fluids are removed from underground formations. This induced subsidence, which is either sub-regional or local in extent, has its greatest impact on flat coastal plains and wetlands near sea level where minor lowering of the land surface results in permanent inundation. Areas in the CCFO Planning Area could be susceptible to land subsidence.

Central Coast Field Office Planning Area

Key geologic hazard issues in the CCFO Planning Area are fault rupture, strong ground shaking, and landslides. Liquefaction is not anticipated at oil well sites or existing oil fields where the project area is underlain by semi-consolidated Tertiary age deposits, older bedrock, and groundwater depths greater than 50 feet. Expansive soils could be present at many oil well sites and existing oil fields and could cause pipeline damage or heave of building and tank foundations. Existing oil fields in the Planning Area are not directly adjacent to or across the San Andreas fault or other active faults, although surface rupture cannot be entirely dismissed. Strong ground shaking should be anticipated to occur at any of the active oil fields and exploratory well sites in the CCFO Planning Area. Finally, the moderate to locally steep terrain that occurs in some oil fields and that is sometimes composed of younger, poorly consolidated, or weak rock would be especially prone to landslides and slope failure. The majority of landslide hazard areas within the CCFO Planning Area that have been mapped by the California Geological Survey are located near the coast within Santa Cruz and Monterey Counties and on the hills surrounding the San Francisco Bay (CGS, 2015). Specific landslide areas would be identified and avoided or stabilized prior to any new construction activity.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in moderately sloping hillside areas underlain by sedimentary formations that may be susceptible to landslides. Grading for new access roads and drill pads could encounter existing landslides or destabilize slopes with weak soil or bedrock. Several leases west of San Ardo are located across the potentially active late-quaternary Rinconada fault. New access roads, drill pads, and gathering lines could experience fault rupture hazard during an earthquake. Both the west of San Ardo and Vallecitos field locations would experience strong ground shaking from an earthquake on the Rinconada or San Andreas faults. Although these leases either have not been issued or have been suspended, it is possible that some or all of the 37 exploratory or development wells could be drilled on these leases in the future and could be affected by these geologic hazards.

3.4 Hazardous Materials and Public Safety

3.4.1 Introduction

As managers of the nation's public lands, the Bureau of Land Management (BLM) is responsible for the health and safety of visitors to public lands. This section addresses hazardous materials management on BLM-managed lands as well as associated risks to the public.

Public lands located within the four management areas of BLM's Central Coast Field Office (CCFO) have historically been used for a variety of military, industrial, and commercial uses and, occasionally, illegal activities. Use of these lands, both legal and illegal, has resulted in the release of hazardous substances and the creation of hazardous waste sites. Some examples of sources of hazardous materials on public lands include abandoned mine facilities and landfills, illegal dumping of hazardous materials, unexploded ordnance, and physical safety hazards associated with abandoned structures, oil spills, wire burns, cast-away equipment and radioactive material (BLM, 2015a). Other sources of hazardous materials within the CCFO Planning Area include naturally occurring materials, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013).

Through the Hazard Management and Resource Restoration (HMRR) Program commonly known as Hazardous Materials Management (HAZMAT), the CCFO engages in hazardous material emergency response actions, hazardous waste site evaluations, and prioritization of site remediation activities in accordance with Federal, State, and local laws and regulations. Remediation is typically done in coordination with the U.S. Environmental Protection Agency (EPA), California environmental regulatory agencies such as the Department of Toxic Substances Control and the Regional Water Quality Control Boards, counties, and potentially responsible parties (both public and private). As part of the HMRR, hazardous material sites are inventoried in the Abandoned Mine – Site Cleanup Module (AMSCM) database system (BLM, 2015b). This database helps to track and prioritize cleanup activities for identified hazardous material sites.

Section 3.4.2 presents relevant State and Federal regulations and standards associated with Hazardous Materials and Public Safety. Section 3.4.3 provides a description of the regional setting for Hazardous Materials and Public Safety. Section 3.4.4 provides a description of current conditions and trends in the CCFO Planning Area. Please refer to Section 4.4 for a summary of the direct and indirect impacts of the RMPA and the Hazardous Materials and Public Safety evaluation of the RMPA alternatives.

3.4.2 Regulatory Framework

This section gives an overview of the Federal and State programs and regulations affecting hazardous materials generation, transportation, treatment, storage, and disposal, and for worker and public safety related to the risk of upset. Definitions of terms and details on the various regulatory programs appear in this section.

Types of Hazardous Substances

Hazardous substances are defined by Federal and State regulations that aim to protect public health and the environment. Hazardous materials have certain chemical, physical, or infectious properties that cause them to be considered hazardous. Hazardous substances are defined in the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 101(14), and also in the California Code of Regulations (CCR), Title 22, Chapter 11, Article 2, Section 66260 et seq.

In this analysis, chemicals mobilized and/or used at a site and released to the environment may result in their being considered a hazardous waste if the level of contamination exceeds specific CCR Title 22 criteria or criteria defined in CERCLA or other relevant Federal regulations. California has similar laws and regulations for the handling, storage, and discovery of hazardous substances, as well as cleanup and disposal of hazardous materials and wastes. Cleanup and safe removal/disposal of hazardous wastes, including contaminated soil from prior oil production activities can be required if excavation of these materials becomes required. Even if soils or groundwater at a contaminated site do not have the characteristics required to be defined as hazardous wastes, remediation of the site may be required by regulatory agencies subject to jurisdictional authority. Cleanup requirements are determined on a case-by-case basis by the agency taking lead jurisdiction.

Overview of Federal Regulations

The Federal Toxic Substances Control Act of 1976 and the Resource Conservation and Recovery Act (RCRA) established a program administered by the U.S. EPA for the regulation of the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the Hazardous and Solid Waste Act (HSWA), which affirmed and extended the "cradle to grave" system of regulating hazardous wastes. The use of certain techniques for the disposal of some hazardous wastes was specifically prohibited by HSWA.

CERCLA, including the Superfund program, was enacted by Congress on December 11, 1980. This law provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified. CERCLA also enabled the revision of the National Oil and Hazardous Substances Contingency Plan (NCP). The NCP provided the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, and/or contaminants, spill containment, and cleanup. The NCP also established the National Priorities List. CERCLA was amended by the Superfund Amendments and Reauthorization Act on October 17, 1986.

The Spill Prevention, Control and Countermeasures Plan (SPCC) requires facilities that store, handle, or produce significant quantities of hazardous material to prepare plan to ensure that containment and countermeasures are in place to prevent release of hazardous materials to the environment.

Federal Hazardous Liquid Pipeline Safety Act

Hazardous liquid pipelines are under the jurisdiction of the U.S. Department of Transportation (USDOT) and must follow the regulations in 49 CFR Part 195, Transportation of Hazardous Liquids by Pipeline, as authorized by the Hazardous Liquid Pipeline Safety Act of 1979 (49 USC Sections 60101–60133). Other important Federal requirements are contained in 40 CFR Parts 109, 110, 112, and 113, which pertain to the need for Oil SPCC Plans and were promulgated in response to the Oil Pollution Act of 1990, as well as the Outer Continental Shelf Lands Act.

Overview of Requirements in 49 CFR Part 195. Part 195.3 incorporates many of the applicable national safety standards of the:

- American Petroleum Institute (API)
- American Society of Mechanical Engineers (ASME)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)

Part 195.49 requires, beginning no later than June 15, 2005, that each operator must annually complete and submit to the USDOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) form PHMSA F 7000–1.1 for each type of hazardous liquid pipeline facility operated at the end of the previous year. A separate report is required for crude oil, highly volatile liquids (HVL) including anhydrous ammonia, petroleum products, carbon dioxide pipelines, and fuel grade ethanol pipelines.

Part 195.50, amended in 2002, requires reporting of accidents by telephone and in writing for:

- Explosion or fire not intentionally set by operator.
- Spills of greater than 5 gallons of a hazardous liquid, or 5 barrels if associated with a maintenance activity that meets four criteria (including confinement to company property and immediate clean-up).
- Death or serious injury of a person requiring hospitalization.
- Damage to property of operator or others, greater than $50,000, including clean-up costs.

The Part 195.100 series includes design requirements for the temperature environment, variations in pressure, internal design pressure for pipe specifications, external pressure and external loads, new and used pipe, valves, fittings, and flanges.

The Part 195.200 series highlights construction requirements for standards such as compliance, inspections, welding, siting and routing, bending, welding and welders, inspection and nondestructive testing of welds, external corrosion protection and cathodic protection, installing in ditch and covering, clearances and crossings, valves, pumping, breakout tanks, and construction records.

The Part 195.300 series indicates the minimum requirements for hydrostatic testing, compliance dates, test pressures and duration, test medium, and records.

The Part 195.400 series specifies minimum requirements for operating and maintaining steel pipeline systems, including:

- Correction of unsafe conditions within a reasonable time
- Procedural manual for operations, maintenance, and emergencies
- Emergency Response Training
- Maps and Records
- Maximum operating pressure
- Communication system
- Cathodic protection system
- External and internal corrosion control
- Continued evaluation and assessment to maintain pipeline integrity (including method and test interval)
- Valve maintenance
- Pipeline repairs
- Overpressure safety devices
- Firefighting equipment
- Public education program for hazardous liquid pipeline emergencies and reporting

Overview of Requirements in 40 CFR Parts 109, 110, 112, 113, and 146.5. The SPCC plan requirements covered in these regulatory programs applies to oil storage and transportation facilities and terminals, tank farms, bulk plants, oil refineries, and production facilities, as well as bulk oil consumers such as apartment houses, office buildings, schools, hospitals, farms, and State and Federal facilities.

Part 109 establishes the minimum criteria for developing oil removal contingency plans for certain inland navigable waters by State, local, and regional agencies in consultation with the regulated community (oil facilities).

Part 110 prohibits discharge of oil such that applicable water quality standards would be violated, or that would cause a film or sheen upon or in the water. These regulations were updated in 1987 to adequately reflect the intent of Congress in Section 311(b)(3) and (4) of the Clean Water Act (CWA).

Part 112 deals with oil spill prevention and preparation of SPCC Plans. These regulations establish procedures, methods, and equipment requirements to prevent the discharge of oil from onshore and offshore facilities into or upon the navigable waters of the United States. Current wording applies these regulations to facilities that are non-transportation-related. These rules should be used by pipeline operators as additional guidelines for the development of oil spill prevention, control and emergency response plans.

Part 113 establishes financial liability limits; however these limits were preempted by the Oil Pollution Act (OPA) of 1990.

40 CFR 146.5 classifies injection wells according to the six types described below:

- ***Class I Injection Wells:***
  1. *Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to inject hazardous waste beneath the lowermost formation containing, within one quarter (1/4) mile of the well bore, an underground source of drinking water.*
  2. *Other industrial and municipal disposal wells which inject fluids beneath the lowermost formation containing, within one quarter mile of the well bore, an underground source of drinking water.*
  3. *Radioactive waste disposal wells which inject fluids below the lowermost formation containing an underground source of drinking water within one quarter mile of the well bore.*
- ***Class II Injection Wells. Wells which inject fluids:***
  1. *Which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection.*
  2. *For enhanced recovery of oil or natural gas; and*
  3. *For storage of hydrocarbons which are liquid at standard temperature and pressure.*
- ***Class III Injection Wells. Wells which inject for extraction of minerals including:***
  1. *Mining of sulfur by the Frasch process;*
  2. *In situ production of uranium or other metals. This category includes only in-situ production from ore bodies which have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class V.*
  3. *Solution mining of salts or potash.*
- ***Class IV Injection Wells:***
  1. *Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste into a formation which within 0.25 mile of the well contains an underground source of drinking water.*
  2. *Wells used by generators of hazardous waste or of radioactive waste, by owners or operators of hazardous waste management facilities, or by owners or operators of radioactive waste disposal sites to dispose of hazardous waste or radioactive waste above a formation which within 0.25 mile of the well contains an underground source of drinking water.*

3. *Wells used by generators of hazardous waste or owners or operators of hazardous waste management facilities to dispose of hazardous waste, which cannot be classified under Section 146.05(a)(1) or Section 146.05(d) (1) and (2), (e.g., wells used to dispose of hazardous wastes into or above a formation which contains an aquifer which has been exempted pursuant to Section 146.04).*

- ***Class V Injection Wells:*** *Injection wells not included in Class I, II, III, IV or VI.*
- ***Class VI Injection Wells:*** *Wells that are not experimental in nature and that are used for geologic sequestration of carbon dioxide beneath the lowermost formation containing a Underground Source of Drinking Water (USDW); or wells used for geologic sequestration of carbon dioxide that have been granted a waiver of the injection depth requirements pursuant to requirements at Section 146.95; or wells used for geologic sequestration of carbon dioxide that have received an expansion to the areal extent of an existing Class II enhanced oil recovery or enhanced gas recovery aquifer exemption pursuant to Section 146.4 and 144.7(d) of EPA 40 CFR 146.5.*

Oil Pollution Act of 1990 OPA. Public Law 101-380, 104 Stat. 484 (August 18, 1990). In the case of U.S. waters defined by the CWA and the Army Corp of Engineers**,** the Oil Pollution Act of 1990, together with the Oil Pollution Liability and Compensation Act of 1989, builds upon Section 311 of the CWA to create a single Federal law providing cleanup authority, penalties, and liability for oil pollution. The bill creates a single fund to pay for removal of and damages from oil pollution. This new fund replaces those created under the Trans-Alaska Pipeline Act, Deep Water Port Act of 1974, and Outer Continental Shelf Lands Act, and supersedes the contingency fund established under Section 311 of CWA. The law may also apply if a connection can be established between the location of the spill and a water of the U.S.

The Oil Pollution Act of 1990 establishes the Oil Spill Liability Trust Fund. It makes the responsible party for a vessel or facility from which oil is discharged (or which poses a substantial threat of discharge) liable for removal costs and for economic or natural resource damages, including:

- Injury or loss of real or personal property or natural resources;
- Loss of use (including subsistence use) of natural resources;
- Loss or impairment of income, profits, or earning capacity;
- Loss of Federal and State tax, royalty, rental, or net profits share revenue; and
- Net costs of increased public services as a result of the discharge.

The Oil Spill Liability Trust Fund will be available, up to a limit of $1 billion per incident, for removal costs and compensatory damages. The act provides for liability and availability of the fund to pay removal costs and compensation in case of discharges of oil.

Hazardous Waste Handling Regulations

RCRA directs the U.S. EPA to develop a comprehensive set of regulations to implement the law. The hazardous waste program, under RCRA Subtitle C, establishes a system for controlling hazardous waste from the time it is generated until its ultimate disposal. 40 CFR Parts 260-273 contain all of the RCRA regulations governing hazardous waste identification, classification, generation, management and disposal. The EPA approved California's program to implement Federal hazardous waste regulations on August 1, 1992.

Under RCRA, the EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. Hazardous waste is a waste with properties that make it dangerous or potentially harmful to human health or the environment. In regulatory terms, RCRA hazardous wastes fall into two categories:

- Listed Wastes, which appear on one of the four hazardous wastes lists established by EPA regulations in 40 CFR Part 261, Subpart D
- Characteristic wastes, which exhibit one or more of four characteristics defined in 40 CFR Part 261, Subpart C

Hazardous Materials Risk Management

The Clean Air Act Amendments of 1990, Section 112(r) requires EPA to publish regulations and guidance for chemical accident prevention at facilities using substances that posed the greatest risk of harm from accidental releases (40 CFR Part 68). These regulations were built upon existing industry codes and standards and require companies of all sizes that use certain listed regulated flammable and toxic substances to develop a Risk Management Program, including a:

- Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental release scenarios; and
- Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures.

Transportation of Hazardous Materials

The USDOT issues the Hazardous Materials Regulations (HMR) found in 49 CFR Parts 171-181. These rules govern the transportation of hazardous materials in all modes of transportation: air, highway, rail and water. The Hazardous Materials Transportation Act requires that carriers report accidental releases of hazardous materials to USDOT at the earliest practical moment. Other incidents that must be reported include deaths, injuries requiring hospitalization, and property damage exceeding $50,000.

The Federal Railroad Administration (FRA) is a department within the USDOT. FRA adopts and enforces railroad safety regulations, including regulations relating to track safety, rail equipment, operating practices, and the transport of hazardous materials by rail. Rail facilities, including yard facilities, are inspected by the FRA to ensure compliance with regulations, and those adopted by the PHMSA. PHMSA is another department within the USDOT. Pursuant to the Hazardous Materials Transportation Act, PHMSA adopts regulations governing the transport of hazardous materials by rail, highway, air, and water. The PHMSA regulations are set forth in Chapter I of Subtitle B of 49 CFR (Parts 105 to 199).

The National Transportation Safety Board is an independent Federal agency that reviews transportation accidents, including rail accidents, and makes recommendations to FRA and PHMSA for regulatory changes.

The American Association of Railroads (AAR) is an industry trade association that represents railroads, including the major freight railroads in the United States, Canada, and Mexico. AAR adopts standards for the construction and design of tank cars which, in some cases, are more stringent than the requirements set forth in FRA or PHMSA regulations.

The PHMSA regulations classify hazardous materials based on each material's hazardous characteristics. Crude oil is assigned to hazard Class 3, based on specified characteristics of combustibility and flammability (49 CFR 173.120). In 2014, USDOT issued Emergency Order DOT-OST-2014-0025 to address crude oil transport by rail. Among other issues, the Emergency Order requires shippers to assign crude oil to Packing Groups I or II, thereby assuring that Bakken and other highly volatile crude oils cannot be mischaracterized and assigned to Packing Group III. The pertinent PHMSA regulations governing rail transport are summarized as follows:

- 49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans, addresses numerous aspects of safe rail transport, including requirements pertaining to the hazardous materials classification of crude oil.
- 49 CFR 173, General Requirements for Shipments and Packages, addresses requirements for bulk packaging including the type of tank car a hazardous material must be transported in.
- 49 CFR 174, Carriage by Rail, specifies handling, loading, and unloading requirements for the safe transport and shipping of hazardous materials, which must be performed by qualified personnel.
- 49 CFR 176, Carriage by Vessel, provides additional details on vessel carriage requirements for different classes of hazardous materials.
- 49 CFR 179, Specifications for Tank Cars, provides construction and design standards requirements for rail tank cars including tank wall thickness, welding certification, tank mounting, pressure relief devices, thermal protection systems, protection of fittings, loading/unloading valve requirements, coupler vertical restraints systems and tank-head puncture-resistance systems.

Federal regulatory agencies and AAR have taken a variety of actions designed to reduce the risk of accidental releases from DOT-111 tank cars, in response to recent rail accidents involving crude oil and ethanol. On May 1, 2015, with a goal of reducing rail transportation risk, the U.S. Department of Transportation issued new rules for railroads hauling crude oil which include the use of sturdier rail cars and new braking systems.

Worker and Workplace Safety

Occupational Safety and Health Act Requirements

Congress passed the Occupational and Safety Health Act (OSHA) to ensure worker and workplace safety. Their goal was to make sure employers provide their workers a place of employment free from recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions (along with Cal OSHA in California). OSHA regulations at 29 CFR 1910 contains several standards that describe requirements for the safe management of hazards associated with processes using, storing, manufacturing, handling, or moving highly hazardous chemicals onsite. It emphasizes the management of hazards through an established comprehensive program that integrates technologies, procedures, and management practices, including communication.

- 29 CFR 1910.119 (Subpart H) – Process Safety Management of Highly Hazardous Chemicals
- 29 CFR 1910.120 (Subpart H) – Hazardous waste operations and emergency response.
- 29 CFR 1910 (Subpart N) – Materials Handling and Storage

BLM Enjoined Final Rule on Hydraulic Fracturing on Federal and Indian Lands

In March 2015, the BLM issued a final ruling regarding hydraulic fracturing on Federal and Indian lands. The standards included in the rule update the requirements for well-bore integrity, wastewater disposal, and public disclosure of chemicals. The rule also includes a process to allow states and tribes to request a variance from provisions for which they have an equal or more protective regulation in place.

The rule includes the following key components which would apply to hazardous materials and public safety:

- Increased transparency by requiring companies to publicly disclose chemicals used in hydraulic fracturing to the BLM through the website FracFocus, within 30 days of completing fracturing operations;
- Higher standards for interim storage of recovered waste fluids from hydraulic fracturing to mitigate risks to air, water, and wildlife; and

- Measures to lower the risk of cross-well contamination with chemicals and fluids used in the fracturing operation, by requiring companies to submit more detailed information on the geology, depth, and location of preexisting wells to afford the BLM an opportunity to better evaluate and manage unique site characteristics.

BLM Guidelines and BLM Gold Book

BLM has spill cleanup guidelines for heavy crude oil releases in California (2002). The guidelines include clean-up of spills on developed surfaces and on undeveloped surfaces and sensitive areas. The guidelines were developed for heavy crude oil spills. Emergency response to releases of light crude oil and other hazardous materials are regulated by 40 CFR Part 300 and corresponding California regulations.

The BLM Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (known as the Gold Book) includes a section regarding pollution control and hazardous wastes including the spill requirements. All spills or leakages of oil, gas, saltwater, toxic liquids or waste materials, blowouts, fires, personal injuries, and fatalities shall be reported by the operator to the BLM and the surface management agency in accordance with the requirements of Notice to Lessees NTL-3A; Reporting of Undesirable Events, and in accordance with any applicable local requirements.

BLM Best Management Practices

Best Management Practices (BMPs) are those land and resource management techniques designed to maximize beneficial results and minimize negative impacts of management actions. BMPs are defined as methods, measures, or practices selected on the basis of site-specific conditions to provide the most effective, environmentally sound, and economically feasible means of managing an activity and mitigating its impacts. BMPs are identified as part of the National Environmental Policy Act (NEPA) process, with interdisciplinary involvement.

The BMPs that appear in Appendix D are a compilation of existing policies and guidelines and commonly employed practices designed to assist in achieving the objectives for maintaining or minimizing water quality degradation from nonpoint sources, loss of soil productivity, providing guidelines for aesthetic conditions within watersheds, and mitigating impacts to soil, vegetation, or wildlife habitat from surface disturbing activities. BMPs are selected and implemented as necessary, based on site-specific conditions, to meet a variety of resource objectives for specific management actions. Where necessary, additional BMPs or modifications may be identified to minimize the potential for negative impacts when evaluating site-specific management actions through BLM's interdisciplinary process.

The BLM Mineral Exploration and Development BMP (Appendix D 1.6.2) requires that operators obtain all required State and Federal permits for the protection of groundwater and surface water quality. Additional measures to protect water resources that may be included as Conditions of Approval (COAs) are described in Section 1.8.2. COAs specifically designed to protect groundwater include zone isolation, general casing depth and cement requirements, pressure testing, casing integrity testing, fluid surveys, and/or wellhead monitoring.

Overview of State Regulations

The California Environmental Protection Agency (CalEPA) was created in 1991, which unified California's environmental authority in a single cabinet-level agency and brought the Air Resources Board, State Water Resources Control Board, Regional Water Quality Control Boards, Department of Resources Recycling and Recovery (CalRecycle), Department of Toxic Substances Control (DTSC), Office of Environmental Health Hazard Assessment, and Department of Pesticide Regulation under one agency. These agencies were placed within the CalEPA "umbrella" for the protection of human health and the environment and to ensure the coordinated deployment of State resources. Their mission is to restore, protect and enhance the environment, to ensure public health, environmental quality, and economic vitality.

The California Hazardous Waste Control Law (HWCL) is administered by CalEPA to regulate hazardous wastes. While the HWCL is generally more stringent than RCRA, both the State and Federal laws apply in California. The HWCL lists 791 chemicals and about 300 common materials that may be hazardous; establishes criteria for identifying, packaging and labeling hazardous wastes; prescribes management controls; establishes permit requirements for treatment, storage, disposal and transportation; and identifies some wastes that cannot be disposed of in landfills.

DTSC is a department of CalEPA and is the primary agency in California that regulates hazardous waste, cleans-up existing contamination, and looks for ways to reduce the hazardous waste produced in California. DTSC has authority under RCRA and the California Health and Safety Code (HSC). California's hazardous waste laws and regulations as implemented by DTSC are contained in HSC Division 20, Chapter 6.5, and CCR Title 22, Division 4.5. Activities subject to DTSC oversight include the generation, storage, treatment and disposal of hazardous waste and regulates cleanup of contaminated sites in the State, including industrial sites with soil and groundwater contamination. Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning.

The California Occupational Safety and Health Administration (Cal/OSHA) is the primary agency responsible for worker safety in the handling and use of chemicals in the workplace. Cal/OSHA standards are generally more stringent than Federal regulations. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337 340). The regulations specify requirements for employee training, availability of safety equipment, accident-prevention programs, and hazardous substance exposure warnings. On-site oil-field workers and oil-field support workers generally are required to have site-specific hazardous materials/chemical safety training both for preventative and emergency response actions. Such training sometimes is referred to as Hazardous Waste Operations and Emergency Response (HAZWOPER) training. Because some site workers could be exposed to chemicals above the permissible exposure limit (PEL), general site workers must have training covering use of personal protective equipment, respiratory protection, and understanding of hazardous materials and toxicities. General site workers require 40 hours of training plus 24 hours of on the job training with an annual refresher (within 365 days after the initial training) to maintain valid certification. Site supervisors require the same 40-hour training and 24 hours on the job training plus an additional 8 hours of training as a HAZWOPER Supervisor. Subcontractors who are on the site on an occasional basis but remain outside area(s) where the chemical exposure could be above the PEL, would be trained as Occasional Site workers, requiring 24 hours of training plus 8 hours on the job training. In addition to HAZWOPER, many oil companies have their own worker health and safety training programs. These address risks from releases such as tanks, equipment, and pipeline ruptures and leaks and fire and explosion hazards.

California's Department of Conservation (DOC), Division of Oil, Gas and Geothermal Resources (DOGGR) regulations (California Code of Regulations, Title 14, Section 1722.9) require that oil and gas well operators develop and maintain a spill contingency plan to prevent and respond to unauthorized releases. In addition, secondary containment for any container with hazardous fluids is required (Section 1773.1). The secondary containment requirement does not apply to various conveyance components such as lines, valves, etc. Spill contingency plans must include a list of all chemicals used on a site for which a Material Safety Data Sheet (MSDS) exists.

California Department of Industrial Relations, Division of Occupational Safety and Health (Cal OSHA)

Cal OSHA protects workers from health and safety hazards on the job through its research and standards, enforcement, and consultation programs, through Title 8.

California Accidental Release Prevention (CalARP)

The California Accidental Release Prevention is based on the EPA's Risk Management Program, but it made it more stringent for California. Similar to the EPA Risk Management Program, the CalARP is a performance based regulation that has different prevention elements for different program levels. According to the CalARP, stationary sources with more than a threshold quantity of a regulated substance shall be evaluated to determine the potential for and impacts of accidental releases from that covered process.

California Pipeline Safety Act of 1981

This act gives regulatory jurisdiction to the California State Fire Marshal (CSFM) for the safety of all intrastate hazardous liquid pipelines and all interstate pipelines used for the transportation of hazardous or highly volatile liquid substances. The law establishes the governing rules for interstate pipelines to be the Federal Hazardous Liquid Pipeline Safety Act and Federal pipeline safety regulations.

Overview of California Pipeline Safety Regulations

The California Government Code (Parts 51010 through 51019.1) provides specific safety requirements that are more stringent than the Federal rules. The requirements that go beyond 49 CFR Part 195 which are required by incorporation include:

- Periodic hydrostatic testing of pipelines, with specific accuracy requirements on leak rate determination.
- Hydrostatic testing by State-certified independent pipeline testing firms.
- Pipeline leak detection.
- Reporting of all leaks required.

Recent amendments require pipelines to include means of leak prevention and cathodic protection, with acceptability to be determined by the State Fire Marshal. All new pipelines must also be designed to accommodate passage of instrumented inspection devices (smart pigs) through the pipeline.

California Coastal Commission

The California Coastal Act of 1976 (PRC Division 20) created the California Coastal Commission, which is charged with the responsibility of granting development permits for within the legally defined California Coastal Zone and for determining consistency between Federal and State coastal management programs. Section 30232 of the Coastal Act addresses hazardous material spills and states that "Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur."

Sections 30260, 30262 and 30265 require that adverse environmental effects be mitigated to the maximum extent feasible, that new and expanded oil and gas facilities be consolidated and that platforms not be sited where a substantial hazard to vessel traffic might result from the facility or related operations. Section 30265 finds that pipeline transport of oil is generally both economically feasible and environmentally preferable to other forms of crude oil transport.

Also in 1976, the State legislature created the California State Coastal Conservancy to take steps to preserve, enhance, and restore coastal resources and to address issues that regulation alone cannot resolve.

California State Lands Commission (CCR Title 2, Division 3, Chapter 1)

The California State Lands Commission (CSLC) was established in 1938 with authority detailed in PRC Division 6. Title 2, Division 3, Chapter 1 (Articles 1 through 13) addresses the requirements related to leasing and permits, oil and gas operations, mineral resource regulations, and marine terminal regulations.

Article 3.4 specifically addresses pollution control, disposal of drilling muds and cuttings and the oil spill contingency plan. Article 3.4 specifically requires the development of an operating manual. Article 3 specifically addresses the operating requirements, such as tankage, laboratory testing, drilling operations and offshore operations. Article 3.2 and 3.3 address specifics related to drilling and production activities.

California Regulations for Well Stimulation Treatments (Senate Bill 4)

Under existing law, DOGGR in the Department of Conservation, regulates the drilling, operation, maintenance, and abandonment of oil and gas wells in the State. The State Oil and Gas Supervisor supervises the drilling. Regulations in Title 14 of the California Code of Regulations (CCR) under Senate Bill 4 (SB 4) define, among other things, the terms well stimulation treatment, hydraulic fracturing, and hydraulic fracturing fluid. Public disclosures of chemical constituents of well stimulation fluids are also required.

California Oil Pipeline Environmental Responsibility Act of 1995 (Assembly Bill 1868)

This legislation requires each pipeline corporation qualifying as a public utility that transports crude oil in a public utility oil pipeline system to be strictly liable for any damages incurred by "any injured party which arise out of, or caused by, the discharge or leaking of crude oil or any fraction thereof…." The law only applies to public utility pipelines for which construction would be completed after January 1, 1996, or that part of an existing utility pipeline that is being relocated after the above date and is more than 3 miles in length. The major features of the law include:

- Each pipeline corporation that qualifies as a public utility that transports any crude oil in a public utility oil pipeline system shall be absolutely liable without regard to fault for any damages incurred by any injured party that arise out of, or are caused by, the discharge or leaking of crude oil.
- Damages for which a pipeline corporation is liable under this law are:
  - All costs of response, containment, cleanup, removal, and treatment including monitoring and administration cost.
  - Injury or economic losses resulting from destruction of or injury to, real or personal property.
  - Injury to, destruction of, or loss of, natural resources, including but not limited to, the reasonable cost of rehabilitating wildlife habitat, and other resources and the reasonable cost of assessing that injury, destruction, or loss, in any action brought by the State, county, city, or district.
  - Loss of taxes, royalties, rents, use, or profit shares caused by the injury, destruction, loss, or impairment of use of real property, personal property, or natural resources.
  - Loss of use and enjoyment of natural resources and other public resources or facilities in any action brought by the State, county, city, or district.
- A pipeline corporation shall immediately cleanup all crude oil that leaks or is discharged from a pipeline.
- No pipeline system subject to this law shall be permitted to operate unless the State Fire Marshal certifies that the pipeline corporation demonstrates sufficient financial responsibility to respond to the liability imposed by this section. The minimum financial responsibility required by the State Fire Marshal shall be $750 times the maximum capacity of the pipeline in the number of barrels per day up to a maximum of $100 million per pipeline system, or a maximum of $200 million per multiple pipeline systems. For the Pacific Pipeline, the legislation specifically requires $100 million for the financial responsibility (Section l.h(l)).
- Financial responsibility shall be demonstrated by evidence that is substantially equivalent to that required by regulations issued under Section 8670.37.54 of the Government Code, including insurance, surety bond, letter of credit, guaranty, qualification as a self-insurer, or combination thereof or any other evidence of financial responsibility. The State Fire Marshal shall require the documentation evidencing financial responsibility to be placed on file with that office.

- The State Fire Marshal shall require evidence of financial responsibility to fund post closure cleanup spots. The evidence of financial responsibility shall be 15 percent of the amount of financial responsibility stated above.

California Oil Spill Prevention and Response

The Lempert-Keene-Seastrand Oil Spill Prevention and Response Act (OSPRA) enacted by the California Legislature in 1990 requires a State oil spill contingency plan to protect marine waters and empowers a deputy director of the Department of Fish and Wildlife to take steps to prevent, remove, abate, respond, contain and clean up oil spills. Notification of all oil spills in the marine environment, regardless of size, is required to the Office of Emergency Services, which in turn notifies the response agencies. Oil Spill Contingency Plans must be prepared and implemented. The Act created the Oil Spill Prevention and Administration Fund and the Oil Spill Response Trust Fund. Pipeline operators will pay fees into the first of these funds for pipelines transporting oil into the State across, under, or through marine waters. The Act also directs some authority to the California Coastal Commission.

In 2014, Senate Bill 861 expanded California's Oil Spill Prevention and Response program to cover all statewide surface waters at risk from oil spills from any source, including pipelines and the increasing shipments of oil transported by railroads. Under this law the Office of Spill Prevention and Response (OSPR) has the authority to implement spill preparedness and response requirements for inland oil spills. This bill applies to areas where there is a thread to State surface waters and includes pipelines, oil wells, railroads, and ships.

California Code of Regulations (CCR), Title 8

California Code of Regulations Title 8, Section 6533 refers to the following regulations and standards to prevent crude oil and produced gas releases:

- CCR Title 8, Subchapter 7, Article 146 of the General Industry Safety Orders;
- American Society of Mechanical Engineers ASME B31.3 2002, Process Piping;
- ASME B31.4-2002, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids;
- ASME B31.8-2003, Gas Transmission and Distribution Piping Systems; or American Petroleum Institute (API) 1104, Nineteenth Edition, September 1999, Welding of Pipelines and Related Facilities (including the October 31, 2001 Errata).

Regulations of the Division of Occupational Safety and Health of Cal/OSHA, lists six Title 8 regulations that are applicable with regard to Valley Fever protection:

- 342 – Reporting Work-Connected Fatalities and Serious Injuries
- 3203 – Injury and Illness Prevention
- 5141 – Control of Harmful Exposures
- 5144 – Respiratory Protection
- 14300 – Employer records Log300
- 5145 – Media for Allaying Dusts, Fumes, Mists, Vapors and Gases

California State Fire Marshal

The California State Fire Marshal (CSFM) exercises safety regulatory jurisdiction over interstate and intrastate pipelines used for the transportation of hazardous or highly volatile liquid substances within California. In 1983, the Pipeline Safety and Enforcement Program was specifically created to administer this effort.

In 1987, CSFM acquired the regulatory responsibility for interstate lines when an agreement was executed with the United States Department of Transportation. In doing so, CSFM became an agent of the USDOT responsible for ensuring that California interstate pipeline operators meet Federal pipeline safety standards. Specifically, interstate pipelines under this agreement are subject to the Federal Pipeline Safety Act (49 USC Chapter 601) and Federal pipeline regulations.

CSFM's responsibility for intrastate lines is covered in the Elder California Pipeline Safety Act of 1981 (Chapter 5.5, California Government Code). The agency's responsibilities are twofold:

- To enforce Federal minimum pipeline safety standards over all regulated interstate hazardous liquid pipelines within California; and
- To enforce Federal minimum pipeline safety standards as well as the Elder California Pipeline Safety Act of 1981 on regulated hazardous liquid intrastate pipelines.

Other Recognized Industry Codes and Standards

Safety and Corrosion Prevention Standards: ASME, NACE, ANSI

- ASME & ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings.
- ASME & ANSI B16.9, Factory-Made Wrought Steel Butt Welding Fittings.
- ASME & ANSI B31.1, Power Piping.
- ASME & ANSI B31.4, "Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids."
- ASME & ANSI B31.8, "Gas Transmission and Distribution Piping Systems."
- NACE Standard RP-01-90, 95, Item No. 530.71 Standard Recommended Practice External Protective Coatings for Joints, Fittings, and Valves on Metallic Underground or Submerged Pipelines and Piping Systems.
- NACE Standard RP-01-6996, Item No. 53002. Standard Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
- API Guidance Document HF1, Hydraulic Fracturing Operations – Well Construction and Integrity Guidelines, First Edition, October 2009
- API Guidance Document HF3, Practices for Mitigating Surface Impacts Associated with Hydraulic Fracturing, First Edition, January 2011
- API Specification 5B, Specification for Threading, Gauging, and Thread Inspection of Casing, Tubing, and Line Pipe Threads
- API Specification 5CT/ISO 11960, Specification for Casing and Tubing
- API Specification 7K, Specification for Drilling and Well Servicing Equipment
- API Specification 10A/ISO 10426-1, Specification for Cements and Materials for Well Cementing
- API Recommended Practice 10B-2/ISO 10426-2, Recommended Practice for Testing Well Cements
- API Recommended Practice 10D-2/ISO 10427-2, Recommended Practice for Centralizer Placement and Stop Collar Testing
- API Specification 16C, Specification for Choke and Kill Systems
- API Specification 17K, Specification for Bonded Flexible Pipe
- API Technical Report 10TR1, Cement Sheath Evaluation
- API Technical Report 10TR4, Technical Report on Considerations Regarding Selection of Centralizers for Primary Cementing Operations

- API Recommended Practice 49, Recommended Practice for Drilling and Well Servicing Operations Involving Hydrogen Sulfide
- API Standard 53, Blowout Prevention Equipment Systems for Drilling Wells
- API Recommended Practice 65-2, Isolating Potential Flow Zones During Well Construction
- API Recommended Practice 90, Annular Casing Pressure Management for Offshore Wells

Fire and Explosion Prevention and Control, National Fire Protection Association (NFPA) Standards

- NFPA 30 – Flammable and Combustible Liquids Code and Handbook
- NFPA 11 – Foam Extinguishing Systems
- NFPA 12 – A&B Halogenated Extinguishing Agent Systems
- NFPA 15 – Water Spray Fixed Systems
- NFPA 20 – Centrifugal Fire Pumps
- NFPA 70 – National Electrical Code

3.4.3 Regional Setting

Figure 1-2 shows the portions of the CCFO Planning Area indicating major oil and gas resource formations. The formations and sedimentary basins include Sacramento, San Joaquin, and Salinas Basins. Hazardous materials may be present at current oil and gas fields or well sites that would have further development or exploration, as discussed in the Reasonably Foreseeable Development Scenario (Appendix B). These materials may include existing soil contamination from spills and leaks that occurred previously and chemicals stored at drilling pads or staging areas.

Other hazards could include military munitions and explosives at the former Fort Ord military base and Fort Hunter Liggett. In accordance with the new management actions with this RMPA (ENERG-A1 in Chapter 2), Fort Ord National Monument is excluded from future mineral leasing. Other sources of hazardous materials within the CCFO Planning Area include naturally occurring materials, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013).

The California Division of Mines and Geology conducted an investigation in the mid-1950s that identified chrysotile asbestos as a major component of the New Idria Formation (BLM, 2013). Asbestos is a known carcinogen and exposure to airborne asbestos can lead to adverse health effects, including asbestosis and lung cancer. The identification of naturally occurring asbestos, as well as knowledge of potential adverse health effects from exposure to this naturally occurring hazardous material, led to the designation of the Clear Creek Serpentine Area of Critical Environmental Concern (ACEC) in 1984 (BLM, 2013). Recreational use of the Clear Creek Serpentine ACEC remains restricted to minimize human exposure to asbestos and has been closed to oil and gas leasing

In addition to the regional hazards described above, the CCFO Planning Area contains areas that are favorable to the growth of the "Valley Fever" vector, which is the fungus *Coccidioides immitis* (COSB, 2015). This fungus tends to grow in areas with hot, dry summers and moderate winters. The fungus can be mobilized during soil disturbing activities that can result in airborne fungal spores which can infect construction personnel, visitors of public lands, and wildlife. Most cases of the disease are mild, with flu-like symptoms that rarely require medical attention; however, extreme cases of the disease can be fatal (COSB, 2015). For additional discussion of Valley Fever, please see Section 3.9 (Soil Resources).

Oil and Gas Facilities

Most of California's historic oil and gas production has been from conventional resources, or vertical wells, into traditional oil and natural gas reservoirs. Today, after recovery of some of the reservoirs' hydrocarbons, most of California's oil and gas reservoirs require some form of artificial lift, such as a pumping unit, to flow (DOC, 2015). Despite being a top producer of oil and gas resources and a major contributor to the nation's economy (responsible for approximately one-tenth of the United States' total production), production levels in California have shown a declining trend over the past 25 years.

The areas of the fields within the CCFO Planning Area are no exception; however, some operators have slowed or flattened the decline rate by applying enhanced oil recovery (EOR) technology (e.g., steam injection into heavy oil deposits). Information regarding the number of active wells and production in the primary fields in the CCFO Planning Area is summarized in Table 3.4-1 for 2014.

Table 3.4-1. Central Coast Field Office Area Oil and Gas Production (2014)

Basin	Field	Operator	Active Wells	Oil (Mbbl)	Gas (MMcf)
San Joaquin	Coalinga	Aera Energy	1,995	2,590.3	225
		Cal Energy	9	24.6	0
		Chevron USA	N/A	210.6	0
		Seneca	169	266.9	0
	Jacalitos	Crimson Resource Management	92	7.6	6.5
		HT Olsen O&G	19	5.8	0
Salinas	Lynch Canyon	Eagle Pet.	43	24.6	0
	San Ardo	Aera Energy	979	3,589.0	507
		NY Oil	43	25.3	0
		Vintage Prod.	19	75	3.5

Source: DOGGR, 2014

Characteristics of Crude Oil

This section discusses the properties of crude oil as it relates to safety risks, such as oil spills, toxic exposure, and fires.

All crude oils contain carbon, hydrogen, sulfur, nitrogen, oxygen, minerals and salts in varying proportions depending on their source. A crude oil spill could damage the environment if oil spilled on land, or in rivers, creeks, or the ocean, and could produce public safety concerns from fires that may arise if the oil burns. Flammable vapors (propane, butane, and pentane) may also emanate from the crude oil, and there may be safety hazards arising from toxic vapors in the crude oil (primarily benzene and hydrogen sulfide).

As crude oil emerges from the wellhead, is a heterogeneous mixture of solids, liquids and gases. This mixture includes sediments, water, salts, and acid gases, including hydrogen sulfide and carbon dioxide. The major hydrocarbon constituents include:

- **Alkanes (paraffins)** – straight-chain normal alkanes and branched iso-alkanes with the general formula CnH2n+2, where C stands for carbon and H stands for hydrogen. The major paraffinic components of most crude oils are in the C1 (=methane) to C35 range. The alkane composition in crude oils typically varies from 15 to 60 percent.
- **Cycloalkanes (naphthenes)** – saturated hydrocarbons containing structures with carbon atoms linked in a ring. The cycloalkane composition in crude oils worldwide typically varies from 30 to 60 percent.

- **Aromatic Hydrocarbons** – most commonly benzene, benzene derivatives, and fused benzene ring compounds. The aromatic composition in crude oils typically varies from 3 to 30 percent. The concentration of benzene in crude oils ranges between 0.01 percent and 1 percent.

The quality of crude oil is determined by a number of characteristics that affect the proportions of transportation fuels and petroleum products produced when the oil is refined. The two most common measurements of crude oil quality are the specific gravity and the sulfur content of the oil.

The specific gravity is typically measured using the American Petroleum Institute (API) standard or the API gravity of the crude oil (which is measured in degrees). The API gravity is the measure of the weight of crude oil in relation to the weight of water (water has an API gravity of 10 degrees).

Sulfur occurs in many natural compounds and as hydrogen sulfide (H_2S) in the crude oil. Total sulfur ranges from approximately 0.1 to 5 percent or higher by weight in crude oils, and hydrogen sulfide concentrations can reach 100 parts per million (ppm) in "sour" crudes. Crude oil is defined as "sweet" if the sulfur content is 0.5 percent or less by weight and "sour" if the sulfur content is greater than 1.0 percent. Other constituents of crude oil include nitrogen and oxygen compounds, water, and metal-containing compounds such as vanadium and nickel. Table 3.4.2-2 depicts crude oil properties.

Information pertaining to the crude characteristics from the most active fields in in the CCFO Planning Area is presented in Table 3.4-3.

Table 3.4-2. Crude Oil Properties

IAPI Gravity (º)	
Light Crude	38–45
Medium Crude	28–38
Heavy Crude	12–28
Sulfur Content (percent by weight)[1]	
Sour Crude	0.8–5
Semi-Sweet Crude	0.5–0.8
Sweet Crude	0.1–0.5

1 - Total sulfur content; not equivalent to hydrogen sulfide (H_2S).
Source: http://www.petroleum.co.uk/composition, California Energy Commission.

Table 3.4-3. Crude Oil Characteristics of Active Fields in the CCFO Planning Area

Field	API Gravity (degrees API)	Depth, Average/Range	Sulfur Content (percent by weight)	Light Hydrocarbons (percent by weight)	County
Coalinga West Side	11-18	2000: 450/3500	0.75	N/A	Fresno
Coalinga East Extension	12-30	700-4600	0.64	N/A	Fresno
Jacalitos	31-39	3400	0.34	N/A	Fresno
San Ardo	13-14	2400: 2100/3025	2.3	2.1	Monterey
Lynch Canyon	N/A	N/A	N/A	N/A	Monterey

Source: DOGGR 1998, DOGGR 2014 and CEC 2006

The designation of "light" or "heavy" for crude oils is based on their density (API gravity is the common measure of crude oil density). Coalinga West Side and East Extension crude typically has an API gravity range of 11-30º and a sulfur content of approximately 0.75 percent and is thus characterized as heavy, semi-sweet crudes. San Ardo crude is also heavy but sour since it contains more sulfur. Jacalitos production would be considered a medium sweet crude.

Given heavy crude oil has lower levels of light end components (lower carbon number hydrocarbon constituents), it is less volatile and has little to no associate gas (C_1 to C_4) and hydrogen sulfide. For these crudes, the sulfur constituents are primarily in the form of mercaptans and thiophenes.

Produced Gas

Produced gas presents hazards in the form of toxicity, due to the presence of H_2S gas; flammability in the form of vapor cloud fires and explosions; and thermal radiation due to flame jet fires emanating from a gas pipeline leak or rupture.

Hydrogen sulfide is a toxic gas often present in the fluids extracted from wells. In the gas phase, it produces odors easily detected in ambient air at concentrations below 0.1 ppm, and it can produce injuries at levels equal to 30 ppm (ERPG [Emergency Response Planning Guidelines]-2) and fatalities as low as 100 ppm (ERPG-3) if exposed to for long enough periods (e.g., over 60 minutes). It has a characteristic "rotten egg" smell. A complicating factor that increases its hazards is that it also produces olfactory paralysis (loss of ability to smell) at levels as low as 50 ppm, or below those at which it could produce injuries or fatalities.

Table 3.4-1 above presents annual oil and gas production totals for the current operators in the four primary fields. Of the four operators in Coalinga, only one reported any gas production in 2014. For San Ardo, two of the three operators reported gas production. The production of gas is dependent on the location of the wells in the formation, and varies depending on the stimulation technique and age of the producing area. Areas of heavy crude production typically lack substantial associated gas production, and this is the case in the CCFO Planning Area, where limited gas production avoids the potential hazards of handling, processing, and transporting produced gas.

Well Stimulation Techniques and Enhanced Oil Recovery

Well stimulation treatments and EOR occur in the Planning Area, and while well stimulation technologies may be used, production using EOR is much more common in the Planning Area. Production through the use of EOR encompasses various techniques for increasing the amount of crude oil that can be extracted from an oil field over the life of a well. It is sometimes referred as tertiary recovery. The RFD Scenario in Appendix B of this EIS provides background information on the different types of EOR techniques and their application to California oil and gas development.

Water flooding, which is the most widely used secondary recovery method in the U.S., is also discussed in Appendix B, since it is used within the CCFO Planning Area. Water flooding includes injection of water into the reservoir, usually to increase pressure and thereby stimulate production, and also to sweep oil through the reservoir towards producing wells. Fields that have reported levels of gas production in Table 3.4-1 are likely to use water flood as a means of maintaining reservoir pressure.

Flowback (if a well is stimulated) and produced water are often injected into Class II wells for EOR. Based on data provided by DOGGR, there were approximately 35,000 active Class II[1] wells in California in 2013. Approximately 5 percent of these wells were used for water and gas disposal, while the remaining were used for EOR (i.e., cyclic steam, steam flood, and water flood) (DOC, 2015).

Also mentioned in Appendix B, the most recent available data indicates a total of 76 percent of production in 2009 was due to application of steam injection and water flood and techniques. About 85 percent of the production from the Coalinga Field is from thermal recovery projects according to DOGGR. EOR techniques are utilized in all of the most productive oil and gas fields within the CCFO Planning Area, which are listed as follows:

[1] Injection wells are classified by the U.S. Environmental Protection Agency into six classes according to the type of fluid they inject and where the fluid is injected. Class II wells inject fluids associated with oil and natural gas production operations. Most of the injected fluid is brine that is produced when oil and gas are extracted from the earth.

- Coalinga oil and gas field with Coalinga East Extension oil and gas field (steam flood, cyclic steam, and water flood);
- San Ardo oil and gas field (steam flood, cyclic steam, water flood, and air injection);
- Lynch Canyon oil and gas field (cyclic steam);
- Jacalitos oil and gas field (cyclic steam and water flood);
- Kettleman North Dome oil and gas field (water flood); and

In California, oil and gas well stimulation treatments may be used during well completion or within weeks or months after a well is put into production in order to keep it economically viable. Hydraulic fracturing, which is one type of well stimulation treatment, is the injection of water, a proppant (usually sand or ceramic beads) and carrier fluids (typically proprietary chemicals designed to enhance recovery yields) into a wellbore over one or two days at pressures sufficient to fracture the reservoir rocks. This increases the flow of hydrocarbons into the wellbore up to several hundred feet from the well. In California, it is typically applied in sandstone, diatomite, limestone, or dolomite formations, and is conducted below the pressure at which the cap rock would fracture.

Service companies have developed a number of different oil and water-based fluids and treatments to more efficiently induce and maintain permeable and productive fractures during the hydraulic fracturing process. The composition of these fluids varies widely, from simple water and sand to complex polymeric substances with a multitude of additives. During the acid treatment step, hydrochloric acid (HCl), is one of the additives used and it cleans out wellbore and perforation holes and helps dissolve carbonate minerals and extra cement. The hydrochloric acid used is diluted with water to a 15 percent acid solution and the typical volumes of acid solutions pumped according to the EPA are 0.08 to 2.1 percent of total fluid pumped. Taking into account the lower concentration of HCl, and that the acid treatment step is not generally used in California, the potential risk to the public regarding hydrochloric acid is negligible.

3.4.4 Current Conditions and Trends

As discussed in Section 3.4.3, current active wells on BLM-administered land are in the San Joaquin Basin near the eastern side of the BLM administrative area. While there currently are no BLM active wells in the Salinas Basin, there are current authorized oil and gas leases on Federal mineral estate near the San Ardo Field, which is one of the large petroleum fields in California. Given the current activity on BLM lands near Coalinga, and the commercial interest in leases near San Ardo, current trends are focused on these plays. As discussed in the RFD Scenario in Appendix B, current development on BLM land in the Sacramento Basin is limited. Additionally, it has been classified by the CCST as an area of moderate conventional resource potential and low unconventional resource potential.

Central Coast Field Office Planning Area

Current BLM active wells are in the San Joaquin Basin, and these include the Coalinga East, Jacalitos, and Kettleman North Dome plays. The major plays in the Salinas Basin high potential area are San Ardo and Lynch Canyon.

Current and ongoing oil and gas development are almost exclusively occurring within the areas of high resource occurrence potential that are highlighted on Figure 5-1, within the San Joaquin and Salinas Basins. Maps in Appendix B show the locations of plays and active oil and gas wells within the CCFO Planning Area.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located in a historically nonproductive wildcat area west of San Ardo field (DOGGR, 2007) and in or near the Vallecitos oil field, which is an area of limited production.

3.5 Air Quality and Atmospheric Conditions

3.5.1 Introduction

Ground-level ozone and particulate matter are the major air quality concerns in the air basins within which the Central Coast Field Office (CCFO) is located. Generally, but with some exceptions, the air pollutant concentrations of ozone and particulate matter recorded by monitoring stations in these air basins do not meet Federal or State of California ozone air quality standards. Ozone is not a directly emitted pollutant; it forms in the presence of sunlight from oxides of nitrogen (NOx) and volatile organic compounds (VOC), including reactive organic gases (ROG). Ambient air concentrations of particulate matter, measured as respirable particulate matter (PM10) and fine particulate matter (PM2.5), also are found above Federal and State standards at many monitoring sites within the CCFO Planning Area. Particulate matter is directly emitted to the atmosphere by vehicle travel on paved and unpaved roads and surfaces, from combustion of fuels, waste burning, and agricultural practices; PM2.5 is also indirectly formed in the atmosphere by the reaction of precursor gases that include sulfur oxides (SOx) and NOx, especially tailpipe emissions from off-road equipment and motor vehicles.

3.5.2 Regulatory Framework

Federal and State legislation and subsequent regulations to protect ambient air quality include:

- The Federal Clean Air Act (CAA) of 1970, 42 United States Code (USC) 7401 et seq., as amended in 1977 and 1990, including the New Source Review (NSR) facility permitting programs applicable to construction or modification of specified stationary sources, New Source Performance Standards, and National Emission Standards for Hazardous Air Pollutants promulgated under the authority of the Federal CAA.
- Code of Federal Regulations (CFR) Title 40, Parts 50-99.
- California Clean Air Act of 1988, including amendments.
- California Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, 1987, Connelly).
- Local air district rules and regulations promulgated under the Federal CAA or other authorities.

Ambient Air Quality Standards

Ambient air quality standards have been established by both Federal and State legislation for a variety of air pollutants, known as criteria air pollutants. National "primary" standards represent thresholds above which may result in known impacts on human health. National "secondary" air quality standards define levels of air quality judged necessary to protect the public welfare from any known effects of an air pollutant, or to protect other resources, such as crops, vegetation, soil or water. The State of California has also established a set of ambient air quality standards to provide additional protection.

Attainment Status and Criteria Air Pollutants

The U.S. EPA, California Air Resources Board (ARB), and local air districts work together to classify each area as attainment, unclassified, or nonattainment depending on the historical levels of contaminants measured in the ambient air and the history of pollutants occurring at levels that do not attain the standards. Table 3.5-1, Table 3.5-2, and Table 3.5-3 summarize the attainment designations for both the Federal and State standards for the criteria pollutants in the North Central Coast, San Joaquin Valley, and San Francisco Bay Area air basins, respectively.

Table 3.5-1. Attainment Status for North Central Coast Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Attainment	Nonattainment
PM10	Attainment	Nonattainment
PM2.5	Attainment	Attainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

Source: ARB, 2013; EPA, 2015.

Table 3.5-2. Attainment Status for San Joaquin Valley Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Nonattainment (Extreme)	Nonattainment
PM10	Attainment (Maintenance)	Nonattainment
PM2.5	Nonattainment	Nonattainment
CO	Attainment (Maintenance)[1]	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

1 - Metropolitan Stockton, Modesto, Fresno, and Bakersfield only.
Source: ARB, 2013; EPA, 2015.

Table 3.5-3. Attainment Status for San Francisco Bay Area Air Basin

Pollutant	Federal Designation	California Designation
Ozone	Nonattainment (Marginal)	Nonattainment
PM10	Attainment	Nonattainment
PM2.5	Nonattainment	Nonattainment
CO	Attainment (Maintenance)[1]	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment

1 - Metropolitan areas only.
Source: ARB, 2013; EPA, 2015.

Local air districts are responsible for developing an air quality management plan (AQMP) or clean air plan (CAP) where necessary to attain the CAAQS, while the ARB develops and implements statewide air pollution control plans to achieve and maintain the NAAQS, known as the State Implementation Plan (SIP). Each local air district: develops the clean air strategies and air quality plans, such as an AQMP or CAP, for the attainment of ambient air quality standards; adopts and enforces rules and regulations concerning sources of air pollution; and issues permits for stationary sources of air pollution. Each air quality plan relies upon an emissions inventory and emissions control measures to demonstrate how the area will attain and maintain the ambient air quality standards.

Ozone (O_3). Ozone is a colorless, toxic gas. Ozone is one of a number of substances called photochemical oxidants, formed in the atmosphere as a result of the action of ultraviolet sunlight on certain chemicals in the atmosphere. Chemicals that react to form ozone are referred to as precursor emissions, primarily NOx and VOC. NOx is a primary culprit in the formation of both ozone and PM2.5. Ozone forms

downwind from the source during the daylight hours. The reaction is accelerated by increased sunlight intensity and temperature. As a result, peak ozone levels are generally reached in the late afternoon during the warmer times of the year. Adverse health effects of ozone include: aggravation of respiratory and cardiovascular diseases; reduced lung function; and increased cough and chest discomfort. Motor vehicle emissions, industrial emissions, and high ambient temperatures that occur in the warmer inland portions of the Planning Area contribute to summertime ozone formation and subsequent violations of the standards. In the coastal areas, ozone concentrations exceed the standards less frequently.

Particulate Matter (PM). Particulate matter is comprised of finely divided soils or condensable liquids including dust, fly ash, soot, smoke, aerosols, fumes, mists, and vapors that can be suspended in the air for extended periods of time. Particles originate from a variety of stationary and mobile sources and may be directly emitted (primary emissions) or formed in the atmosphere secondarily. Anthropogenic PM sources include industrial processes, agricultural operations, combustion of wood and fossil fuels, construction and demolition activities, and airborne entrainment of road dust. Natural sources that contribute to the PM problem include windblown dust and wildfires. Inhalation of PM may also result in exposure to the hazards of naturally occurring asbestos, which can be found in serpentine soils within the CCFO Planning Area (Section 3.4, Hazardous Materials and Public Safety). Secondary PM is formed in the atmosphere from precursor pollutants such as SOx, NOx, VOCs, and ammonia. Control strategies to reduce PM precursor emissions generally have a beneficial impact on reducing ambient PM levels.

Respirable Particulate Matter (PM10). PM10 emissions are comprised of particulate material equal to or less than 10 microns and is a mixture of substances including elemental carbon, lead and nickel; compounds such as nitrates, organics and sulfates. PM10 also originates from the complex mixtures of diesel exhaust and soil. Particulate emissions are considered direct when particles are emitted directly from the source. PM10 precursor emissions are emitted as gases that form into particles in the atmosphere downwind from the source. Human activities that contribute to the PM10 emissions include combustion sources such as stack emissions, diesel exhaust, and smoke from prescribed fire and wild fire, fugitive dust sources such as construction and demolition activities, off highway vehicle (OHV) travel and open areas, unpaved public roads and parking lots, industrial activities, and military activities. One of the reasons for concern with PM10 emissions is their adverse effect on human health; PM10 is considered respirable because particles of this size can be easily inhaled into the nose, throat and/or lungs.

Health hazards in the CCFO Planning Area include inhaling airborne dust that may contain the microscopic fungus that causes Valley Fever. The fungus grows in the soil and gets into the air when the ground is broken and soil or dust becomes airborne. Hazards posed by fugitive dust emissions containing Valley Fever are discussed in more detail in Section 3.4, Hazardous Materials and Public Safety.

Fine Particulate Matter (PM2.5). Fine particles equal to or less than 2.5 microns pose a greater threat to human health than PM10 because they can deposit in lungs. PM2.5 consists of chemical compounds that mostly result from fuel combustion processes, although fugitive dust sources are also important contributors. PM2.5 is emitted directly from sources and forms secondarily through the chemical transformation of precursor emissions in the atmosphere. Primary precursor emissions are from the sulfur and nitrogen components of fuel combustion. Secondary PM2.5 accounts much of the ambient PM2.5 especially in inland areas where ammonia is abundant to facilitate conversion of the precursors into airborne particles. Control strategies and programs for reducing PM2.5 target diesel engines, including heavy-duty trucks and off-road equipment, because diesel particulate matter is a toxic air contaminant regulated by the State.

Carbon Monoxide (CO). CO can cause significant effects on human health because it combines readily with hemoglobin and thus reduces the amount of oxygen transported in the bloodstream. Effects on humans range from slight headaches to nausea to death. The major sources of carbon monoxide are combustion processes, such as fuel combustion in motor vehicles and industrial processes, agricultural burning, prescribed burning, and wildfires. Motor vehicles and other internal combustion engines are the dominant source of CO emissions in most areas. CO is also created during refuse, agricultural, and wood stove burning,

and by some industrial processes. High CO levels develop primarily during winter when periods of light winds combine with ground-level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. CO levels have dramatically declined since the early 1990s when stringent motor vehicle exhaust and clean fuels programs came into effect.

Sulfur Oxides and Hydrogen Sulfide. Sulfur is a component of petroleum and natural gas that may be removed during treatment and refining processes. When sulfur is present in a fuel the products of combustion include sulfur dioxide (SO_2) and other sulfur oxides (SOx). Sulfur oxides in the atmosphere are precursors to acid rain and PM2.5 formation through the airborne reactions of sulfates into sulfuric acid gas (H_2SO_4) and ammonium sulfate. Hydrogen sulfide (H_2S) is also a component of natural gas as well as a byproduct of oil and gas treatment and refining. SOx and H_2S cause breathing difficulties, and H_2S has a distinctive rotten-egg odor easily detected in ambient air at very low concentrations below 0.1 ppm (ARB, 2009).

Federal Class I Areas

More stringent standards have been established for maintaining air quality and preserving visibility in many designated wilderness areas. Pinnacles National Park and Ventana Wilderness (managed by U.S. Forest Service and including some BLM public lands) have been designated as Federal Class I Areas and granted special air quality protections under Section 162(a) of the Federal Clean Air Act. If BLM lands are added to a wilderness area after the wilderness area was designated as a Federal Class I Area under the CAA, the BLM parcels in the expanded wilderness also become Federal Class I Areas. For Federal Class I Areas, the CAA requires special management to control emissions from major stationary sources within 100 kilometers of the area. Subjected sources must comply with the Prevention of Significant Deterioration (PSD) program to prevent violations of the ambient air quality standards and protect the natural qualities of and visibility in Federal Class I Areas.

All of the existing and active oil and gas fields within the Monterey County, San Benito County, and Fresno County portions of the CCFO Planning Area are within 100 kilometers of the Pinnacles National Park Class I Area, except for marginal portions of those fields along the boundary of Fresno and Kings Counties.

Federal General Conformity Rule

The classification of any area as a Federal nonattainment or maintenance area introduces applicability of the Federal General Conformity rule for Federal agencies. Section 176(c) of the Federal CAA and regulations (40 CFR 93, Subpart B) state that "no department, agency or instrumentality of the Federal government shall engage in, support in any way or provide financial assistance for, license or permit, or approve any activity which does not conform to an applicable implementation plan." The intent of the General Conformity rule is to prevent the air quality impacts of Federal actions from causing or contributing to a violation of the NAAQS or interfering with the purpose of the SIP. This means that Federal agencies must make a determination that proposed actions in Federal nonattainment areas conform to the applicable EPA approved implementation plans (if pertinent) before the action is taken.

The regulations provide a phased process for meeting the General Conformity requirements of the CAA that begins with an applicability analysis before triggering a requirement for a conformity determination and subsequent review. Because Federal actions often do not result in a significant increase in emissions, the General Conformity regulations include a number of exemptions, including for actions that fall below *de minimis* emission levels based on the pollutant and nonattainment severity. As defined by 40 CFR 93.153, *de minimis* levels are the thresholds above which a conformity determination must be performed. Actions in areas that attain the national ambient air quality standards, for example in the North Central Coast air basin, are exempt from determining conformity with SIPs. Criteria pollutant *de minimis* rates that apply in the nonattainment and maintenance areas within the CCFO Planning Area are indicated in Table 3.5-4.

Table 3.5-4. General Conformity Applicability (*de minimis*) Levels

	San Joaquin Valley Air Basin		San Francisco Bay Area Air Basin	
Pollutant	Federal Designation	General Conformity *de minimis* Level (tons per year)	Federal Designation	General Conformity *de minimis* Level (tons per year)
Ozone (VOC or NOx)	Nonattainment (Extreme)	10	Nonattainment (Marginal)	100
PM10	Attainment (Maintenance)	100	Attainment	—
PM2.5	Nonattainment	100	Nonattainment	100
CO	Attainment (Maintenance)[1]	100	Attainment (Maintenance)[1]	100
NO_2	Attainment	100 (PM2.5 precursor)	Attainment	100 (PM2.5 precursor)
SO_2	Attainment	100 (PM2.5 precursor)	Attainment	100 (PM2.5 precursor)

1 - Metropolitan areas only.
Source: EPA, 2015.

Hazardous Air Pollutants

Federal standards also exist for categories of sources that emit hazardous air pollutants (HAPs) as defined in Section 112(b) of the Federal CAA (42 USC Section 7412(b)), including HAPs from oil and gas production. In accordance with Title III of the Federal CAA as amended in 1990, the National Emission Standards for Hazardous Air Pollutants set limits on emissions from sources in the defined categories (e.g., Oil and Natural Gas Production, 40 CFR 63, Subpart HH).

In addition to ambient air quality standards, the State of California has a long-term program to identify, assess, and control ambient levels of toxic air contaminants (TACs). This program was initiated by passage of the Air Toxics "Hot Spots" Information and Assessment Act of 1987. As the name implies, "hot spots" are localized point-source emissions of air toxics generated by both large and small industrial operations such as mining, oil and gas, manufacturing, and processing. Air Toxic "hot spot" violations are monitored and regulated by the local air districts.

The California Health and Safety Code defines a TAC as an air pollutant which may cause or contribute to an increase in mortality or serious illness, or which may pose a present or potential hazard to human health. There are almost 200 compounds designated in California regulations as TACs (17 CCR Sections 93000-93001). The list of TACs also includes the substances defined in Federal statute as HAPs. Although dangerous, hydrogen sulfide (H_2S) is not a TAC or HAP.

Local Air District Rules and Regulations

Lands managed by BLM CCFO are within the jurisdiction of three local air districts:

- Monterey Bay Unified Air Pollution Control District (MBUAPCD) has jurisdiction within Santa Cruz, San Benito and Monterey Counties.
- San Joaquin Valley Air Pollution Control District (SJVAPCD) has jurisdiction within San Joaquin, Stanislaus, Fresno, and Merced Counties.
- San Francisco Bay Area Air Quality Management District (BAAQMD) has jurisdiction within Alameda, Contra Costa, San Mateo, and Santa Clara Counties.

Monterey Bay Unified APCD Rules and Regulations

Prohibitions in MBUAPCD Regulation IV make all existing activities subject to limitations on visible emissions (MBUAPCD Rule 400) and prohibitions from causing dust or other emissions at a level that constitutes a nuisance (MBUAPCD Rule 402). Requirements for air permits appear in MBUAPCD Regulation II (Permits).

Additional potentially applicable rules include:

- MBUAPCD Rule 404. Sulfur Compounds and Nitrogen Oxides (including boilers, furnaces, or similar fuel burning equipment and H_2S from crude oil production casing gas collection treatment and destruction systems).
- MBUAPCD Rule 412. Sulfur Content of Fuels.
- MBUAPCD Rule 413. Removal of Sulfur Compounds.
- MBUAPCD Rule 417. Storage of Organic Liquids.
- MBUAPCD Rule 420. Effluent Oil Water Separators.
- MBUAPCD Rule 427. Steam Drive Crude Oil Production Wells.
- MBUAPCD Rule 1000. Permit Guidelines and Requirements for Sources Emitting Toxic Air Contaminants.
- MBUAPCD Rule 1003. Air Toxics Emissions Inventory and Risk Assessments.

San Joaquin Valley APCD Rules and Regulations

Prohibitions in SJVAPCD Regulation IV make all existing activities subject to limitations on visible emissions (SJVAPCD Rule 4101) and prohibitions from causing dust or other emissions at a level that constitutes a nuisance (SJVAPCD Rule 4102). Requirements for air permits appear in SJVAPCD Regulation II (Permits).

Additional potentially applicable rules include:

- SJVAPCD Rule 2280. Portable Equipment Registration.
- SJVAPCD Rule 4301. Fuel Burning Equipment.
- SJVAPCD Rule 4306. Reduction of NOx from Boilers, Steam Generators, and Heaters.
- SJVAPCD Rule 4311. Flares.
- SJVAPCD Rule 4320. Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters greater than 5.0 MMBtu/hr.
- SJVAPCD Rule 4401. Steam-Enhanced Crude Oil Production Wells.
- SJVAPCD Rule 4402. Crude Oil Production Sumps
- SJVAPCD Rule 4407. In-Situ Combustion Well Vents.
- SJVAPCD Rule 4408. Glycol Dehydration Systems.
- SJVAPCD Rule 4409. Components at Light Crude Oil Production Facilities, Natural Gas Production Facilities, and Natural Gas Processing Facilities Pump and Compressor Seals at Petroleum Refineries and Chemical Plants.
- SJVAPCD Rule 4455. Components at Petroleum Refineries, Gas Liquids Processing Facilities, and Chemical Plants.
- SJVAPCD Rule 4623. Storage of Organic Liquids.
- SJVAPCD Rule 4624. Transfer of Organic Liquids.
- SJVAPCD Rule 4702. Internal Combustion Engines.
- SJVAPCD Rule 4703. Stationary Gas Turbines.
- SJVAPCD Regulation VIII. Fugitive PM10 Prohibitions and Fugitive Dust Rules (Rule 8011, 8021, 8031, 8061, and 8071, etc.).

San Francisco Bay Area AQMD Rules and Regulations

Prohibitions in BAAQMD Regulation 6, Rule 1 make all existing activities subject to limitations on visible emissions (BAAQMD Rule 6-1-305) and prohibitions from causing dust or other emissions at a level that constitutes an annoyance. Requirements for air permits appear in BAAQMD Regulation 2 (Permits) and for controlling organic compounds during liquids handling and storage are in BAAQMD Regulation 8 (Organic Compounds).

3.5.3 Regional Setting

The respective air districts managing air quality in the CCFO Planning Area have developed air quality plans that govern development and air pollution-producing activities within each air district. These plans consider the cumulative effects of all air pollution sources on the overall air pollution levels within each district. The ultimate goal of these plans is to maintain compliance with an air quality standard or to achieve compliance with an air quality standard if the air district is not in compliance.

3.5.4 Current Conditions and Trends

Meteorological Conditions

In general, the summer climate of California's coastal areas is controlled by high pressure centered over the northeastern Pacific Ocean. The summer period is rarely stormy due to the high-pressure center. During this period, precipitation is negligible and winds are generally from the northwest. Air from the northwest, passing over cold, upwelling water off the coast, frequently forms low clouds and/or fog along the coast. This generally tranquil weather period also is characterized by the presence of atmospheric temperature inversions which tend to inhibit the dispersion of air pollutants and allow for high air pollution potential.

During winter, the high pressure over the northeastern Pacific Ocean generally weakens and moves southward, allowing storms to occur more frequently. The summertime atmospheric temperature inversions and cold, upwelling water off the coast disappear during the winter, and wind speeds tend to be higher; these factors generally result in low air pollution potential. However, during winter, on occasions when the Pacific high-pressure area strengthens, strong atmospheric temperature inversions can develop near the land surface and winds weaken, resulting in high air pollution potential.

Several subclimates occur within the CCFO Planning Area. These are areas where local topography plays a significant role in modifying regional weather conditions. In the San Francisco Bay and North Central Coast regions, temperatures along the coast are milder especially in the summer, and there is less variation in day/night or seasonal temperatures than at inland locations. The San Joaquin Valley has generally cool, wet winters and hot, dry summers, and the air pollution potential is high because movement is constrained by the surrounding topography. Conditions within the North Central Coast vary due to the mountainous topography that protects inland areas including the Salinas Valley and traps air pollution; however, coastal areas have mild temperatures throughout the year and a lower air pollution potential. See also Section 3.6.4 for Current Conditions and Trends as related to climate change.

Central Coast Field Office Planning Area

The CCFO Planning Area includes portions of three air basins. San Joaquin, Stanislaus, Fresno, and Merced Counties are in the San Joaquin Valley Air Basin. San Benito and Monterey Counties are in the North Central Coast Air Basin, which also includes Santa Cruz County. Additional Federal lands in Alameda, Contra Costa, San Mateo, and Santa Clara Counties are within the San Francisco Bay Area Air Basin.

North Central Coast Air Basin

Air quality in the North Central Coast Air Basin is managed by the MBUAPCD. Seven air quality monitoring stations (Hollister, Salinas, Scotts Valley, Santa Cruz, Davenport, Carmel Valley, and Watsonville) in the basin collect data for determining compliance with Federal and State air quality standards. Air quality also is monitored by the National Park Service at Pinnacles National Park. Emissions of air pollutants in the North Central Coast Air Basin are much lower than those for the heavily populated San Francisco Bay Area or San Joaquin Valley air basins. The history of oil and gas exploration and development on Federal lands within the North Central Coast air basin is divided between Monterey County and San Benito County.

San Joaquin Valley Air Basin

Air quality in the San Joaquin Valley Air Basin is managed by the SJVAPCD. The San Joaquin valley is a relatively flat area at an elevation at or below 400 feet above sea level. Twenty-nine ambient air quality monitors are located throughout the air basin. Emissions in this air basin originate primarily from the urban lands and agricultural operations spread along a roughly north-south axis in the valley and from the oil and gas industry in the southern portion of the valley.

Emissions of all major criteria air pollutants have been trending downward since 2000; although during this same period, emissions of SOx, PM10 and PM2.5 remained relatively steady. Controls on motor vehicle emissions are primarily responsible for these decreases, even though population and motor vehicle miles traveled in the air basin have increased substantially. Emissions of VOC also have decreased due to the implementation of stationary source controls on petroleum facilities in the air basin. The history of oil and gas exploration and development on Federal lands within the CCFO Planning Area portion of the San Joaquin Valley air basin is focused to Fresno County.

San Francisco Bay Area Air Basin

Air quality within the San Francisco Bay Area Air Basin is managed by the BAAQMD. Although the San Francisco Bay Area Air Basin is highly urbanized, criteria air pollutant concentrations are much lower in this air basin than in the San Joaquin Valley Air Basin, partly due to emissions reductions and partly due to more favorable weather conditions for transporting pollutants out of the air basin. The history of activity for oil and gas exploration and development on Federal lands within the CCFO Planning Area portion of the San Francisco Bay Area air basin is limited.

Leases Subject to Settlement Agreement

Leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD. There are no leases subject to the settlement agreement located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin.

The leases subject to the settlement agreement that occur in southern Monterey County are approximately 20 to 50 kilometers to the southeast away from the Ventana Wilderness Class I Area and over 40 kilometers south of Pinnacles National Park. The leases subject to the settlement agreement that occur in San Benito County are approximately 22 to 46 kilometers to the east of Pinnacles National Park and over 50 kilometers northeast of Ventana Wilderness.

3.6 Climate Change/Greenhouse Gas Emissions

3.6.1 Introduction

The global climate depends on the presence of greenhouse gases (GHG) to naturally provide the "greenhouse effect." The greenhouse effect is driven mainly by water vapor, aerosols, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and other GHGs that trap heat radiated from the Earth's surface. Globally, the presence of GHGs affects temperatures, precipitation, storm activity, sea levels, ocean currents, and wind patterns. Concentrations of CO_2 in the atmosphere have increased by more than 40 percent since the Industrial Revolution. That the planet has warmed is "unequivocal," and is corroborated though multiple lines of evidence, as is the conclusion that the causes are very likely human in origin (U.S. GCRP, 2014). Human activity contributes to emissions of six primary GHGs: CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The standard definition of anthropogenic GHG includes these six substances under the 1997 Kyoto Protocol (UNFCCC, 1998).

The most important and widely occurring GHG pollutant is CO_2, primarily derived from the use of fossil fuel as a source of energy. Fertilizer use, agriculture, and land use change are also major sources of CH_4 and N_2O. Global emissions of CO_2 from fossil fuel combustion and cement production in 2011 were equivalent to 8.3 billion metric tons of carbon or 54 percent above the 1990 level (IPCC, 2013). The principal component of natural gas is CH_4, and it is also produced biologically under anaerobic conditions in ruminant animals, landfills, and waste handling. Along with CO_2, CH_4 is the second most important anthropogenic GHG in the atmosphere.

Each GHG has a global warming potential (GWP) that is calculated to reflect how long emissions remain in the atmosphere and how strongly the pollutant absorbs energy relative to CO_2. The GWP indicates the relative climate forcing of a given mass of emissions. Methane in the atmosphere over a 100-year horizon has a GWP of 25 according to the IPCC Fourth Assessment Report and 28 according to the IPCC Fifth Assessment Report, meaning that one pound of CH_4 causes the equivalent warming potential of 25 to 28 pounds of CO_2 (ARB, 2014a). When quantifying GHG emissions, the different GWP of each GHG pollutant is multiplied by the mass of that pollutant to arrive at a carbon dioxide-equivalent (CO2e) mass.

3.6.2 Regulatory Framework

Managing the GHG emissions from oil and gas development occurs within an evolving framework of plans, policies, regulations and goals primarily at the Federal and State levels. The U.S. Environmental Protection Agency (EPA) implements and enforces the requirements of most Federal environmental laws. EPA Region 9 administers Federal air programs in California. The U.S. EPA published a rule, in 2009, for the mandatory reporting of greenhouse gases from large sources, which is referred to as the Greenhouse Gas Reporting Program (GGRP). In general, the threshold for reporting is 25,000 metric tons or more of carbon dioxide equivalent per year, for stationary sources. Details on the GGRP and other related Federal and State regulations and policies are listed below. Although the Federal government is not required to comply with State plans and policies for GHG emissions, it is the general approach of the BLM to evaluate, where appropriate, the benefits or impacts of proposed actions on relevant State plans, in which to frame the issue and significance of greenhouse gas emissions and global warming.

Some local municipalities and local governments have policies on energy resources as part of local climate action plans. Where a local jurisdiction requires discretionary land use approvals for oil and gas activity, the cities or counties can regulate GHG emissions through the process of compliance with the California Environmental Quality Act (CEQA) to require project-specific mitigation of GHG emissions that are not subject to Federal, State, or local air quality management district controls.

Federal Laws, Regulations, and Agency Guidelines

CEQ NEPA Guidance for GHG Emissions and Climate Change Impacts

The Council on Environmental Quality (CEQ) released final guidance for Federal agencies on how to consider the impacts of their actions on global climate change in their NEPA reviews. This final guidance provides a framework for agencies to consider both the effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the effects of climate change on a proposed action. The final guidance applies to all types of proposed Federal agency actions that are subject to NEPA analysis and guides agencies to consider both the potential effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the implications of climate change for the environmental effects of a proposed action.

The guidance also emphasizes that agency analyses should be commensurate with projected greenhouse gas emissions and climate impacts, and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is available to inform the public and the decision-making process in distinguishing between alternatives and mitigations.

Executive Order 13693

In 2015, President Obama issued Executive Order 13693, Planning for Federal Sustainability in the Next Decade, with direction to Federal agencies to reduce direct GHG emissions 40 percent from 2008 levels, by 2025. The direction establishes agency-wide reductions of scope 1 and 2[1] GHG emissions in absolute terms, according to the definitions for reduction targets set within the order. Where appropriate, the targets shall exclude direct emissions from excluded vehicles and equipment and from electrical power produced and sold commercially to other parties as primary business of the agency.

The President's Climate Action Plan

The President's Climate Action Plan (Executive Office of the President, 2013) provides a wide range of goals for cutting carbon pollution and the strengthening preparedness, infrastructure and landscapes to the impacts of climate change and severe weather. This plan, along with the March 2014 Interagency Strategy to Reduce Methane Emissions (White House, 2014), identifies certain actions to cut carbon pollution and prepare for the impacts of climate change. Preparedness includes conserving land and water resources by implementing climate-adaptation strategies that promote resilience in fish and wildlife populations, forests, and other plant communities (Executive Office of the President, 2013). As part of the Climate Action Plan, the Department of Interior's BLM will update decades-old standards to reduce wasteful venting, flaring, and leaks of natural gas, which is primarily methane, from oil and gas wells. The BLM standards, finalized in November 2016 as the Waste Prevention, Production Subject to Royalties, and Resource Conservation,[2] will address both new and existing oil and gas wells on public lands. BLM will work closely with U.S. EPA to ensure an integrated approach (White House, 2015).

Department of Interior's Secretarial Order 3289

The Department of Interior's Secretarial Order 3289, Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources, includes the DOI Carbon Storage Project and the DOI Carbon Footprint Project to focus on carbon sequestration methodologies and carbon storage stewardship efforts. The Order also requires that each bureau and office of the Department must consider and analyze potential climate change impacts when undertaking long-range planning exercises.

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1 Executive Order 13693 includes the following definitions: Scope 1 emissions are those direct greenhouse gas emissions from sources that are owned or controlled by the agency; Scope 2 emissions are those direct greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by an agency.

2 See Federal Register Rule 81 FR 83008, Waste Prevention, Production Subject to Royalties, and Resource Conservation.

Social Cost of Carbon Direction

In support of Executive Order 12866, a Federal Interagency Working Group on the Social Cost of Carbon (SCC), convened by the Office of Management and Budget, developed a social cost of carbon protocol for use in the context of Federal agency rulemaking. The Interagency Working Group issued estimates of the social cost of carbon, which reflect the monetary cost incurred by the emission of one additional metric ton of CO_2.

U.S. EPA GHG Mandatory Reporting Program (40 CFR Part 98)

On October 30, 2009, the EPA published a rule for mandatory reporting of GHG from stationary sources emitting 25,000 or more metric tons of carbon dioxide equivalent (MTCO2e) per year. The regulation at Title 40 Code of Federal Regulations, Part 98, is referred to as the Greenhouse Gas Reporting Program. This rule applies to direct GHG emitters, fossil fuel suppliers, industrial gas suppliers, and facilities that inject carbon dioxide underground for sequestration or other purposes. The program does not require control of GHGs, rather it requires that sources above 25,000 MTCO2e per year monitor and report emissions and other related data.

The Petroleum and Natural Gas Systems source category of the GHG Reporting Program (40 CFR 98, Subpart W) includes most of the largest emission sources from the petroleum and natural gas industry. The following eight segments comprise the Petroleum and Natural Gas Systems source category.

- Onshore Production: Emissions from onshore production of petroleum and natural gas associated with production wells and related equipment, including GHG emissions from natural gas well completions and workovers with hydraulic fracturing. In November 2014, the EPA proposed expanding this segment of the rule to include not only natural gas wells but also reporting GHG from completions and workovers of oil wells using hydraulic fracturing.
- Offshore Production: Production of petroleum and natural gas from offshore production platforms.
- Natural Gas Processing: Processing of field quality gas to produce pipeline quality natural gas.
- Natural Gas Transmission: Compressor stations used to transfer natural gas through transmission pipelines.
- Underground Natural Gas Storage: Facilities that store natural gas in underground formations.
- Natural Gas Distribution: Distribution systems that deliver natural gas to customers.

U.S. EPA Federal Clean Air Act

The U.S. EPA Prevention of Significant Deterioration (PSD) and New Source Review programs under the Federal Clean Air Act (CAA) and implementing regulations (40 CFR Parts 51 & 52) require review of CO_2 emission control strategies for any new or modified stationary source that triggers PSD review. The permitting programs are enforced either by the local air quality management district or the U.S. EPA, depending on delegation of authority.

U.S. EPA Methane Challenge Program

The U.S. EPA sponsors the Natural Gas STAR Methane Challenge Program, which is a voluntary program that encourages oil and natural gas companies to commit to and adopt cost-effective technologies and practices to improve operational efficiency and prevent emissions of methane. The program defines protocols for methane control by oil and natural gas production companies that may operate many different facilities. Examples of cost-effective controls include, recovering for beneficial use all associated gas produced from oil reservoirs, regardless of well type, except for gas produced from wildcat and delineation wells or as a result of system failures and emergencies, and avoiding flaring when gas recovery is feasible.

State Laws and Regulations

California Governor's Executive Order S-3-05

The California Governor's Executive Order S-3-05 (June 2005) declares California's particular vulnerability to climate change and sets a target of an 80 percent reduction of California's greenhouse gas emissions from 1990 levels by 2050 and a target to achieve 1990 levels by 2020. In response to Executive Order S-3-05 and increasing societal concern about the effects of climate change, the California Legislature enacted California Global Warming Solutions Act of 2006, Assembly Bill 32 (AB 32). In passing the bill, the California Legislature found that:

> *Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems* [HSC Section 38501, Division 25.5, Part 1].

California Governor's Executive Order B-16-2012

Executive Order B-16-2012 (March 2012) specifically focuses on reducing emissions from the vehicle fleet across California and establishes that California shall achieve a target for 2050 of a reduction of GHG emissions from the transportation sector equaling 80 percent less than 1990 levels. This would be accomplished by achieving benchmarks by 2020 and 2025 for advancement of zero-emission vehicle (ZEV) infrastructure and technology advancement.

California Governor's Executive Order B-30-15

Executive Order B-30-15 (April 2015) establishes a California greenhouse gas reduction target of 40 percent below 1990 levels by 2030. One purpose of this interim target is to ensure California meets the economy-wide target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050. This executive order also specifically addresses the need for climate adaptation and directs State agencies to update the State climate adaption strategy to identify how climate change will affect California infrastructure and industry and what actions the State can take to reduce the risks posed by climate change.

California Global Warming Solutions Act of 2006 (AB 32)

The Global Warming Solutions Act of 2006 (AB 32) set the 2020 greenhouse gas emissions reduction goal into law and requires California to maintain and continue reductions beyond 2020. It also directed the California Air Resources Board (ARB) to develop discrete early actions to reduce GHG and prepare a scoping plan to identify how best to reach the 2020 limit. ARB adopted 427 million metric tons of carbon dioxide equivalent (MMTCO2e) as the 2020 statewide target and mandatory reporting requirements in December 2007 (ARB, 2007), and staff updated the 1990 level to 431 MMTCO2e in 2014 (ARB, 2014b).

The AB 32 Scoping Plan (ARB, 2008) identifies the strategies for achieving the maximum technologically feasible and cost-effective economy-wide GHG reductions by 2020, and to maintain and continue reductions beyond 2020. This includes oil and gas measures and regulations that are under development. The first statewide AB 32 Scoping Plan was adopted by ARB in December 2008, and the ARB approved the First Update to the Scoping Plan in May 2014 (ARB, 2014a). The ARB has also released a Concept Paper (ARB, 2015a) that presents additional ideas for controlling methane from oil and gas operations, and from landfills, as part of a new statewide strategy for short-lived climate pollutants.

AB 32 Scoping Plan Measures

The AB 32 Scoping Plan contains a mix of direct regulations, market-based approaches, voluntary measures, policies, and other emission reductions calculated to limit California's GHG emissions to no greater than the 2020 statewide GHG limit and to initiate the transformations needed to achieve the long-range AB 32 objectives beyond 2020 (ARB, 2014b). The ARB monitors progress in meeting the 2020 limit, and the First Update of the Scoping Plan finds California is on track to meet the near-term 2020 GHG limit and is well positioned to maintain and continue reductions beyond 2020 as required by AB 32 (ARB, 2014a, ARB, 2014b).

The 2008 AB 32 Scoping Plan identified a potential reduction of 1.1 MMTCO2e for two oil and gas industry measures, as follows:

- **AB 32 Scoping Plan Industry Measure I-2. Oil and Gas Extraction GHG Emission Reduction.** Controls for the fugitive sources range from applying simple fixes to existing technologies, to deploying new technologies to replace inefficient equipment and detect leaks. These controls could include: installing compressor rod packing systems; substituting high bleed with low bleed pneumatic devices; improving leak detection; replacing older equipment (flanges, valves, and fittings); and installing vapor recovery devices. These are proven technologies in the EPA's voluntary efficiency program, Natural Gas STAR, which may achieve a short payback of capital costs. This measure could specify improvements at new wells or existing wells, including those undergoing well stimulation treatments. In April 2015, the ARB released draft regulation text to implement this measure, and adoption will include an environmental analysis of the final regulation.
- **AB 32 Scoping Plan Industry Measure I-3. GHG Leak Reduction from Oil and Gas Transmission.** This measure could include improving operating practices to reduce emissions when compressors along the pipeline are taken off-line, installing compressor rod packing systems and replacing older equipment (flanges valves and fittings) along the pipelines. It is anticipated that the measure would be based, to a large degree, upon the EPA's Natural Gas STAR program aimed at cost effective approaches to reducing methane emissions. This measure may also eventually address combustion sources that are not captured by the Cap-and-Trade Program. In 2015 and in response to Senate Bill 1371 (Leno, 2014), the CPUC is conducting rulemaking to implement this measure.

Mandatory Reporting of Greenhouse Gas Emissions (17 CCR 95100-95158)

The ARB Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, or mandatory reporting rule (MRR), applies to entities within certain regulated source categories, including sources related to "Petroleum and Natural Gas Systems" [17 CCR 95150], if combustion or process emissions for the facility exceed 10,000 MTCO2e per calendar year or if stationary combustion, process, fugitive, and vented emissions equal or exceed 25,000 MTCO2e or more per year [17 CCR 95151]. Vented emissions are defined as intentional releases of vapors to the atmosphere. Fugitive emissions are defined as unintentional releases of vapors to the atmosphere (ARB, 2013).

The definition of the Petroleum and Natural Gas Systems category and the procedures for calculating, monitoring, and reporting GHG emissions from various activities appear in 17 CCR 95150-95158. Certain well stimulation treatments at gas wells are specifically addressed in Section 95153(f), although oil wells are not specifically addressed for well completions. For well testing in Section 95153(j), ARB approved modifications to the rule in 2014 to clarify that reporting procedures apply to both oil wells and gas wells.

Cap-and-Trade Program (17 CCR 95800 to 96022)

The California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation (Cap-and-Trade Program) was approved by ARB in October 2011. The Cap-and-Trade Program applies to covered entities that fall within certain source categories, including operators of facilities of Petroleum

and Natural Gas Systems [17 CCR 95852(h)] with emissions exceeding 25,000 MTCO2e in any data year, as evidenced through the MRR requirements. Fuel suppliers became covered on January 1, 2015 for the 2015 combustion emissions of the fuel delivered to end-users that are not otherwise covered entities in the Cap-and-Trade Program.

Covered entities comply with the statewide emissions cap and the Cap-and-Trade Program by submitting eligible compliance instruments equivalent to their GHG emissions by November 1 of each year. Valid compliance instruments include allowances and compliance offset credits (up to an 8 percent usage limit) issued by ARB. Each compliance instrument represents one metric ton of carbon dioxide equivalent. The first surrender date for the initial 30 percent of 2013 vintage emissions was November 1, 2014 [17 CCR 95856].

Low Carbon Fuel Standard (17 CCR 95480-95490)

The ARB adopted a Low Carbon Fuel Standard (LCFS) in 2009 to reduce statewide GHG emissions by reducing the full fuel-cycle, carbon intensity of transportation fuels. The regulation is designed to stimulate the production and use of alternative, low-carbon fuels in California. The LCFS applies to all providers of transportation fuels in California, including gasoline, diesel, compressed natural gas, and fuel blends. Fuel suppliers must demonstrate that the mix of fuels they provide meet the carbon intensity standards of the LCFS. Under the LCFS, the carbon intensity is a measure of the GHG emissions associated with the various production, distribution, and use steps in the "life-cycle" of a transportation fuel.

California Regulations on Well Stimulation Treatments (SB 4)

Operators on Federal lands in California are required to obtain permits/approvals for well stimulation treatments from both the Department of Conservation (DOC) Division of Oil, Gas and Geothermal Resources (DOGGR) and BLM. In 2013, Senate Bill Number 4 (SB 4) amended certain portions of the Public Resources Code (the State's laws for the conservation of petroleum and gas) to mandate a regulatory process and an environmental review of well stimulation treatments. Under SB 4, the various State, regional and local agencies involved with oversight of oil and gas activities, including local air quality management districts, must work in collaboration with DOGGR to establish their respective authority, responsibility, notification, and reporting requirements with respect to well stimulation treatments. The environmental studies required by SB 4 considered atmospheric emissions, including potential GHG emissions and the potential degradation of air quality due to well stimulation treatments, including hydraulic fracturing treatments and acid well stimulation treatments.

California Governor's Office of Planning and Research, Guidelines on GHG (SB 97)

In late December 2009, the California Natural Resources Agency adopted certain amendments to the State CEQA Guidelines for reviewing the environmental impacts of greenhouse gas emissions, to implement the California Legislature's directive in PRC Section 21083.05 (enacted as part of SB 97 (Chapter 185, Statutes, 2007)). These amendments became effective in March 2010. As part of the administrative rulemaking process, the Natural Resources Agency developed a Final Statement of Reasons explaining the legal and factual bases, intent, and purpose of the CEQA Guidelines amendments. The Final Statement of Reasons guides the scope of GHG analyses for CEQA documents and addresses the subject of life-cycle analysis.

Life-cycle analysis (i.e., assessing economy-wide GHG emissions from the processes in manufacturing and transporting all raw materials used in developing a given project and infrastructure) depends on emission factors or econometric factors that are not well established for all processes. The basis of State CEQA Guidelines set forth by the California Natural Resources Agency indicate that a full life-cycle analysis would be beyond the scope of a given CEQA document because of a lack of consensus guidance on life-cycle analysis methodologies.

3.6.3 Regional Setting

The oil and gas enterprise worldwide is responsible for a large fraction of the total GHGs emitted to the atmosphere. By far the largest factor in these emissions is burning the fuel, not producing it (CCST, 2014). Anthropogenic activity globally results in approximately 49,000 MMTCO2e of annual GHG emissions (IPCC, 2014), and the U.S. GHG inventory for 2012 was 6,526 MMTCO2e (EPA, 2015), or roughly 14 percent of the global emissions. Oil and gas production across the U.S. results in about 224 MMTCO2e annually (EPA, 2015), with about 20 MMTCO2e of annual GHG emissions being due to oil and gas extraction occurring in California (ARB, 2015b).

The Third U.S. National Climate Assessment, released on May 6, 2014, provides the most authoritative and comprehensive source of scientific information to date about climate-change impacts across all U.S. regions and on critical sectors of the economy. For the Southwest U.S., including the CCFO Planning Area, the National Climate Assessment emphasizes the risks to scarce water resources and states (U.S. GCRP, 2014):

> *Climate changes pose challenges for an already parched region that is expected to get hotter and, in its southern half, significantly drier. Increased heat and changes to rain and snowpack will send ripple effects throughout the region's critical agriculture sector, affecting the lives and economies of 56 million people — a population that is expected to increase 68 percent by 2050, to 94 million. Severe and sustained drought will stress water sources, already over-utilized in many areas, forcing increasing competition among farmers, energy producers, urban dwellers, and plant and animal life for the region's most precious resource.*

Climate Change Indicators and Evidence

Climate scientists make global-scale observations and construct models of the climate system. For the period 1950 onward, relatively comprehensive data sets of observations are available. Consensus expressed by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) shows that: "warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC, 2013).

Changing temperatures, precipitation, storm activity, sea levels, ocean currents, and wind patterns are indicators and evidence of the effects of climate change. Various indicators and evidence illustrate the many aspects of climate change, namely, how temperature and precipitation are changing, and how these changes are affecting the environment, specifically freshwater and marine systems, as well as humans, plants and animals (OEHHA, 2013). Since California's initial GHG strategy set forth in the 2008 AB 32 Scoping Plan, the scientific evidence has continued to indicate that the climate is changing. This evidence includes rising temperatures, shifting snow and rainfall patterns, and increased incidence of extreme weather events (ARB, 2014a).

3.6.4 Current Conditions and Trends

How global climate change may impact California's public health, infrastructure and natural resources is described in the 2009 Biennial Report of the California Climate Action Team (CAT, 2009) and Our Changing Climate 2012 from the California Climate Change Center (CEC, 2012). The Climate Action Team findings include: "extreme events from heat waves, floods, droughts, wildfires and bad air quality are likely to become more frequent in the future and pose serious challenges to Californians. These impacts pose growing demands on individuals, businesses and governments at the local, State, and Federal levels to minimize vulnerabilities, prepare ahead of time, respond effectively, and recover and rebuild with a changing climate and environment in mind" (CAT, 2009).

Additional research by the CalEPA Office of Environmental Health Hazard Assessment (OEHHA) identifies climate change drivers, observed changes in climate, how natural physical systems respond, and emerging issues. The documented effects of climate change also include impacts on terrestrial, marine, and freshwater biological systems, with resulting changes in habitat, agriculture, and food supply. Examples of the terrestrial effects include increasing tree mortality, large wildfires, and changes in vegetation density and distribution (OEHHA, 2013). The Regulatory Framework identified in Section 3.6.2 illustrates how oil and gas leasing and development decisions made by the BLM must plan for climate change, which may include effects to biological resources, water resources, and agricultural resources.

California Greenhouse Gas Emission Inventory

California's initial GHG management strategy was set forth in 2008 with the AB 32 Scoping Plan, when the State produced approximately 490 MMTCO2e, an amount equal to about 540 million tons, according to the Air Resources Board inventory (ARB, 2015b). One metric ton (MT) equals 1,000 kilograms, which is 2,204.6 pounds or about 1.1 short tons. For 2013, California's emissions were approximately 459 MMTCO2e (ARB, 2015b) or less than one percent of the 49,000 MMTCO2e emitted globally. Table 3.6-1 summarizes the existing inventory for California.

Table 3.6-1. California GHG Emissions Inventory (million metric tons per year)

Source Category	2008 (MMTCO2e)	2009 (MMTCO2e)	2010 (MMTCO2e)	2011 (MMTCO2e)	2012 (MMTCO2e)	2013 (MMTCO2e)
Transportation[1]	177.77	171.19	170.27	168.00	167.36	169.02
Electric Power	120.14	101.32	90.30	88.04	95.09	90.45
Industrial[2]	91.36	88.79	92.12	91.97	92.52	92.68
Commercial and Residential	43.47	43.70	44.88	45.40	42.88	43.54
Recycling and Waste	8.27	8.39	8.46	8.75	8.77	8.87
High GWP	12.61	13.83	15.49	16.78	17.77	18.50
Agriculture	36.48	34.86	34.50	35.68	36.43	36.21
Total Emissions	**490.1**	**462.1**	**456.0**	**454.6**	**460.8**	**459.3**

Notes:
1 - Transportation category includes off-road equipment used in construction, mining, oil drilling, and other vehicles and mobile sources.
2 - Industrial category includes refineries, oil and gas extraction, and other industries including combustion of fuels plus fugitive emissions.
Source: ARB, 2015b. California Greenhouse Gas Inventory for 2000-2013, by Category as Defined in the 2008 Scoping Plan.

Central Coast Field Office Planning Area

The effects anticipated in the Central Valley provide an illustration of the potential changes: the number of days conducive to ozone formation in the San Joaquin Valley may rise by 75 to 85 percent by the end of the century; and sea-level rise may place additional pressure on the levee systems and increase the intensity of saltwater intrusion into coastal groundwater resources, leading to increased flooding and decreased freshwater availability (CAT, 2006; CAT, 2009). The California Climate Change Center notes that the agricultural resources of the Salinas Valley are particularly vulnerable (CEC, 2012).

Leases Subject to Settlement Agreement

Leases subject to the settlement agreement occur in the North Central Coast air basin and in the jurisdiction of the MBUAPCD. There are no leases subject to the settlement agreement located in the San Joaquin Valley air basin or the San Francisco Bay Area air basin. The discussion of Climate Change Indicators and Evidence for California and the CCFO Planning Area would be the same for these leases. Oil and gas leasing and development that is subject to the settlement agreement would also be subject to the Regulatory Framework identified in Section 3.6.2.

3.7 Groundwater Resources

This section provides a description of the affected environment for Groundwater Resources for the BLM-administered Federal mineral estate within the CCFO Planning Area. EIS Section 3.7.1 provides an introduction to Groundwater Resources. EIS Section 3.7.2 summarizes relevant State and Federal regulations and standards associated with this analysis. EIS Section 3.7.3 describes the regional setting for Groundwater Resources. EIS Section 3.7.4 discusses the current conditions for Groundwater Resources within the CCFO Planning Area, the leases subject to settlement agreement, and the four fields most likely to be used for future oil and gas development.

3.7.1 Introduction

Groundwater, one of California's most important natural resources, is essential to agriculture and other sectors of the economy, and provides 30 million Californians — about 75 percent of the population — with at least a portion of their drinking water (State Water Board, 2015). In a typical year, groundwater provides about 40 percent of California's urban and agricultural water demands. In extended or extreme drought years, this percentage increases to 60 percent or more. Groundwater use will increase as California's projected population grows to more than 50 million by 2049.

Groundwater is the water occurring beneath the earth's surface that fills the voids in rocks or sediment. It can be found underlying nearly any location in California, including areas underlain by bedrock. Most of the groundwater used in California occurs in alluvial deposits of stream-laid unconsolidated to semi-consolidated gravel, sand, silt, and clay. These deposits typically occur in thin lenses and beds. Coarse-grained sediments (sand and gravel) usually provide the best source of groundwater and are termed aquifers; finer-grained clay and silt deposits are relatively poor sources of groundwater and are referred to as aquitards.

A groundwater basin — typically underlying a valley or coastal plain — contains one or more connected and interrelated aquifers and often represents a groundwater reservoir capable of providing substantial water supply. The California Department of Water Resources (CDWR) defines groundwater basins throughout California, designating 515 basins and subbasins. CDWR numbered the groundwater basins according to nine Regional Water Quality Control Board boundaries, three of which are within the CCFO Planning Area: San Francisco Bay (Region 2), Central Coast (Region 3), and Central Valley (Region 5). Many basins also contain oil and gas fields. The CDWR-designated groundwater basins and oil and gas fields in the CCFO Planning Area are shown on Figure 3.7-1. The boundaries or limits of a groundwater basin often consist of low-permeability bedrock or a geologic structure such as a fault. The bottom often is bedrock (generally less than 2,500 feet deep); in the deep Central Valley formations, the base of fresh water is considered the bottom of a basin (CDWR, 2003).

All groundwater contains dissolved constituents; the types and concentrations depend on the source, environment, and movement of the groundwater. A measure of the general mineral quality of groundwater is total dissolved solids (TDS) expressed in milligrams per liter (mg/L). Typically, groundwater has higher concentrations of dissolved constituents than surface water because of its longer exposure to soluble materials (e.g., salts) in rocks or sediments. Moreover, groundwater salinity tends to increase with depth in a groundwater basin, reflecting the long, slow pathways that groundwater travels at depth, or in some cases, the presence of ancient seawater that has not been flushed from deep marine sediments.

Most of the groundwater used in California contains TDS concentrations of less than about 3,000 mg/L. However, the desalination of brackish or saline groundwater supplies has increased significantly in the last two decades (CDWR, 2013a). This increase results from improved technology that has lowered the cost of treatment — a cost that has been justified in part through an increase in water demand. Increased water demand has also resulted in the increased use of lower-quality groundwater when appropriate. In the BLM final rule for Oil and Gas; Hydraulic Fracturing on Federal and Indian Lands (43 CFR Part

3160), usable water is defined as waters containing less than 10,000 mg/L TDS. This is consistent with the U.S. Environmental Protection Agency definition of Underground Sources of Drinking Water (see 40 CFR 144.3 for the complete USDW definition). The BLM hydraulic fracturing rule also excludes zones designated as exempted aquifers under 40 CFR 144.7 from the definition of usable water. Exempted aquifers include specially designated aquifers that meet the criteria of the definition of Underground Sources of Drinking Water but which have been exempted according to the criteria provided in 40 CFR 146.4 (Criteria are included in the discussion of the State Underground Injection Control Program in Section 3.7.2 below. Exempt Aquifers in the CCFO Planning Area are discussed in Section 3.7.4 and listed in Table 3.7-3). Additional qualifications are also included in the full definition of usable water; see 43 CFR Part 3160 for the complete definition. For purposes of the Groundwater Resources sections of the EIS, the terms *usable water* and *usable groundwater* are interchangeable.

Groundwater quality and quantity are typically managed by a local public agency, such as a water district, irrigation district, municipality, or county. In September 2014, the Sustainable Groundwater Management Act (SGMA) was signed into law. This legislation provides a framework for sustainable management of groundwater resources by local agencies. Additional details of the Act are provided in Section 3.7.2 in Regulatory Framework.

CDWR has historically provided funding and technical support for groundwater management and, pursuant to Water Code Section 10920 et seq., has implemented the California Statewide Groundwater Elevation Monitoring (CASGEM) program. CASGEM is a statewide program primarily based on monitoring of groundwater levels by local parties. It also includes prioritization of California's 515 groundwater basins and subbasins using the following criteria:

- Overlying population
- Projected population growth
- Number of public supply wells
- Total number of wells
- Irrigated acreage
- Reliance on groundwater
- Groundwater impacts, including overdraft, subsidence, saline intrusion, and any other water quality degradation, and
- Any other information determined to be relevant by CDWR.

The prioritization is expressed in terms of very low, low, medium, or high. Of the 515 groundwater basins in California, 127 were assigned high and medium priority (CDWR, 2014). While the CASGEM program purpose for prioritizing basins is to help evaluate the need for additional groundwater level monitoring, the prioritization is also being used to prioritize groundwater sustainability plans under SGMA. For the EIS analysis, the prioritization provides a reasonable assessment of the relative importance of groundwater basins statewide. (It is not intended to diminish the local importance of groundwater in the smaller-size or lower-use groundwater basins.) Accordingly, the basins and subbasins with medium and high rankings are identified in the regional discussions of the Affected Environment section to identify the State's priority groundwater supplies.

Estimated volumes of groundwater use for each groundwater basin and subbasin (as compiled by CDWR in connection with the CASGEM prioritization process) also are considered for the groundwater quantity impacts analysis. CDWR cautions that these groundwater use data are current estimates and may be incomplete. Nonetheless, they represent the best available and most comprehensive groundwater use data that cover all of the State's groundwater subbasins.

3.7.2 Regulatory Framework

This section provides background information on Federal, State, and local regulations that apply to management of oil and gas resources, including well simulation and hydraulic fracturing, on BLM-administered mineral estate within the CCFO Planning Area. The RMPA relationship to existing BLM policies, plans and programs, and collaboration with other agencies and groups is discussed in RMPA/EIS Section 1.5 while Section 1.6 introduces Federal, State, and local laws that guide development of the RMPA. BLM's Enjoined Final Rule on Hydraulic Fracturing on Federal and Indian Lands is discussed in Section 1.5.1.

On Federal lands, BLM enforces BLM regulations and requires compliance with the provisions of other Federal agency regulations, such as compliance with the ESA, Antiquities Act, the SHPA, etc. In addition, it is California BLM policy to require per 43 CFR 3162.1(a), at the operations approval stage, that operators comply with all local and State regulations to the extent that they do not interfere with Federal lease rights or contradict Federal law. The State of California, through the Division of Oil, Gas and Geothermal Resources (DOGGR) enforces State regulations on all oil and gas operations on Public Lands in California. Operators on Federal lands in California are required to obtain permits/approvals, including those for well stimulation treatments, from both DOGGR and BLM.

Senate Bill Number 4 (SB 4, Chapter 313) was signed into State law in 2013 to establish a comprehensive regulatory program for oil and gas well stimulation treatments. As related to oil and gas well stimulation treatments, SB 4 amends Sections 3213, 3215, 3236.5 and 3401 of, and adds Article 3 (Sections 3150 through 3161) to, Chapter 1 of Division 3 of the Public Resources Code (the State's laws for the conservation of petroleum and gas), and adds Section 10783 to Part 2.76 (Groundwater Quality Monitoring) of the State's Water Code. Public Resources Code (PRC) Section 3161 was subsequently amended in 2014 by Senate Bill 861 (Statutes, 2014, Chapter 35). Under SB 4, the State, regional and local agencies are to work in collaboration with DOGGR to establish their respective authority, responsibility, notification, and reporting requirements with respect to well stimulation treatments. The following section provides more detail on regulations that apply to groundwater resources with regard to well stimulation technologies.

Federal

On BLM-administered land, BLM has statutory authority for regulation of oilfield operations through Oil and Gas Operations Regulations (43 CFR 3160), which govern operations associated with the exploration, development and production of oil and gas on Federal and Indian lands. In March 2015, BLM issued a final rule regarding hydraulic fracturing on Federal and Indian lands. On June 21, 2016, the United States District Court for the District of Wyoming (Case No. 2:15-CV-043-SWS) set aside the March 2015 final rule. The BLM subsequently appealed the District Court's decision to the 10th Circuit Court of Appeals (No. 16-8068).

BLM's final rule includes standards that provide new requirements to ensure well-bore integrity, to protect water quality, and to enhance the public disclosure of chemicals. These new requirements provide additional protection of usable water (defined as having less than 10,000 mg/L TDS; see 43 CFR Part 3160.0-5 for the complete definition). The rule also includes a process to allow states and tribes to request a variance from provisions for which they have an equal or more protective regulation in place.

The rule includes the following key protective measures for groundwater resources:

- Provisions for ensuring the protection of groundwater supplies from aquifers with less than 10,000 mg/L TDS by requiring a validation of well integrity and strong cement barriers between the wellbore and water zones through which the wellbore passes;
- Increased transparency by requiring companies to publicly disclose chemicals used in hydraulic fracturing to the BLM through the website FracFocus, within 30 days of completing fracturing operations;

- Higher standards for interim storage of recovered waste fluids from hydraulic fracturing to mitigate risks to air, water, and wildlife; and
- Measures to lower the risk of cross-well contamination with chemicals and fluids used in the fracturing operation, by requiring companies to submit more detailed information on the geology, depth, and location of preexisting wells to afford the BLM an opportunity to better evaluate and manage unique site characteristics.

In addition to BLM's final rule, two key Federal laws pertaining to groundwater resources are the Safe Drinking Water Act (SDWA) and Clean Water Act (CWA). The SDWA protects drinking water and its sources (rivers, lakes, reservoirs, springs, and groundwater). Under the SDWA, the EPA sets national health-based standards for drinking water and works with states and water suppliers to implement those standards. Private wells that supply fewer than 25 people are not regulated by the SDWA (EPA, 2014c). The EPA regulates waste disposal of flowback fluids and sometimes the injection of fracturing fluids as authorized by the SDWA and CWA. Protection of underground sources of drinking water is focused in the Underground Injection Control (UIC) program, which regulates the subsurface injection of fluid. Exclusions to UIC authority (SDWA Section 1421(d)) include:

- the underground injection of natural gas for purposes of storage, and
- the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities (EPA, 2014b).

Consequently, hydraulic fracturing is excluded from the SDWA unless diesel fuel is injected, in which case, an authorization through the applicable UIC program is needed. States have the option of requesting regulatory primacy for Class II wells under the SDWA (EPA, 2014a). Class II injection wells inject fluids associated with oil and gas production into subsurface zones for enhanced oil and gas recovery or wastewater disposal. In California, the State regulates the UIC program as discussed in more detail in RMPA/EIS Section 3.7.2.2.

Under the CWA, states or the EPA have the authority to regulate the discharge of produced waters from hydraulic fracturing operations. Disposal into surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES) permit program (EPA, 2014b). In California, the State Water Resources Control Board (State Water Board) and its Regional Water Quality Control Boards (Regional Water Boards) administer the NPDES program. Section 1786 of the SB 4 Well Stimulation Treatment Regulations prohibits the disposal of flowback water to sumps or pits in California.

The CWA established the basic structure for regulating discharges to navigable waters of the United States. The CWA does not directly address groundwater contamination but contains provisions that can be applicable to groundwater (Quattrocchi, 1996). Attempts to apply CWA authority to prevent groundwater contamination have met with mixed results in the courts. Some courts have ruled that the law specifically excludes groundwater while others say it can be regulated as long as the groundwater is hydrologically connected to jurisdictional surface water (InsideEPA.com, 2013). The CWA provides two general types of water quality control standards:

- Effluent standards, which are technology-derived standards that limit the quantity of pollutants discharged from a point source such as a pipe, ditch, tunnel, etc., into a navigable water body (non-point source pollution is subject to State control); and
- Ambient water quality standards, which are based on beneficial uses and limit the concentrations of pollutants in navigable waters.

The NPDES permitting system was established under CWA Section 402 to regulate discharges from point sources into navigable waters. Management of non-point source discharges is regulated under Section 319 of the CWA. Section 319 requires the states to submit an assessment report that identifies: (1)

navigable waters that are not expected to achieve applicable water quality standards or goals, (2) categories of non-point sources or specific sources that add significant pollution that contributes to non-attainment of water quality standards or goals, and (3) the process to develop best management practices and measures to control each category of non-point source or specific sources. The states are then required to develop a management program that proposes to implement the non-point source control program.

Section 305(b) of the CWA requires the states to perform a biannual assessment of the water quality of navigable water within the State. The assessment is required to analyze the extent to which beneficial uses are supported and provide an analysis of the extent to which elimination of pollution and protection of beneficial uses have been achieved. The assessment also is required to describe the nature and extent of non-point sources of pollution and provide recommendations for control programs that include costs.

Section 303(d) of the CWA requires states to identify waters that are not expected to meet water quality standards after application of effluent limitations, to develop a priority ranking, and to determine the total maximum daily load (TMDL) of specific pollutants that may be discharged into the water and still meet the water quality standards. Surface water quality regulations are discussed in EIS Section 3.8.

Groundwater quality and groundwater contamination also are managed through the Comprehensive Environmental Response and Liability Act (CERCLA) also known as Superfund (40 CFR Part 300). CERCLA provides funding and enforcement authority for the EPA to conduct hazardous waste site assessment and remediation including groundwater contamination. CERCLA requires the development of a National Priorities List (NPL) that documents contaminated sites at which long-term cleanup is required. Specific site locations can be queried at the EPA Region 9 website.

State

Groundwater Law in California. In California, the State Water Board administers surface water rights law. A water right is legal permission to use a reasonable amount of water for beneficial purposes (State Water Board, 2014). Statutory and case law in California distinguish between groundwater and surface water. Groundwater is considered either percolating or a subterranean stream flowing through known and defined channels (GRA, 2005). The State Water Board issues permits for diversion of subterranean stream water, which generally moves through permeable streambed material following the course of a stream. However, most groundwater in California is considered to be percolating groundwater, which is not regulated by the State Water Board unless it is being used for wasteful or unreasonable purposes or harms State resources, such as fisheries (State Water Board, 2014). Although not regulated by the State, some groundwater use can be regulated by local entities such as a county, groundwater management agency, or Groundwater Sustainability Agency (see information on 2014 Sustainable Groundwater Management Act below).

Overlying groundwater rights allow a landowner to use percolating groundwater on the overlying property. Overlying rights are usually not limited by history or frequency of use and are considered correlative rights where they are of equal priority to one another. If supply insufficiency exists, the water may be apportioned among the land owners by a court decree (Barkiewicz, 2006).

If groundwater is used elsewhere, it becomes an appropriative groundwater right; for example, municipal use is considered an appropriative groundwater right. Appropriative rights are limited by historical use and priority is determined on a first-in-time, first-in-right basis between appropriators. Appropriative groundwater rights are junior to overlying groundwater rights (GRA, 2005).

A third type of groundwater right is a prescriptive groundwater right and is acquired by someone who openly uses groundwater from someone who has an existing prior right (GRA, 2005). The use can become a right if it is open, continuous and uninterrupted for a period of five years (Barkiewicz, 2006).

Groundwater rights can also be quantified through adjudication. State courts and occasionally the State Water Board can adjudicate a groundwater basin if competing demands become too great and lawsuits arise. In an adjudicated basin, water rights are allocated to the users based on complex legal and factual issues. There is one adjudicated basin (Seaside Groundwater Basin, 3-4.08) in the CCFO Planning Area (CDWR, 2015a).

Sustainable Groundwater Management Act. In September 2014, Governor Brown signed three legislative bills (AB 1739, SB 1168, and SB1319) that together are known as the Sustainable Groundwater Management Act (SGMA). The legislation provides a framework for sustainable management of groundwater resources by local agencies, defined as a local public agency with water supply, water management, or land use responsibilities within a groundwater basin.

The legislation lays out a process and timeline for local agencies to achieve sustainability, including:

- Local agencies must form local groundwater sustainability agencies (GSAs) within two years;
- Local agencies in basins deemed medium- and high-priority must prepare groundwater sustainability plans (GSPs) within five to seven years (depending on the overdraft status of the basin); and
- When plans are in place, local agencies must implement the GSPs and achieve sustainability within 20 years.

A combination of local agencies may form a GSA; if a portion of a groundwater basin is not included within a GSA, the local county is presumed to be the GSA for that area.

The Sustainable Groundwater Management Act is directed at groundwater basins or subbasins that have been designated by CDWR as medium- or high-priority through the CASGEM program (see RMPA/EIS Section 3.7.1). Of the 515 groundwater basins in California, 127 were assigned high- and medium-priority (CDWR, 2014a). Of these, basins that have been, or are being, adjudicated are not subject to the entire Act, but have certain reporting requirements.

The legislation also provides local agencies with the tools to achieve sustainability, including specific authorities and procedures. For example, local agencies may:

- Conduct investigations to carry out the requirements of the Act;
- Require registration of wells and measurement of extractions;
- Require annual extraction reports;
- Impose well spacing requirements and limits on extractions from individual groundwater wells;
- Assess fees to implement local groundwater management plans; and
- Request a revision of basin boundaries, including establishing new subbasins.

CDWR has the responsibility to review GSPs for compliance. In basins where (1) a GSA is not formed in a timely manner, (2) a GSP is determined to be inadequate, or (3) groundwater sustainability is deemed unlikely to be achieved, the State Water Board can designate a basin as probationary and intervene with an interim plan to protect groundwater resources.

Porter-Cologne Water Quality Control Act. The Porter-Cologne Water Quality Control Act (Porter-Cologne Act) of 1969, which became Division 7 of the California Water Code, authorized the State Water Board to provide comprehensive protection for California's waters through water allocation and water quality protection. The State Water Board implements the requirements of CWA Section 303 (that water quality standards be set for certain waters) by adopting water quality control plans through the Porter-Cologne Act. The Porter-Cologne Act also established the responsibilities and authorities of the State's nine Regional Water Boards. These responsibilities and authorities include preparing water quality plans for areas within the region (Basin Plans), identifying water quality objectives (WQOs), and issuing NPDES permits pursuant to the Clean Water Act. WQOs are defined as limits or levels of water quality constituents and characteristics established for reasonable protection of beneficial uses or prevention of nuisance.

California's Antidegradation Policy (Resolution No. 68-16) was adopted in 1968 to protect and maintain existing water quality in California. It is intended to incorporate the Federal antidegradation policy and satisfy Federal regulations requiring states to adopt their own antidegradation policy. It applies to only high-quality waters and is incorporated into the Basin Plans. Existing high-quality water must be maintained to the maximum extent possible. The Antidegradation Policy applies to groundwater and surface water with quality that meets or exceeds WQOs. Several conditions must be met before the quality of high-quality waters may be lowered by waste discharges including the following: provide consistency with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, not result in water quality less than the WQOs, and meet waste discharge requirements that result in best practicable treatment or control of the discharge.

Basin Plans designate beneficial uses for surface and groundwater and establish objectives (narrative and numerical) for protection of the designated beneficial use. Implementation programs to protect beneficial uses and monitoring activities to evaluate the effectiveness are also described in the Basin Plans.

Basin Plans are implemented largely through the NPDES permitting program and updated by TMDL analyses to regulate waste discharges so that water quality objectives are met. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards and an allocation of that load among the various sources of that pollutant.

In addition to implementing the NPDES permitting program, the Porter-Cologne Act authorizes the RWQCBs to issue Waste Discharge Requirements (WDRs), which are issued to dischargers of point-source effluent to a surface water body. Generally, WDRs are issued for discharges that are exempt from the CWA NPDES permitting program, discharges that may affect groundwater quality, and/or wastes that may be discharged in a diffused manner. WDRs are established and implemented to achieve the WQOs for receiving waters as established in the Basin Plans. The WDR permit also serves as a federally required NPDES permit (under the CWA) and incorporates the requirements of other applicable regulations.

As of July 1, 2014, the State Water Board also regulates drinking water from public water systems, including groundwater sources, through its new Drinking Water Division. The Drinking Water Division also provides information on drought preparedness, water conservation, and water supply emergency response; oversees water recycling projects; certifies drinking water treatment operators, supports research; and provides funding opportunities for water system improvements including funding under Proposition 84, Proposition 50, and the Safe Drinking Water State Revolving Fund. The drinking water program was previously administered through the California Department of Public Health, Division of Drinking Water and Environmental Management (DDWEM), but was transferred to the State Water Board in July 2014.

California Groundwater Monitoring Programs. In addition, the State Water Board is responsible for implementation of California's Groundwater Quality Monitoring Act of 2001. Through a cooperative program with the USGS, the State Water Board has developed the basis for a comprehensive groundwater quality monitoring program that integrates existing water quality monitoring programs and provides the capability of assessing the groundwater quality of each groundwater basin in the State.

In 2009, a bill that developed a statewide groundwater elevation monitoring program was enacted in California. Authorized under SBX7 6, the California Ambient Statewide Groundwater Elevation Monitoring (CASGEM) program provides for the monitoring of groundwater levels by local monitoring entities or the CDWR in each of the State's groundwater basins and subbasins. The objective of the program is to establish a permanent, locally managed program of regular and systematic groundwater elevation monitoring program in all of California's alluvial groundwater basins.

Drinking Water Source Water Assessment Program (DWSAP). In response to 1986 amendments and the 1996 reauthorization of the SDWA, states are required to develop a wellhead protection program and a drinking water source assessment program (DWSAP) for wells in public drinking water systems. Two

key goals of the programs are to protect and improve drinking water quality and support management of the State's water resources. The program involves the delineation and protection of recharge areas that could impact groundwater in drinking water supply wells. California's DWSAP was first developed and implemented by the Department of Health Services (DHS) Division of Drinking Water and Environmental Management, the lead agency in 1996. The program is now operating under the authority of the State Water Resources Control Board, Division of Drinking Water (DDW). There are 14,326 groundwater sources of drinking water (wells) that are included in the statewide DWSAP, about 1,500 of which are estimated to be within the CCFO Planning Area. Due to security concerns, specific locations of these drinking water sources are not generally available to the public.

Underground Injection Control (UIC) Program for Class II Wells. In California, DOGGR regulates wells that inject fluids associated with oil and gas production (Class II injection wells) through its UIC Program. The program is monitored and audited by the EPA under the SDWA. The UIC Program includes permitting, inspection, enforcement, mechanical integrity testing, plugging and abandonment oversight, data management, and public outreach in connection with underground injection activities (DOC, 2014). Surface disposal is overseen by the Regional Water Boards and disposal of oil field produced water into deep injection wells is overseen by DOGGR.

Under agreement between the EPA and DOGGR, aquifers may be designated as "exempt" for the purposes of the UIC program only, which allows injection into aquifers. To be eligible for exemption an aquifer must meet criteria set forth in 40 CFR 146.4(a) and either (b) or (c):

(a) The aquifer does not currently serve as a source of drinking water; and

(b) The aquifer cannot now and will not in the future serve as a source of drinking water because:

- *(1) It is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible; or*
- *(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or*
- *(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or*
- *(4) It is located over a Class II well mining area subject to subsidence or catastrophic collapse; or*

(c) The total dissolved solids content of the ground water is more than 3,000 mg/L and less than 10,000 mg/L and it is not reasonably expected to supply a public water system.

DOGGR has to approve the designation of the exempt aquifers. Details of the UIC program are currently under review by DOGGR and are subject to revision, including the exemption status of previously exempt aquifers. Prior to revision, exempt aquifers exist beneath six oil and gas fields within the CCFO Planning Area:

- Monroe Swell and San Ardo in southern Monterey County, and
- Coalinga, Guijarral Hills, Jacalitos, and Kettleman North Dome in western Fresno County.

UIC well construction and UIC injection projects are also regulated under 14 CCR 1724.6, 1724.7, and 1724.10. These regulations stipulate the data and analysis that must be approved before any subsurface injection or disposal project can begin. Data include reservoir characteristics, well diagrams (including cement seals), geologic studies, and injection project details. Chemical analyses of the liquid being injected are also required.

Oil and Gas Well Regulations. Development, regulation, and conservation of oil and gas resources in the State are addressed under 14 CCR, Chapter 4. These regulations include, among other operations, the construction of oil and gas wells, including those used in well stimulation treatments. Specifically, sections 1722.3 and 1722.4 provide requirements for casing strings and cementing that are protective of groundwater resources. In particular, annular cement seals are required to extend to at least 100 feet above the base of fresh water and at least 500 feet above oil and gas zones. On BLM-administered land, BLM has statutory authority for regulation of oilfield operations through Oil and Gas Operations Regulations (43 CFR 3160), which govern operations associated with the exploration, development and production of oil and gas on Federal and Indian lands. The Onshore Oil and Gas Orders clarify and supplement the 43 CFR 3160 regulations and the Notices-To-Lessees (NTLs) supplement or clarify the 43 CFR 3160 for oil and gas operations for specific types of activities or to address local or regional issues. BLM acts as a NEPA lead or responsible agency and consults with DOGGR to facilitate CEQA compliance as appropriate (40 CFR Part 1500).

Groundwater Monitoring under SB 4. SB 4 required development of specific well stimulation treatment regulations including groundwater monitoring requirements. Well simulation fluid composition data and electronically submitted water quality data also are required (DOC, 2015). Under SB 4, the State Water Board is required to:

- Consult with DOGGR during DOGGR's development of regulations for well stimulation treatments.
- Enter into a formal agreement with DOGGR regarding roles and responsibilities in the regulation of well stimulation treatments.
- Designate one or more qualified third-party contractors that adhere to board-specified standards and protocols to perform property owner requested water quality sampling and testing. In those areas where BLM is the surface owner, BLM will be notified as appropriate and provided an opportunity to request testing of any existing usable water, whether from a water well or surface waters.
- Audit and review sampling and testing conducted by the third-party contractor(s).
- Develop groundwater monitoring model criteria by July 1, 2015, in consultation with DOGGR and other stakeholders that outline the approach to be implemented either on a well-by-well basis for a well subject to well stimulation treatments, or on a regional scale.
- Begin implementation of a regional groundwater monitoring program by January 1, 2016, based on the developed criteria (DOC, 2015, Section 10783; State Water Board, 2015).

The report *Model Criteria for Groundwater Monitoring* (Model Criteria) was adopted by the State Water Board at their July 7, 2015 Board Meeting (State Water Board, 2015). The Model Criteria report describes the methods for assessment, sampling, analytical testing, and reporting of water quality associated with oil and gas well stimulation activities. The criteria are for the monitoring of protected groundwater defined as having TDS concentrations less than 10,000 mg/L and outside of exempt aquifers. The groundwater monitoring data will be used to establish baseline conditions prior to well stimulation and to then evaluate data and test results to document water quality changes. Results will be used to determine whether additional monitoring or corrective actions are necessary. The Model Criteria was used by the State Water Board to implement a regional groundwater monitoring program, which began January 1, 2016. The Model Criteria is also being used by oil and gas operators to implement area-specific groundwater monitoring near well stimulation activities. Area-specific groundwater monitoring plans and subsequent groundwater monitoring reports are to be submitted to and approved by the State Water Board. Groundwater monitoring plans are to contain site-specific information including geology, geophysics, hydrogeology, geochemistry, and current and past field operations. Major components of the monitoring program include establishing baseline water quality conditions, identifying a minimum of one upgradient and two downgradient monitoring wells for each aquifer with wells located within 0.5 miles of the surface projection of the zone(s) of stimulation, locating sentry monitoring wells between the stimulated well(s)

and drinking water supply wells if the supply wells are within 1 mile of zone of stimulation, and providing maps and cross sections showing various oil field, well and boundary components, among other requirements.

Samples are to be collected before and after well stimulation with area-specific groundwater sampling to occur on a semi-annual basis and analyzed for constituents provided in Table B1 or Table B2 (if potential impacts) of Appendix B of the Model Criteria report or as modified by the State Water Board. Groundwater monitoring reports and associated water quality data are to be submitted to the State Water Board in an electronic format and uploaded to the online GeoTracker groundwater information system.

The regional monitoring program conducted by the State Water Board will be implemented in phases with the first phase taking approximately five years and focusing on identifying vulnerable beneficial use water resources and establishing baseline water quality conditions. The next phase will consist of establishing a vulnerability model to consider ranking levels of relative risk to groundwater resources. The regional monitoring program will characterize and monitor zones of groundwater risk, effects of surface activity, and well integrity and groundwater quality.

Local

Local agencies also have authority over groundwater resources through three general means:

- Management under the authority granted by the California Water Code or other State statutes
- Local government ordinances or joint powers agreements, and
- Court adjudications.

Many local agencies authorized by statute to provide water have statutory authority to institute some form of groundwater management. In addition, greater groundwater management authority has been granted to 13 special act districts (CDWR, 2014b). Three of these (Monterey Peninsula Water Management District, Pajaro Valley Water Management Agency, and Santa Clara Valley Water District) are within the CCFO Planning Area.

Cities and counties can also manage groundwater through ordinances. More than half of California's 58 counties have ordinances addressing groundwater management. A 1994 California Court of Appeal decision concluded that State law does not prevent cities and counties from adopting ordinances to manage groundwater under their police powers. (*Baldwin v. County of Tehama* (1994) 31 Cal.App.4th 166). However, the extent to which cities and counties can regulate groundwater remains uncertain (CDWR, 2014b). In the CCFO Planning Area, four counties — San Joaquin, San Benito, Monterey, and Fresno — have adopted groundwater ordinances (CDWR, 2003). Three of these ordinances (San Joaquin, San Benito, and Fresno) either prohibit the export of groundwater outside of the basin from which it is extracted or require a permit to do so. The ordinance for Monterey County regulates extraction facilities in zones of groundwater problems including seawater intrusion.

Local agencies have recently been provided considerable new powers, most notably the power to regulate pumping, by the Sustainable Groundwater Management Act (SGMA) as described above. It authorizes designated groundwater sustainability agencies to conduct investigations to carry out the requirements of the act, register wells and monitor pumping, prepare annual extraction reports, impose well spacing requirements and limit pumping, and assess fees to fund groundwater management and replenishment activities, among other actions.

Court adjudications are a result of lawsuits and the groundwater rights of all the overliers and appropriators are determined by the court. There are 23 adjudicated groundwater basins in California and one adjudicated stream system (CDWR, 2015a). Within the CCFO Planning Area, only the Seaside Groundwater Basin (portion of CDWR basin designation 3-4.08) in Monterey County is adjudicated. No oil and gas fields or Federal mineral estate overlie the Seaside Groundwater Basin.

3.7.3 Regional Setting

The EIS/RMPA study area consists of the CCFO Planning Area shown on Figure 3.7-1. The map includes CCFO Planning Area boundaries, CDWR groundwater basins and subbasins (designated by CDWR basin numbers), Federal mineral estate, and oil and gas fields (including abandoned fields). Federal mineral estate is shown in both green and purple to identify the Federal leases subject to the settlement agreement (in purple). As shown on Figure 3.7-1, the settlement agreement leases are generally located in the southern portions of the CCFO Planning Area in southern Monterey and San Benito Counties.

Also shown on Figure 3.7-1 is the area considered by BLM to contain the highest potential for oil and gas occurrence. This high-potential area generally covers the southern Salinas Valley of Monterey County, southeastern San Benito County (east of the San Andreas Fault zone), and the western flank of the San Joaquin Valley including portions of western Fresno, Merced, and Stanislaus Counties (Figure 3.7-1). Most of the Federal mineral estate in the CCFO Planning Area occurs within the areas of high-potential oil and gas occurrence.

As shown on Figure 3.7-1 and listed in Table 3.7-1, there are 41 active or abandoned oil and gas fields in the CCFO Planning Area. Only 13 of these fields contain Federal mineral estate (see fields in bold font in Table 3.7-1). All but one of these 13 fields (abandoned Quinado Canyon) are located within a portion of one or more CDWR groundwater basins or subbasins.

Table 3.7-1. Existing Oil and Gas Fields in the Central Coast Field Office Planning Area

County [1]	Oil and Gas Field		Within a Groundwater Basin?	Includes Federal Mineral Estate?
Alameda	1	Hospital Nose Gas (abandoned)	yes	no
	2	Livermore	yes	no
Contra Costa	3	Bixler Gas	yes	no
	4	Brentwood	yes	no
	5	Brentwood, East Gas	yes	no
	6	Concord Gas (abandoned)	yes	no
	7	**Dutch Slough Gas**	**yes**	**yes**
	8	Knightsen Gas (abandoned)	yes	no
	9	**Los Medanos Gas**	**yes**	**yes**
	10	Mulligan Hill Gas	no	no
	11	Oakley Gas (abandoned)	yes	no
	12	Oakley Gas, South	yes	no
	13	Pinole Point (abandoned)	no	no
	14	Rio Vista Gas	yes	no
	15	River Break Gas	yes	no
	16	Sand Mound Slough Gas (abandoned)	yes	no
	17	Sherman Island Gas	yes	no
	18	Van Sickle Island Gas	no	no
	19	**Willow Pass Gas (abandoned)**	**yes**	**yes**
Fresno	**20**	**Coalinga**	**yes**	**yes**
	21	**Coalinga, East Extension**	**yes**	**yes**
	22	**Guijarral Hills**	**yes**	**yes**
	23	**Jacalitos**	**yes**	**yes**
	24	**Kettleman North Dome**	**yes**	**yes**
	25	Kreyenhagen	no	no
	26	**Pleasant Valley**	**yes**	**yes**

Table 3.7-1. Existing Oil and Gas Fields in the Central Coast Field Office Planning Area

County [1]	Oil and Gas Field	Within a Groundwater Basin?	Includes Federal Mineral Estate?
Monterey	27 King City (abandoned)	yes	no
	28 Lynch Canyon	yes	no
	29 McCool Ranch	yes	no
	30 Monroe Swell	**yes**	**yes**
	31 Paris Valley	yes	no
	32 Quinado Canyon (abandoned)	**no**	**yes**
	33 San Ardo	**yes**	**yes**
San Benito	34 Bitterwater	yes	no
	35 Hollister	yes	no
	36 Vallecitos	**yes**	**yes**
San Mateo	37 Half Moon Bay	yes	no
	38 La Honda	no	no
	39 Oil Creek	no	no
Santa Clara	40 Moody Gulch (abandoned)	no	no
	41 Sargent	no	no

1 - No existing oil and gas fields in Merced, San Francisco, San Joaquin, Santa Cruz, or Stanislaus Counties.
2 - Oil and gas fields shown in **bold** contain Federal mineral estate.

Groundwater Basins in the CCFO Planning Area

There are 66 groundwater basins or subbasins that are either wholly or partially located within the CCFO Planning Area (Figure 3.7-1). These basins occur within portions of 4 of the 10 CDWR-defined hydrologic regions in the State: San Francisco Bay Hydrologic Region (basin designations 2-x on Figure 3.7-1), Central Coast Hydrologic Region (basin designations 3-x on Figure 3.7-1), the San Joaquin River Hydrologic Region (basin designations 5-22.07, 5-22.15, and 5-70; see Figure 3.7-1), and the Tulare Lake Hydrologic Region (basin designations 5-22.09, 5-22.10, 5-23, and 5-71; see Figure 3.7-1). For basins/subbasins in the San Joaquin River and Tulare Lake hydrologic regions (basin designations 5-x), only the western edges of the basins are contained within the CCFO Planning Area (Figure 3.7-1) (CDWR, 2003).

Four Basin Plans developed by the Regional Water Quality Control Boards list beneficial uses for groundwater in the CCFO Planning Area (CRWQCB-CCR, 2011; CRWQCB-CVR, 2011; CRWQCB-CVR, 2004, CRWQCB-SFBR, 2015). These plans designate municipal, agricultural, and/or industrial water supply for most of the groundwater basins/subbasins. Specific beneficial uses for groundwater in the basins/subbasins that contain Federal mineral estate are discussed in Section 3.7.4.

Although groundwater is used throughout the CCFO Planning Area, reliance on groundwater varies significantly from basin to basin. In general, groundwater use is lowest in the northern CCFO Planning Area, especially in the San Francisco Bay region where groundwater provides only about five percent of the total water supply (CDWR, 2003). In contrast, groundwater supplies more than 80 percent of the demand in the southern and central portions of the CCFO Planning Area. Groundwater is also heavily used in areas along the eastern edge of the CCFO Planning Area.

Thousands of public and private wells have been drilled throughout the CCFO Planning Area to support domestic, irrigation, urban, industrial, and other beneficial uses. Information associated with these wells has been confidential historically and not available to the public. With the recent adoption of Senate Bill 83, the public (as of June 2015) can access well completion reports prepared by the well driller (California Water Code Section 13752). Even though the well completion reports are now available, the cur-

rent status of each well is unknown. The timing and amounts of water pumped from any individual well are also unknown (except in the Seaside Groundwater Basin, where water rights have been adjudicated by the courts). Only summary information provided by State agencies such as CDWR is available for documentation of local groundwater use, as summarized in subsequent sections.

California drinking water systems that have completed source water assessments in compliance with the DWSAP program are published by county. For the 12 counties that are either wholly or partially contained within the CCFO Planning Area, approximately 1,721 systems (with 3,643 sources) have completed assessments associated with the DWSAP as listed below:

- Alameda – 21 systems; 79 sources
- Contra Costa County – 119 systems; 166 sources
- San Francisco County – 3 systems; 6 sources
- San Mateo County – 41 systems; 75 sources
- Santa Clara County – 91 systems; 366 sources
- Santa Cruz County – 80 systems; 167 sources
- San Benito County – 56 systems; 79 sources
- Monterey County – 297 systems; 529 sources
- San Joaquin County – 332 systems; 583 sources
- Stanislaus County – 223 systems; 466 sources
- Merced County – 117 systems; 223 sources
- Fresno County – 341 systems; 904 sources

Approximately 59 percent of these systems (and sources) are located in four counties of the adjacent San Joaquin Valley (San Joaquin, Stanislaus, Merced, and Fresno). Only small areas of these counties intersect the CCFO Planning Area, suggesting that the number of drinking water sources and source water assessments in the CCFO Planning Area is closer to about 700 systems and 1,500 sources. Due to security concerns, the actual locations of these sources are not publicly available.

Additional groundwater information is summarized below, organized by three general regions of the CCFO Planning Area (northern, central/southern, and eastern). This discussion is followed by more specific information on groundwater basins/subbasins that contain Federal mineral estate.

Groundwater Basins in the Northern CCFO Planning Area

Groundwater basins in the northern portion of the CCFO Planning Area are in the San Francisco Bay Hydrologic Region (basin designations 2-x on Figure 3.7-1), generally characterized by highly urbanized areas. Aquifers in this area are relatively thin in the smaller basins and moderately thick in the larger and more heavily developed basins such as the Livermore Valley (2-10) or the Santa Clara Valley (2-9.02) (Figure 3.7-1). Well depths range from about 100 feet to 500 feet and well yields range from less than 50 gallons per minute (gpm) to approximately 3,000 gpm. Land subsidence has been a major issue historically in the Santa Clara Valley (2.9-02) but has been mitigated, in part, through monitoring and groundwater management activities (CDWR, 2003).

Groundwater throughout the region is suitable for most urban and agricultural uses with only local impairments. Primary constituents of concern are TDS, nitrate, boron, and organic compounds. Due to the availability of imported surface water supplies, groundwater only supplies approximately five percent of the total water supply demand throughout the hydrologic region. Water quality data from almost 500 public water supply wells indicate that groundwater quality in about 85 percent of the supply wells meets all State primary maximum contaminant levels (MCLs) for drinking water. About 15 percent of the wells have constituents that exceed one or more MCLs (CDWR, 2003).

Groundwater Basins in the Central and Southern CCFO Planning Area

Groundwater basins in the central and southern CCFO Planning Area are located within a portion of the Central Coast Hydrologic Region (designations 3-x on Figure 3.7-1) and include basins/subbasins in Santa Cruz, Santa Clara, San Benito, and Monterey Counties. Aquifer systems range from small inland valleys and coastal terraces to relatively large alluvial valleys (CDWR, 2003).

Groundwater chemistry in the region is characterized by calcium sulfate to calcium-sodium bicarbonate-sulfate water types, related to the marine sedimentary rocks in the region. Seawater intrusion is a major problem in the coastal basins of the region, including basins adjacent to Monterey Bay in the CCFO Planning Area (Figure 3.7-1) (CDWR, 2003). Potential risk of seawater intrusion in one basin along the Monterey Bay was the primary reason for an adjudication of water rights by the courts. This basin, Seaside Groundwater Basin (3-4.08; see Figure 3.7-1), is the only adjudicated basin in the CCFO Planning Area.

The region is heavily reliant on groundwater, providing about 83 percent of the total agricultural and municipal water demand (CDWR, 2003). One basin in the Central Coast Region, Scotts Valley Groundwater Basin (3-27), contains an EPA-designated Sole Source Aquifer (SSA) — the Santa Margarita Aquifer (EPA, 2015b). The SSA Program was established under Section 1424(e) of the Safe Drinking Water Act and identifies aquifers that function as the sole or principal drinking water source of an area with no alternative supplies. The SSA Program has been used by communities to use federally funded projects to assist in protecting an SSA from contamination. The Santa Margarita Aquifer is the only SSA designated in the CCFO Planning Area (EPA, 2015b).

Water quality data collected from about 83 percent of more than 700 public water supply wells indicate that groundwater quality meets State primary MCLs for drinking water. About 17 percent of the wells have constituent concentrations that exceed one or more MCL (CDWR, 2003).

Groundwater Basins along the Eastern CCFO Planning Area Boundary

Groundwater basins along the eastern edge of the CCFO Planning Area include portions of basins and subbasins in the San Joaquin River and Tulare Lake hydrologic regions (basin designations 5-x on Figure 3.7-1). These two hydrologic regions generally cover the San Joaquin Valley, which is the southern portion of the Central Valley of California. Although these regions cover very large groundwater basins, the CCFO Planning Area includes only a few small basins and narrow western segments of the larger San Joaquin Valley basins (Figure 3.7-1). However, these narrow segments are generally hydraulically contiguous with the larger groundwater basins to the east. Aquifers in the San Joaquin Valley basins are relatively thick, extending to depths greater than about 800 feet to 1,000 feet in some areas. Well yields are variable but range up to about 5,000 gpm in the more permeable portions of the San Joaquin Valley. In general, aquifers are thinner and well yields are lower in the portions of the basins within the CCFO Planning Area (CDWR, 2003).

Groundwater typically is of poorer quality along the eastern edge of the CCFO Planning Area due to elevated TDS values and local impacts from nitrates, boron, chloride, and pesticides/herbicides. The basins are heavily reliant on groundwater, accounting for about 30 to 40 percent of the agricultural and municipal water supplies (CDWR, 2003). Most of this groundwater use occurs outside of the CCFO Planning Area.

Groundwater Basins Containing Federal Mineral Estate

Of the 66 groundwater basins and subbasins that partially intersect the CCFO Planning Area, 20 contain Federal mineral estate. These 20 basins/subbasins occur in 7 of the 12 counties in the CCFO Planning Area — Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, and Santa Cruz. In the remaining five counties — San Francisco, San Joaquin, San Mateo, Santa Clara, and Stanislaus — none of the designated groundwater basins or subbasins contain Federal mineral estate (Figure 3.7-1).

As shown on Figure 3.7-1, most of the Federal mineral estate lands lie outside of a groundwater basin or subbasin. Although groundwater also occurs beneath lands outside of groundwater basin or subbasin boundaries, in general groundwater resources are more limited, less used, and not actively managed in these areas. In addition, less information may be available on the quality and quantity of groundwater outside of groundwater basin boundaries.

Table 3.7-2 presents summary information on the 20 groundwater basins and subbasins that contain Federal mineral estate within the CCFO Planning Area. The table identifies the basin and subbasin (if applicable), along with the CDWR-designated basin number included on Figure 3.7-1. Also included is the CCFO Planning Area county in which most of the basin/subbasin resides. Oil and gas fields that intersect a portion of the basin/subbasin are identified by field numbers (see Table 3.7-1 for oil and gas field numbers and names). Table 3.7-2 also includes an estimate of how much groundwater is used in each basin/subbasin (CDWR, 2014a), an amount that varies widely with the size of the basin, local population, and availability of surface water supplies, among other factors. Some of the small, isolated subbasins in the southeastern study area are essentially un-used groundwater basins (e.g., Vallecitos Creek Valley), while one subbasin in the adjacent San Joaquin Valley (e.g., Delta Mendota subbasin) provides more than 500,000 acre-feet per year (AFY) for groundwater supply. However, as shown on Figure 3.7-1, the two high-use subbasins of the San Joaquin Valley are located mostly outside of the CCFO Planning Area; only small segments along the western boundaries occur in the CCFO Planning Area (see subbasin numbers 5-22.07 and 5-22.09 on Figure 3.7-1). For the basins/subbasins contained mostly within the CCFO Planning Area, three subbasins in the Salinas Valley of Monterey County represent the most groundwater use. As shown on Table 3.7-2, each of these three subbasins provide a groundwater supply of more than 100,000 AFY.

Table 3.7-2. Groundwater Basins in the CCFO Planning Area with Federal Mineral Estate

CDWR Groundwater Basin / Subbasin			County[1]	Oil & Gas Field(s) in Basin?		Groundwater Usage (AFY)	CDWR Priority Ranking[2]
Basin Name	Subbasin Name	Number		Y/N	Field No.		
Santa Clara Valley	Niles Cone	2-9.01	Alameda	N	—	29,600	medium
Clayton Valley	—	2-5	Contra Costa	Y	9, 19	189	very low
San Joaquin Valley	Tracy	5-22.15		Y	7	19,198	medium
	Delta-Mendota*	5-22.07	Fresno / Merced	N	—	509,687	high*
	Pleasant Valley	5-22.10	Fresno	Y	20, 21, 22, 23, 24, 26	47,383	low
	Westside*	5-22.09		Y	20, 21, 22, 24, 26	411,534	high*
Cholame Valley	—	3-5	Monterey	N	—	5,011	very low
Lockwood Valley	—	3-6		N	—	4,565	very low
Peach Tree Valley	—	3-32		N	—	902	very low
Salinas Valley	Forebay Aquifer	3-4.04		Y	30	160,000	medium
	Upper Valley Aquifer	3-4.05		Y	30, 33	125,000	medium
	Paso Robles Area*	3-4.06		Y	33	120,215	high*

Table 3.7-2. Groundwater Basins in the CCFO Planning Area with Federal Mineral Estate

CDWR Groundwater Basin / Subbasin			County[1]	Oil & Gas Field(s) in Basin?		Groundwater Usage (AFY)	CDWR Priority Ranking[2]
Basin Name	Subbasin Name	Number		Y/N	Field No.		
Bitterwater Valley	—	3-30	San Benito	N	—	3,023	very low
San Benito River Valley	—	3-28		N	—	946	very low
Gilroy–Hollister Valley	San Juan Bautista Area	3-3.04		N	—	13,530	medium
Hernandez Valley	—	3-31		N	—	0	very low
Panoche Valley	—	5-23		N	—	200	very low
Vallecitos Creek Valley	—	5-71		Y	36	0	very low
Santa Cruz Purisima Formation	—	3-21	Santa Cruz	N	—	15,000	medium
Pajaro Valley*	—	3-2		N	—	67,000	high*

1 - No groundwater basins with Federal mineral estate in San Francisco, San Joaquin, San Mateo, Santa Clara, or Stanislaus Counties.
2 - As part of the CASGEM basin prioritization process.
*Included on the CDWR Draft List of Critically Overdrafted Groundwater Basins, August 6, 2015 (CDWR, 2015b).

In part, because of this relatively low reliance on groundwater, one-half of the 20 basins/subbasins with Federal mineral estate have been assigned a low- to very low-priority ranking by CDWR (Table 3.7-2). The remaining 10 basins/subbasins with Federal mineral estate are assigned a medium to high-priority ranking, which triggers certain groundwater management planning requirements under SGMA. The high-priority groundwater basins/subbasins in Table 3.7-2 have also been included on the recently published Draft List of Critically Overdrafted Groundwater Basins (CDWR, 2015b). However, two of the high-priority basins/subbasins (Delta-Mendota and Westside) and one of the medium-priority basins (Tracy) are located mostly outside of the CCFO Planning Area.

Additional local details on the groundwater basins/subbasins with Federal mineral estate, along with information on current conditions and trends, are provided in the following section.

3.7.4 Current Conditions and Trends

Since 2012, lower-than-normal precipitation has created drought conditions across California. As of August 2015, the National Drought Mitigation Center has categorized more than 95 percent of the State as being under a severe drought and most of the State, including the CCFO Planning Area, categorized being in an extreme or exceptional drought (NDMC, 2015). The snowpack in the Sierra Nevada, which provides storage and runoff for the State's water supply during the dry season, was measured at five percent of average in April 2015, the lowest snowpack in 75 years (Pacific Institute, 2015). Water year 2014 was the driest in 119 years of records and the warmest year on record. These conditions have contributed to reduced streamflows, fallowed agricultural land, a drop in hydroelectric power generation, ecosystem stress or damage, rising water prices, mandatory water conservation programs, and a significant increase in groundwater pumping.

The scarcity of surface water sources has increased reliance on groundwater, and water levels have declined significantly in many areas including portions of the CCFO Planning Area. According to a CDWR map of changes in water levels, water level declines of up to about 25 feet from 2011 to 2013 were typical in wells located in the CCFO Planning Area (CDWR, 2013b). Water level data were limited in the southern CCFO Planning Area, but some of the largest declines in the State were measured several miles east of the southern CCFO Planning Area in the groundwater basins of the San Joaquin Valley. In

some areas of the valley, water levels have declined more than 130 feet during the last four years (USGS, 2015). The increased use of groundwater has also contributed to overdraft conditions, groundwater quality degradation, and land subsidence in local areas throughout the State. A recent study published by NASA indicates that groundwater pumping in the Central Valley has caused land subsidence of over 13 inches from May 2014 to January 2015 in Corcoran, located east of the CCFO Planning Area in Kings County (NASA, 2015).

The current California drought is likely exacerbated by climate change (Williams et al., 2015) and, as a result of climate change, there is a greater than average probability that drought will become more common place for California. Long-term drought not only increases reliability upon groundwater but also can significantly decrease the amount of recharge aquifers receive, which can increase aquifer stress and overdraft. Warmer temperatures resulting from climate change can also mean that precipitation which historically fell as snow will fall as rain in the future resulting in more runoff and less aquifer recharge. As described previously, groundwater basins and subbasins have recently been prioritized as high-, medium-, or low-priority by CDWR as part of the State-wide CASGEM program (see previous descriptions of the CASGEM Program in Sections 3.7.1 and 3.7.2) (CDWR, 2014a). The CASGEM priority rankings for basins with Federal mineral estate are summarized in Table 3.7-2 above. As discussed previously, one criterion of the CASGEM ranking relates to local groundwater impacts including overdraft conditions, seawater intrusion, and other factors relating to groundwater quality degradation. On August 6, 2015, CDWR published a draft list of the State's 21 most critically overdrafted groundwater basins (CDWR, 2015b). Six of those basins are in the CCFO Planning Area and four contain Federal mineral estate. Following a public comment period, these basins may be permanently added to the State list, triggering additional groundwater management actions under SGMA. The six basins on the Draft List of Critically Overdrafted Basins, including the four with Federal mineral estate, are listed below (CDWR, 2015b) and shown on Figures 3.7-2 and 3.7-3.

- Soquel Valley (3-1), Santa Cruz County
- Pajaro Valley (3-2), Santa Cruz and Monterey Counties (contains Federal mineral estate)
- 180/400 Foot Aquifer (3-4.01), Monterey County
- Paso Robles Area (3-4.6), Monterey County (and San Luis Obispo County outside of the CCFO Planning Area) (contains Federal mineral estate)
- Delta-Mendota (5-22.07), Stanislaus, Merced, and Fresno Counties (contains Federal mineral estate)
- Westside (5-22.09), Fresno County (contains Federal mineral estate)

Figures 3.7-2 (northern CCFO Planning Area) and 3.7-3 (southern CCFO Planning Area) show the same groundwater basin/subbasins boundaries as on Figure 3.7-1, but each basin/subbasin is color-coded to represent its respective CASGEM ranking. High-priority and medium-priority basins/subbasins are highlighted in orange and yellow, respectively (Figures 3.7-2 and 3.7-3). The six high-priority basins that are also on the Draft List of Critically Overdrafted Basins are highlighted with orange stripes.

In addition to requirements associated with SGMA and the CASGEM basin prioritization, four counties that are partially or wholly contained within the CCFO Planning Area have adopted groundwater ordinances (CDWR, 2003). These ordinances address local issues relating to groundwater quality or overdraft and often require a permitting process if pumped groundwater is to be exported for use outside of the groundwater basin from which it was pumped. The four ordinances that apply to the CCFO Planning Area are summarized below:

- San Joaquin County – Export permit required
- San Benito County – Overdraft pumping for export prohibited; permit required for off-parcel use or injecting imported water; restrictions on certain pumping impacts on other wells
- Monterey County – Water Resources Agency regulates extraction in areas of seawater intrusion
- Fresno County – Export permit required

This discussion on general groundwater conditions in the CCFO Planning Area focuses on the 20 groundwater basins and subbasins containing Federal mineral estate. The description of each groundwater basin provides basic information on the location, size and geologic setting of the basin and the occurrence of groundwater. Data on groundwater storage, groundwater pumping, and groundwater quality are informative about the magnitude of the resource, its general quality, and its use. This information supports consideration of the importance of a groundwater basin on a statewide basis, recognizing that small, lightly developed, or poor quality basins may have great local significance. Much information was compiled from CDWR's Bulletin 118 Update, California's Groundwater (CDWR, 2003). It is recognized that many basins are carefully managed and monitored, and that substantial additional information is available from local water agencies, which will be considered at the APD stage. However, Bulletin 118 and recent CASGEM data provide consistent, comparable information for all groundwater basins/subbasins in the CCFO Planning Area.

The information presented on Figure 3.7-1 has been repeated at different scales on Figures 3.7-2 (northern area) and 3.7-3 (southern area) to better identify key features regarding boundaries of BLM parcels, oil and gas fields, and groundwater basins/subbasins.

The 13 oil and gas fields that contain Federal mineral estate (shown in bold on Table 3.7-1) are located throughout the CCFO Planning Area, but most of these fields occur in the southern area (Figure 3.7-3). As previously noted, the southern area also contains the largest portion of Federal mineral estate, including the location of the leases subject to the settlement agreement. The three fields with Federal mineral estate in the northern area consist of gas fields (one abandoned) in Contra Costa County (Table 3.7-1 and Figure 3.7-2). Most of the remaining oil and gas fields with Federal mineral estate occur in the southern area along the western flank of the San Joaquin Valley (western Fresno County), along the southern Salinas Valley of Monterey County, or throughout the hills of the Coast Ranges in southern San Benito County. Regional cross sections of these three geologic settings have been prepared by DOGGR and are reproduced, in part, on Figure 3.7-4. The locations of the cross sections are shown on Figure 3.7-3. Although these cross sections are relatively old, they adequately represent the subsurface depths and conditions for the purposes of this groundwater analysis. Specific oil and gas fields represented on the cross sections include the Vallecitos field in San Benito County, the San Ardo field in Monterey County, and the Coalinga field (including East Side, West Side, and the East Coalinga Extension fields) in western Fresno County (Figure 3.7-4).

Recent oil and gas development has been concentrated in four existing fields in the CCFO Planning Area: Coalinga and Jacalitos fields in western Fresno County and San Ardo and Lynch Canyon fields in Monterey County (Figures 3.7-3 and 3.7-4). Federal mineral estate occurs in each of these fields except for the Lynch Canyon field. In addition, a portion of each of these fields occurs in a groundwater basin (Table 3.7-1 and Figure 3.7-3). Based on DOGGR's well stimulation disclosures, there were 903 well stimulation treatments, including hydraulic fracturing, completed in California between January 2, 2014 and June 22, 2015. These well stimulation treatments were conducted in 12 oil and gas fields in California, none of which are within the CCFO Planning Area. Therefore, the source and volume of water needed for potential future hydraulic fracturing in these four fields is uncertain. However, since each of these four fields is located, at least in part, within a groundwater basin, there is the potential that groundwater will be used to support oil and gas operations including hydraulic fracturing. As discussed more fully in Section 4.7.2, the average amount of water required for hydraulic fracturing in California is approximately 140,000 gallons per well, an amount equivalent to 0.4 AF (CCST, 2015a). For context, this amount is similar to the average annual household water use of 153,000 gallons (CCST, 2015a). In addition, the amount is small compared to the amount of groundwater being used in most groundwater basins (Table 3.7-2). However, two of the fields which include Federal mineral estate are within portions of critically overdrafted basins: the Coalinga field is within a portion of the Westside subbasin (5-22.09) and the San Ardo field is within a portion of the Paso Robles Area subbasin (3-4.06).

As described more fully in Section 4.7.2, CCST compiled water use data for 1,760 hydraulic fracturing events conducted in California from 2011 through June 2014 (CCST, 2015a). During this time, there was only one hydraulic fracturing event in the CCFO Planning Area, located in the Guijarral Hills field in Fresno County. This hydraulic fracturing event used 2,123,268 gallons (6.5 AF) of water (CCST, 2015a, Appendix O), which is significantly above the average per well water use (0.4 AF). The Guijarral Hills field contains Federal mineral estate and is within a portion of the Westside subbasin (5-22.09), a critically overdrafted basin (CDWR, 2015b).

For groundwater basins/subbasins that intersect portions of the 13 oil and gas fields on Federal mineral estate, additional information has been compiled to examine the subsurface relationships between usable groundwater and hydrocarbon-bearing zones. It is noted that the depth of the usable groundwater zones has not been identified over most of the CCFO Planning Area. To address this data gap near existing oil and gas fields, relevant available information has been examined. The depth to the base of fresh groundwater at each oil and gas field has been tabulated based on data published by DOGGR. The depths to the productive hydrocarbon zones have been compiled, with an emphasis on the shallow-most producing zone — assumed to be the zone closest to usable groundwater. In addition, available salinity data for water produced from the hydrocarbon zones (referred to as produced water) have been evaluated. Although hydrocarbon zones are exempt from the definition of usable groundwater, lower salinity values in produced water may indicate that usable groundwater (<10,000 mg/L TDS) is in close vertical proximity to the hydrocarbon zones. These data sets are pertinent to the analysis of potential impacts to usable groundwater from oil and gas production and hydraulic fracturing. This assertion is based on the simple supposition that less vertical separation between usable groundwater and hydrocarbon-bearing zones can suggest a greater potential for adverse impacts; conversely, greater separation may indicate a lesser potential for adverse impacts. This assumption and the accompanying impacts analysis are discussed in more detail in Section 4.7.

As discussed in Section 3.7.2, Regulatory Framework, aquifers can be designated by EPA and DOGGR as exempt as part of the UIC program to allow injection of wastewater into aquifers. By definition, exempt aquifers do not contain usable water. Exempt aquifers typically underlie the freshwater zone, overlie hydrocarbon zones, and usually do not extend laterally beyond the oil and gas field. There are some cases where exempt aquifers extend to the surface.

As summarized below in Table 3.7-3, there are nine exempt aquifers associated with six oil and gas fields within the CCFO Planning Area. Two of the oil and gas fields, Coalinga and San Ardo, contain more than one exempt aquifer. The tops of the exempt aquifers are relatively shallow in the CCFO Planning Area (1,400 feet deep or less) and extend to the surface within portions of the Coalinga fields. The cross sections on Figure 3.7-4 illustrate the vertical extent of the exempt aquifers within the San Ardo and Coalinga fields. Exempt aquifers are exempted from usable water by definition in the BLM final rule (43 CFR Part 3160).

Table 3.7-3. Exempt Aquifers in the CCFO Planning Area

Oil and Gas Field	Exempt Aquifer Formation Name (Geologic Age)	Depth to Top of Exempt Aquifer (feet below ground surface)
Coalinga	Santa Margarita (Miocene)	surface (to 1,500 feet)
Coalinga	Etchegoin-Jacalitos Undifferentiated (Pliocene)	surface (to 500 feet)
Guijarral Hills	Etchegoin-Jacalitos Undifferentiated (Pliocene)	1,400
Kettleman North Dome	San Joaquin–Etchegoin (Pliocene)	1,000
Jacalitos	Etchegoin-Jacalitos Undifferentiated (Pliocene)	<1,000
San Ardo	Santa Margarita (Miocene)	900
San Ardo	Monterey (Miocene) D Sand	1,200
San Ardo	Monterey (Miocene) E Sand	1,300
Monroe Swell	Santa Margarita (Miocene)	800

Descriptions of Groundwater Basins with Federal Mineral Estate

There are 20 groundwater basins overlain by Federal mineral estate in the CCFO Planning Area. To facilitate the discussion of groundwater in these basins/subbasins, the information is organized by County. Where basins/subbasins cross county lines, the information is included in the county where most of the basin/subbasin resides. For any of these 20 basins/subbasins that also contain at least a portion of an oil and gas field, data from those fields are also discussed. Data for the 20 basins/subbasins are summarized in Table 3.7-2. Information on the 13 oil and gas fields with Federal mineral estate is included in Table 3.7-4, which includes data used to examine the subsurface relationships between usable groundwater and hydrocarbon zones beneath Federal mineral estate, where data exist for both zones. Data from Table 3.7-4 are discussed with the groundwater basin/subbasin in which they occur. Exempt aquifers for the 13 oil and gas fields, if any, are also mentioned.

Alameda County

Santa Clara Valley, Niles Cone Subbasin (2.9-01). The Niles Cone groundwater subbasin is in southern Alameda County and has a surface area of 103 square miles (Figure 3-7.2). The subbasin is bounded by Alameda County Water District boundaries on the north, the Santa Clara County border on the south, the Diablo Range on the east, and the San Francisco Bay on the west. The subbasin is dominated by an alluvial fan that was formed by Alameda Creek as it flowed toward the San Francisco Bay. The Hayward Fault impedes the flow of groundwater from west to east and separates the subbasin into two parts. The east side of the Hayward Fault is composed of one relatively homogeneous sand and gravel aquifer while the west side of the Hayward Fault is composed of a series of gently dipping aquifers separated by extensive clay aquitards. Artificial recharge projects on the west side of the Hayward Fault since the 1960s have resulted in significant groundwater level recovery. Municipal/irrigation wells are, on average, approximately 2,000 feet deep and yield between approximately 650 and 3,000 gpm. Groundwater in storage in 1999-2000 was estimated to be 38,000 AF (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Niles Cone subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-SFBR, 2015). CDWR estimates groundwater use in the basin at 29,600 AFY and has assigned a medium-priority ranking to the subbasin as part of the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 286 to 39,734 mg/L and averages 2,204 mg/L. TDS concentrations are highest along San Francisco Bay (CDWR, 2003).

The Niles Cone Subbasin does not contain any oil and gas fields with Federal mineral estate.

Contra Costa County

As shown on Figure 3.7-2 and Table 3.7-2, the groundwater basins on Federal mineral estate in Contra Costa County include the Clayton Valley groundwater basin and the Tracy subbasin.

Clayton Valley (2-5). The Clayton Valley basin is in northern Contra Costa County along the south side of Suisun Bay and has a surface area of 28 square miles (Figure 3.7-2). The basin is bounded by Mt. Diablo Creek on the east, the Concord Fault to the west, and the Mt. Diablo foothills to the south. The Pittsburg Plain basin (2-4) lies to the northeast, and the Ygnacio Valley basin (2-6) borders the basin on the southwest. Water bearing units consist of Recent and older alluvium with a combined thickness of

Table 3.7-4. Relationship Between Fresh Water and Hydrocarbon Zones in the CCFO Planning Area for Fields with Federal Mineral Estate

County[1]	Oil and Gas Field Name	Oil and Gas Field Number	Depth to Base of Fresh Water[2] (feet)	Depth to Hydrocarbon Zone (feet)		Difference Between Base of Fresh Water and Top of Hydrocarbon Zone (feet)	Water Salinity of Hydrocarbon Zone		TDS <10,000 mg/L? (Y/N)
				Upper	Lower		NaCl (mg/L)	TDS (mg/L)	
Contra Costa	Dutch Slough Gas	7	800	7,000	8,100	6,200	325–4,622	—	Y
	Los Medanos Gas	9	150-1,000	2,800	4,300	1,800–2,650	10,800	—	N
	Willow Pass Gas (abandoned)	19	150	1,500	3,100	1,350	—	—	
Fresno	Coalinga	20	2,100	500	700	500	1,600	5,700–6,800	Y
	Coalinga, East Extension	21	2,100	6,400	8,000	4,300	500	2,600	Y
	Guijarral Hills	22	2,000-3,250	7,900	10,700	4,650–5,900	2,400–7,870	4,500–9,300	Y
	Jacalitos	23	550	3,400	—	2,850	8,700–9,900	9,400–11,800	Y
	Kettleman North Dome	24	—	6,000	11,700	—	7,100–33,000	8,900–33,900	Y
	Pleasant Valley	26	2,300	6,644	9,144	4,344	11,300	15,700	N
Monterey	Monroe Swell	30	1,300-2,000	2,000	3,200	700–1,900	3,500	4,800–5,300	Y
	Quinado Canyon (abandoned)	32	1,800	2,030	—	230	4,200	—	Y
	San Ardo	33	1,000	2,000	2,400	1,000	1,700–6,000	4,300	Y
San Benito	Vallecitos	36	100-500	1,040	5,350	540–940	1,100–3,600	8,100–8,200	Y

1 - No oil and gas fields within Federal mineral estate in Alameda, San Mateo, Santa Clara Counties.
2 - Range provided, where available.

over 700 feet. Aquifers are hydrologically connected to Suisun Bay. The older alluvial deposits are at the surface in the southern portion of the basin and provide the primary groundwater supply. The younger alluvial deposits consist of soft muds, peat, and loose sand located along the Suisun Bay (CDWR, 2003).

The Basin Plan lists municipal and domestic supply as beneficial uses for groundwater in the Clayton Valley basin (CRWQCB-SFBR, 2015). CDWR estimates groundwater use in the basin at 189 AFY and has assigned the basin with a very low-priority ranking (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 328 to 864 mg/L and average 472 mg/L. Municipal and irrigation well yields average 200 gpm and are drilled to depths of 80 to 540 feet (average 209 feet). Domestic well depths range from 40 to 605 feet (average 217 feet) (CDWR, 2003).

The Clayton Valley groundwater basin intersects two oil and gas fields that contain Federal mineral estate — Los Medanos Gas and Willow Pass Gas (abandoned). As summarized on Table 3.7-4, the depth to the base of fresh water within these oil and gas fields ranges from 150 to 1,000 feet. The depth to the shallowest hydrocarbon zone ranges from about 1,500 to 2,800 feet. In the hydrocarbon zone, sodium chloride concentrations are 10,800 mg/L. The vertical separation between the base of fresh water and the top of the hydrocarbon zone ranges from 1,350 to 2,650 feet. Based on reported depths and salinity in the fields, the base of usable groundwater likely occurs within this zone (see Appendix J in DOC, 2015; DOC, 1998).

San Joaquin Valley, Tracy Subbasin (5-22.15). The Tracy subbasin has a surface area of 539 square miles (Figure 3.7-2). The subbasin is also in San Joaquin and Contra Costa Counties. The Mokelumne and San Joaquin rivers lie to the north, the San Joaquin River is to the east, the Diablo Range lies to the west, and the San Joaquin–Stanislaus County line is to the south. The Eastern San Joaquin subbasin (5-22.01) lies to the east, the Delta-Mendota subbasin (5-22.07) lies to south, and the Solano (5-21.66) subbasin of the Sacramento Valley groundwater basin lies to the north (CDWR, 2003).

Water bearing units consist of younger alluvium, flood basin, older alluvium, and Tulare Formation deposits. The alluvium is less than 100 feet thick and has high well yields if saturated. The flood basin deposits can be up to 1,400 feet thick, occur in the northern two-thirds of the subbasin, and have low well yields. The older alluvial fan deposits are 150 feet thick, occur at the surface between the foothills of the Coast Ranges and the Sacramento–San Joaquin Delta, and have moderate to high permeability. The Tulare Formation is about 1,400 feet thick, crops out in the Coast Range foothills in the western portion of the subbasin, and dips eastward toward the valley axis. The Corcoran Clay is found at the top of the Tulare Formation and confines the underlying deposits. The eastern limit of the Corcoran Clay is near the eastern boundary of the basin. Larger wells are screened below the Corcoran Clay and can yield 3,000 gpm while smaller wells may be screened above the clay layer but water quality is generally poorer. The storage capacity for the Tracy-Patterson Storage Unit (which includes the southern portion of the Tracy subbasin) was estimated to be 4,040,000 AF (CDWR, 2003).

The Basin Plan lists groundwater beneficial uses in the Tracy subbasin as municipal, domestic, agricultural, and industrial service supply (CRWQCB-CVR, 2011). CDWR estimates groundwater use in the subbasin at 19,198 AFY and has assigned a medium CASGEM groundwater priority ranking to the subbasin (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from 210 to 7,800 mg/L and average 1,190 mg/L. Municipal and irrigation wells are drilled to depths of 60 to 1,020 feet (average 352 feet) and yields are generally between 500 and 3,000 gpm. Domestic well depths range from 44 to 665 feet (average 188 feet) (CDWR, 2003).

The Tracy subbasin contains one oil and gas field on Federal mineral estate — Dutch Slough Gas. As summarized on Table 3.7-4, the depth to the base of fresh water within this oil and gas field is estimated at 800 feet. The depth to the hydrocarbon zone is 7,000 feet. The vertical separation between the base of fresh water and the top of the hydrocarbon zone is estimated at 6,200 feet thick. In the hydrocarbon zone, sodium chloride concentrations of produced water range from 325 to 4,622 mg/L. Although these con-

centrations would be expected to be lower than TDS concentrations, the values indicate relatively low salinities and may also indicate a deep zone of usable groundwater in this area (see Appendix J in DOC, 2015; DOC, 1998).

Fresno County

As shown on Figure 3.7-3, three subbasins of the San Joaquin Valley are the primary groundwater basins/ subbasins for the Fresno County portion of the CCFO Planning Area. As shown on the map, only a small portion of the Delta Mendota (5-22.07) and Westside (5-22.09) subbasins are contained within the CCFO Planning Area, but the entire northern half of the Pleasant Valley subbasin (5-22.10) is included. (Note that Pleasant Valley is the name of both a groundwater subbasin and an oil and gas field). A small portion of the Panoche Valley groundwater basin (5-23) is also located in Fresno County, but because it lies primarily within San Benito County, it is described below with other San Benito County basins/subbasins.

San Joaquin Valley, Delta-Mendota Subbasin (5-22.07). The Delta-Mendota groundwater subbasin covers 1,170 square miles in Stanislaus, Merced, Madera, and Fresno Counties (Figure 3.7-3). The subbasin is bounded on the west by the Coast Ranges, on the north by the Stanislaus/San Joaquin County line and the Tracy subbasin (5-22.15), on the south by the Fresno County line and the Westside subbasin (5-22.09), and on the east by the San Joaquin River and the Modesto (5-22.02), Turlock (5-22.03), Merced (5-22.04), Chowchilla (5-22.05), and Madera (5-22.06) subbasins. Only a narrow segment along the subbasin western boundary is included in the CCFO Planning Area (CDWR, 2003).

Historically, groundwater flow has been to the northwest, parallel to the San Joaquin River. Data published by CDWR in 2000 indicate that groundwater flows to the north and east, toward the San Joaquin River. Groundwater is present in the lower and upper zones of the Tulare Formation and the overlying shallow deposits where depth to water is approximately 25 feet. Thicknesses of these units are not available. Municipal/irrigation well depths are up to 800 feet and yield up to 5,000 gpm. Based on estimates completed in 1995, the total storage capacity is 30.4 million AF in the upper 300 feet and is 81.8 million AF to the base of fresh water (depth not available). In 1995, the estimated volume of groundwater in storage in the upper 300 feet was estimated to be 26.6 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Delta-Mendota subbasin as municipal, domestic, agricultural, and industrial supply, non-contact recreation, and wildlife habitat (CRWQCB-CVR, 2011). CDWR estimates groundwater use in the subbasin at 509,687 AFY (CDWR, 2014a). The subbasin has been assigned a high-priority ranking for the CASGEM basin prioritization program (CDWR, 2014a) and has also been placed on the Draft List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2015b). TDS concentrations range from approximately 200 to 6,000 mg/L, and are typically between 700 and 1,000 mg/L. Saline groundwater occurs within the upper 10 feet of ground surface in a large portion of the subbasin (CDWR, 2003).

The Delta-Mendota subbasin does not contain any oil and gas fields with Federal mineral estate.

San Joaquin Valley, Pleasant Valley Subbasin (5-22.10). The Pleasant Valley groundwater subbasin covers 227 square miles in southern Fresno County and western Kings County (Figure 3.7-3). The subbasin is bounded on the north and west by the Coast Ranges, on the east by the Kettleman Hills and the Westside and Tulare Lake subbasins, and on the south by the Kern County subbasin. The water bearing units include the alluvium and Tulare Formation, both of which are up to 300 feet thick. These units are underlain by the San Joaquin Formation. The Pleasant Valley Subbasin is shown conceptually on the lower cross section on Figure 3.7-4. Municipal/irrigation wells are up to approximately 1,800 feet deep and yield up to 3,300 gpm. The total storage capacity is estimated to be 14.1 million AF and the estimated groundwater in storage to a depth of 1,000 was estimated in 1961 to be 4 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Pleasant Valley subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the subbasin at

47,383 AFY and has assigned the subbasin a low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations range from approximately 1,000 to 3,000 mg/L (CDWR, 2003).

The Pleasant Valley subbasin contains six active oil and gas fields with Federal mineral estate — Coalinga, Coalinga East Extension, Guijarral Hills, Jacalitos, Kettleman North Dome, and Pleasant Valley (note that Pleasant Valley is the name of both a groundwater subbasin and an oil and gas field). The geologic setting for these fields on the western flank of the San Joaquin Valley is illustrated by the regional cross section at the bottom of Figure 3.7-4. As summarized in Table 3.7-4, the depth to the base of fresh water ranges from ground surface to 3,250 feet across these fields. The depth to the top of the hydrocarbon zone ranges from about 500 feet (above portions of the subbasin) to about 7,900 feet. In the hydrocarbon zone, sodium chloride concentrations range from 500 to 33,000 mg/L and TDS ranges from 2,600 to 33,900 mg/L. The vertical separation between the base of the fresh water and the top of the hydrocarbon zone ranges from about 500 to 5,900 feet. The wide range in TDS values, depths, and separation between fresh water and hydrocarbons reflects the variable locations of the fields with respect to the groundwater basin (see Figure 3.7-4). Available data corroborate the relatively high TDS values in groundwater reported in the basin and the dip of the hydrocarbon zones from east to west (see Appendix J in DOC, 2015; DOC, 1998).

Although the Coalinga, Guijarral Hills, Jacalitos, and Kettleman North Dome oil and gas fields contain exempt aquifers, none of the exemptions appear to apply to the water-bearing zones in the alluvium or the Tulare Formation (see Table 3.7-3). The underlying San Joaquin Formation is included in the exempt aquifers and may reflect an absence of usable water in the deeper Pleasant Valley subbasin zones.

San Joaquin Valley, Westside Subbasin (5-22.09). The Westside subbasin covers 1,000 square miles in western Fresno County and western Kings County (Figure 3.7-3). The subbasin is bounded on the north by the Delta-Mendota subbasin, on the east by the San Joaquin River, Fresno Slough, and the Kings subbasin, on the southeast by the Tulare Lake subbasin, on the southwest by the Pleasant Valley subbasin, and on the west by the Coast Range foothills. Similar to the Delta-Mendota subbasin, only a narrow segment along the west side of the subbasin is contained within the CCFO Planning Area (CDWR, 2003).

The water bearing units include continental deposits that form an unconfined to semi-confined upper aquifer above the Corcoran Clay aquitard and a confined lower aquifer below the Corcoran Clay. The top of the Corcoran Clay is at a depth ranging from 500 to 850 feet and the lower aquifer is approximately 1,200 feet thick from the average base of the Corcoran Clay to the average base of fresh water. Municipal/irrigation well depths are up to 3,000 feet deep and yield up to 2,000 gpm. The storage capacity of the upper and lower aquifers were estimated to be approximately 36.5 and 65 million AF, respectively. In 1961, the volume of groundwater in storage to a depth of 1,000 feet was estimated to be approximately 52 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Westside subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the subbasin at 411,534 AFY (CDWR, 2014a). The subbasin has been assigned a high-priority ranking for the CASGEM program (CDWR, 2014a) and has also been placed on the Draft List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2015b). TDS concentrations typically range from approximately 220 to 1,300 mg/L, but can exceed 10,000 mg/L in some places (CDWR, 2003).

The Westside subbasin contains portions of five active oil and gas fields on Federal mineral estate — Coalinga, Coalinga East Extension, Guijarral Hills, Kettleman North Dome, and Pleasant Valley. These fields and the subsurface relationships of groundwater and hydrocarbons beneath them are included in the previous description of the Pleasant Valley subbasin (5-22.10). Exempt aquifers beneath these fields are summarized in Table 3.7-3. The presence of exempt aquifers beneath these fields makes the zone of usable water less certain.

Merced County

As shown on Figures 3.7-2 and 3.7-3, the San Joaquin Valley, Delta-Mendota subbasin is the only groundwater basin with Federal mineral estate in the CCFO Planning Area portion of Merced County. The Delta-Mendota subbasin is also located in Fresno County and is described above.

Monterey County

Cholame Valley (3-5). Cholame Valley groundwater basin has a surface area of approximately 62 square miles and is located in the Coast Ranges of southern Monterey County and northern San Luis Obispo County (Figure 3.7-3). Groundwater flow direction is to the southeast. Based on CDWR's review of 18 well completion logs in the basin, wells are from 100 to 665 feet deep and penetrate both alluvial and consolidated rocks. Most of the well completion reports are for domestic wells. Wells in the basin yield an average of 1,000 gpm, but can yield up to 3,000 gpm (CDWR, 2003).

The Basin Plan lists beneficial uses for the Cholame Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 5,011 AFY and has assigned the basin a very low-priority ranking under the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The basin does not intersect any existing oil and gas fields with Federal mineral estate.

Lockwood Valley (3-6). Lockwood Valley groundwater basin has a surface area of approximately 94 square miles and is located in the Coast Ranges west of Salinas Valley in southern Monterey County (Figure 3.7-3). Groundwater is present in the unconsolidated alluvium along the San Antonio River and in the terrace deposits. Domestic wells are up to 30 feet deep, while municipal/irrigation wells are up to 1,000 feet deep and yield an average of 100 gpm. Based on well completion reports, the depth to water ranges from approximately 10 to 150 feet. The groundwater storage capacity is approximately 1 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for the Lockwood Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 4,565 AFY and has assigned the basin a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The basin does not contain any existing oil and gas fields with Federal mineral estate.

Peach Tree Valley (3-32). The Peach Tree Valley groundwater basin is a narrow northwest-southeast trending basin approximately 21 miles long and less than 1 mile wide mostly within Monterey County (Figure 3.7-3). The basin is composed primarily of Quaternary alluvium with well depths ranging from 60 to 117 feet, based on four well completion reports. Based on well completion reports for wells drilled between 1953 and 1997, groundwater levels ranged from 35 to 65 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for the Peach Tree Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 902 AFY and has assigned the basin a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Peach Tree Valley basin does not contain oil and gas fields with Federal mineral estate.

Salinas Valley, Forebay Aquifer Subbasin (3-4.04). The Salinas Valley groundwater basin contains eight subbasins, three of which contain Federal mineral estate including the Forebay Aquifer (3-4.04), Upper Valley Aquifer (3-4.05), and Paso Robles Area (3-4.06) subbasins (Figure 3.7-3). The Forebay Aquifer subbasin covers approximately 147 square miles in the central portion of the Salinas Valley. The subbasin is located between the 180/400 Foot Aquifer and Eastside Aquifer subbasins to the north, the

Upper Aquifer subbasin to the south, and surrounded by the Gabilan Range on the east and the Sierra de Salinas on the west. The Forebay Aquifer subbasin was once split into the Upper Forebay area (formerly basin number 3-4.04) and the Lower Forebay area (formerly basin number 3-4.03), but has been combined into one subbasin (CDWR, 2003).

Groundwater flow direction is to the northwest, along the axis of the valley. The primary water bearing units are the 180-Foot Aquifer and the 400-Foot Aquifer. The average thickness of the 180-Foot Aquifer and 400-Foot Aquifer is 100 and 200 feet, respectively. There is a deeper aquifer, the 900-Foot Aquifer or the Deep Aquifer, which has not been significantly developed. Municipal/irrigation well depths range from 120 to 807 feet and average 349 feet. The subbasin has an estimated 5.7 million AF of groundwater storage capacity and in 1994, there was approximately 4.5 million AF in storage. According to CDWR, 2003, the depth to the base of fresh water ranges from approximately 200 feet at the eastern Valley margin to 2,200 feet at the western Valley margin (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Forebay Aquifer subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 160,000 AFY and has assigned the subbasin a medium-priority ranking under the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations for groundwater range from 300 to 1,100 mg/L (CDWR, 2003).

The subbasin contains a portion of one oil and gas field with Federal mineral estate — Monroe Swell. As summarized in Table 3.7-4, the depth to the base of fresh water within the Monroe Swell field is estimated at 1,300 feet to 2,000 feet. The depth to the top of the hydrocarbon zone ranges from approximately 2,000 to 3,200 feet. Because the shallowest hydrocarbon zone depth (2,000 feet) is located in an area where the reported base of the fresh water is 1,300 feet deep, the smallest vertical separation between the base of fresh water and the top of the hydrocarbon zone is estimated at about 700 feet. Deeper zones in other parts of the field provide an estimated vertical separation of about 1,900 feet. In the hydrocarbon zone, a sodium chloride concentration is reported at 3,500 mg/L and TDS ranges from 4,800 mg/L to 5,300 mg/L. These salinities are in the range of TDS values for usable groundwater. The reported depths and TDS values associated with the Monroe Swell field indicate that usable groundwater may be in close proximity to hydrocarbon-bearing zones unless this zone contains an exempt aquifer (see Appendix J in DOC, 2015; DOC, 1998).

There is an exempt aquifer beneath the Monroe Swell field within the Santa Margarita Formation (Miocene), reported at an average depth of 800 feet. With the base of fresh water reported beneath the field at an average depth of 1,300 feet to 2,000 feet, the two zones appear to overlap. This may not be the case because the depths represent averages throughout the field.

Salinas Valley, Upper Valley Aquifer Subbasin (3-4.05). The Upper Valley Aquifer subbasin has a surface area of approximately 153 square miles located in the central/southern region of the Salinas Valley groundwater basin, between the Forebay Aquifer (3-4.04) and Paso Robles Area (3-4.06) subbasins (Figure 3.7-3). The subbasin is surrounded by the Gabilan Range on the east and the Sierra de Salinas and Santa Lucia Range on the west. Groundwater flow direction is to the northwest, along the axis of the valley. The primary aquifer is unconfined and within the Paso Robles Formation, alluvial fan and river deposits. Municipal/irrigation well depths range from 93 to 600 feet and average 235 feet. The subbasin has an estimated 3.1 million AF of groundwater storage capacity and in 1994, there was approximately 2.5 million AF in storage (CDWR, 2003). According to CDWR, 2003, the depth to the base of fresh water ranges from approximately 200 feet in the southern area of the subbasin to approximately 1,000 feet in the northern area of the subbasin.

The Basin Plan lists beneficial uses for groundwater in the Upper Valley Aquifer subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 125,000 AFY, and has assigned the subbasin a medium-priority ranking in the

CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). As a result of poor quality surface water recharge from the Gabilan Range, groundwater along the eastern side of the subbasin has elevated TDS concentrations. TDS in the basin ranges from approximately 140 to 3,700 mg/L (CDWR, 2003).

The subbasin contains portions of two oil and gas fields involving Federal mineral estate: Monroe Swell and San Ardo. Details on the Monroe Swell field are summarized in the description of the Forebay Aquifer subbasin included above. The regional geologic setting of the San Ardo field is represented on a cross section across the Salinas Valley on Figure 3.7-4. As summarized on Table 3.7-4, the depth to the base of fresh water at the San Ardo field is reported to be 1,000 feet. The depth to the top of the hydrocarbon zones ranges from about 2,000 feet to 2,400 feet (Table 3.7-4). The vertical separation between the base of the fresh water and the top of the hydrocarbon zone is estimated at about 1,000 feet. In the hydrocarbon zone, sodium chloride concentrations range from 1,700 to 6,000 mg/L with a TDS value of 4,300 mg/L reported for a portion of the main area in the field. TDS and depth data indicate that usable groundwater is likely in close proximity to the hydrocarbon zones (see Appendix J in DOC, 2015; DOC, 1998).

There are four exempt aquifers beneath the San Ardo and Monroe Swell oil and gas fields, which may reduce the amount of usable water in the zone between the base of fresh water and the shallow hydrocarbons estimated above. Three of these exempt aquifers are below the San Ardo field. As summarized on Table 3.7-3, the depth to the top of the exempt aquifers beneath these fields varies from 800 feet (beneath the Monroe Swell field) to 900 feet (beneath the San Ardo field). The exempt aquifers are located either in the Santa Margarita Formation (Miocene) or the Monterey D and E Sand Formations (Miocene). As indicated by the conceptual cross section of the San Ardo field on Figure 3.7-4, the exempt aquifers in the Miocene-aged units do not appear to intersect the fresh water zone beneath the San Ardo field.

Salinas Valley, Paso Robles Area Subbasin (3-4.06). The Paso Robles Area subbasin covers approximately 932 square miles in both Monterey and San Luis Obispo Counties immediately south of the Upper Aquifer Valley subbasin (Figure 3.7-3). The subbasin is bounded on the south by the La Panza Range, on the east by the Temblor Range, and on the west by the Santa Lucia Range. Groundwater flow direction is to the northwest. The Paso Robles Formation is the primary water-bearing unit and reaches a thickness of up to 2,000 feet. The shallow alluvium, which ranges from 30 to 130 feet thick, has well yields that can exceed 1,000 gpm. In general, well yields in the subbasin range from 500 to 3,300 gpm. Estimates of storage capacity in the subbasin vary. CDWR, 1975, estimates total storage capacity to be 6.8 million AF whereas Fugro West, 2001, estimates storage capacity at more than 30.4 million AF. The average annual groundwater in storage between 1980 and 1997, as estimated by Fugro West, 2001, was 30.5 million AF (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Paso Robles Area subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 120,215 AFY and has assigned the basin a high-priority ranking in the CASGEM basin prioritization program (CDWR, 2014a). As previously mentioned, the basin has also been placed on the recently published Draft List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2015b). According to CDWR, TDS concentrations range from 346 to 1,670 mg/L and average 614 mg/L (CDWR, 2003).

The Paso Robles Area subbasin contains a portion of the San Ardo field, a small area of which occurs on Federal mineral estate. Data from this oil and gas field are included in the description of the Upper Valley Aquifer subbasin (3-4.05), provided above.

San Benito County

As shown on Table 3.7-2 and Figure 3.7-3, the groundwater basins on Federal mineral estate in San Benito County are Bitterwater Valley, San Benito River Valley, Gilroy–Hollister Valley, Hernandez Valley, Panoche Valley, and Vallecitos Creek Valley.

Bitterwater Valley (3-30). The Bitterwater Valley basin is in the Coast Ranges and consists of several valleys bounded by the Bear Valley Fault to the north and the San Andreas Fault Zone to the east. The basin is up to 18 miles long and 6 miles wide in the southwestern portion of the County and covers 50 square miles (Figure 3.7-3). Middle or lower Pliocene marine rocks bound the basin to the south and west. The valley areas consist of Quaternary alluvium and Plio-Pleistocene nonmarine rock. Groundwater flow is generally south to the Salinas River Valley. Well depths range from 67 to 390 feet and average 187 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Bitterwater Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the basin at 3,023 AFY and has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Bitterwater Valley basin does not contain any oil and gas fields with Federal mineral estate.

San Benito River Valley (3-28). San Benito River Valley groundwater basin has a surface area of approximately 38 square miles and is located within the San Benito River Valley (Figure 3.7-3). The basin is bounded by fault contacts and there is no information about groundwater flow within or across basin boundaries. Based on CDWR's review of 33 well completion reports, well depths ranged from 36 to 600 feet and well yields were up to 2,000 gpm. Groundwater levels ranged from four to 59 feet based on well completion reports for wells constructed between 1955 and 1989 (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the San Benito River Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011).CDWR estimates groundwater use in the basin at 946 AFY and has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The San Benito River Valley basin does not contain oil and gas fields with Federal mineral estate.

Gilroy–Hollister Valley, San Juan Bautista Area Subbasin (3-3.04). The San Juan Bautista Area subbasin encompasses 116 square miles in the southwest portion of the of the Gilroy-Hollister basin in northern San Benito County (Figure 3.7-3). The Sargent Fault and anticline and the Bolsa subbasin lie to the north, the San Andreas Fault and the Gabilan Range are to the southwest, and the Calaveras Fault and Hollister subbasin are to the east. Groundwater occurs in alluvium and Purisima Formation. Alluvial thickness ranges from 0 to 300 feet and the Purisima Formation thickness can range from the surface to several thousand feet. Consolidated rocks of the Jurassic age are believed to underlie the Purisima Formation (CDWR, 2003).

The Calaveras and Sargent faults that bound the subbasin restrict groundwater movement. The storage capacity of the entire Gilroy-Hollister basin is estimated at 932,000 AF but groundwater storage information for the subbasin is not readily available from CDWR. Well yields average 400 gpm. Groundwater generally flows to the northwest (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the San Juan Bautista Area subbasin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR estimates groundwater use in the subbasin at 13,530 AFY and has assigned a medium-priority ranking to the subbasin for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The San Juan Bautista Area subbasin does not contain any oil and gas fields with Federal mineral estate.

Hernandez Valley (3-31). The Hernandez Valley basin is a small 4-square-mile basin (2,860 acres) in the Coast Ranges in southern San Benito County (Figure 3.7-3). Pliocene marine rocks lie to the northeast, the Franciscan Formation forms the northwest boundary, Lower Miocene marine sediments are to the north, and Upper Cretaceous marine sediments are to the south and southwest. The basin consist of alluvium and a small area of nonmarine terrace deposits. The Hernandez Reservoir occupies most of the southern basin. Well depths range from 20 to 160 feet and average 58 feet (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Hernandez Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011), although CDWR data indicate very low groundwater use in the basin (<100 AFY) (CDWR, 2014a). The basin is assigned a very low-priority ranking in the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Hernandez Valley basin does not contain any oil and gas fields with Federal mineral estate.

Panoche Valley (5-23). The Panoche Valley basin encompasses 52 square miles in the Coast Ranges in eastern San Benito County (Figure 3.7-3). A very small portion of the basin extends into Fresno County. The Franciscan Formation lies to the northwest, Upper Cretaceous marine sedimentary rocks lie to the northeast and southeast, and Lower Miocene marine rocks lie to the southwest. Water bearing units may include alluvium, nonmarine terrace deposits and nonmarine sediments. Groundwater flow is generally to the east toward Tulare Lake. Well depths ranged from 171 to 1,500 feet and generally encounter alluvial materials including gravels, sands, silts and clays (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Panoche Valley basin as municipal and domestic supply (CRWQCB-CVR, 2004). CDWR estimates groundwater use in the basin at 200 AFY and has assigned a very low-priority ranking to the basin as part of the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a). TDS concentrations in groundwater range from 394 to 3,530 mg/L with an average of 1,300 mg/L (CDWR, 2003).

The Panoche Valley basin does not contain any oil and gas fields with Federal mineral estate.

Vallecitos Creek Valley (5-71). The Vallecitos Creek Valley basin encompasses 24 square miles in the Coast Ranges in eastern San Benito County (Figure 3.7-3). The basin is a northwest-southeast trending synclinal valley filled with alluvium and surrounded by nonmarine and marine sediments. Water bearing units may be limited to the shallow alluvium in the valley center. Three wells drilled in the northwest portion of the basin extend to depths of 80 to 122 feet. Groundwater flow is generally to the east toward Tulare Lake (CDWR, 2003).

The Basin Plan lists municipal and domestic supply as a beneficial use for groundwater in the Vallecitos Creek Valley basin (CRWQCB-CVR, 2004), although data from CDWR indicate only a relatively small amount of groundwater use in the basin (<500 AFY) (CDWR, 2014a). In addition, CDWR has assigned the basin a very low-priority ranking for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Vallecitos Creek Valley basin contains portions of one oil and gas field on BLM surface lands — the Vallecitos oil field. Figure 3.7-4 illustrates the regional geologic setting with a cross section across several areas of the Vallecitos field. As summarized on Table 3.7-4, the depth to fresh water beneath the Vallecitos field is reported to range from about 100 to 500 feet deep. The top of the hydrocarbon zone is reported to be as shallow as 80 feet, but that zone appears to be located in the hills outside of the groundwater basin boundary. Within the groundwater basin, the upper hydrocarbon zone is about 1,040 feet deep, providing a minimum vertical separation of about 540 feet to about 940 feet. Concentrations of sodium chloride in produced water are reported to range between about 1,100 mg/L to 3,600 mg/L. TDS concentrations in produced water are reported at 8,100 mg/L and 8,200 mg/L in two areas of the field. Depth and salinity data indicate that usable groundwater is in close proximity to hydrocarbon-bearing zones (see Appendix J in DOC, 2015; DOC, 1998).

Santa Cruz County

Santa Cruz Purisima Formation (3-21). The Santa Cruz Purisima Formation groundwater basin encompasses 63 square miles in central Santa Cruz County (Figure 3.7-2) and is defined by the Purisima Formation geologic boundary. The primary water bearing unit is the Purisima Formation, which is composed of moderately to poorly consolidated fine to medium-grained sandstone with interbeds of siltstone. The Purisima Formation is up to 2,000 feet thick and groundwater is primarily confined. Groundwater flows to the east in the northern portion of the basin and either to the southwest towards Monterey Bay or to the southeast towards Pajaro Valley in the remaining portions of the basin. Municipal/irrigation wells range from 61 to 833 feet deep and yield up to 200 gpm. Groundwater storage in the Purisima Formation, west of the Zayante Fault, is estimated to be 1.22 million AF. TDS concentrations range from approximately 300 to 600 mg/L (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Santa Cruz Purisima Formation basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR reports a groundwater use of about 15,000 AFY in the basin and has assigned a medium-priority ranking to the basin for the CASGEM basin prioritization program (Table 3.7-2) (CDWR, 2014a).

The Santa Cruz Purisima Formation basin does not contain any oil and gas fields with Federal mineral estate.

Pajaro Valley (3-2). The Pajaro Valley groundwater basin is 120 square miles and extends into Monterey and San Benito Counties (Figure 3.7-2). It is bounded by the Monterey Bay to the west, the San Andreas Fault to the east, the Purisima Formation to the north, and a drainage divide to the south. The Aromas Red Sands formation is the primary water-bearing unit in the basin and is composed of well sorted brown to red sands weakly cemented with iron oxide. The Aromas Red Sands formation ranges from 100 feet thick in the foothills to 900 feet near the mouth of the Pajaro River. Municipal/irrigation well depths range from 150 to 800 feet and yield between 100 and 2,000 gpm. Groundwater levels have decreased due to over pumping; between 34 and 51 square miles of the basin have groundwater levels below sea level. The total storage capacity of the basin is estimated to be approximately 7.7 million AF. TDS concentrations vary throughout the basin based on groundwater age. High TDS concentrations are found near the coast due to recent seawater intrusion and older seawater in the Purisima Formation has TDS concentrations that range from 3,000 to 30,000 mg/L (CDWR, 2003).

The Basin Plan lists beneficial uses for groundwater in the Pajaro Valley basin as municipal, domestic, agricultural, and industrial supply (CRWQCB-CCR, 2011). CDWR reports a groundwater use of approximately 67,000 AFY in the basin (CDWR, 2014a). CDWR has assigned the basin a high-priority ranking for the CASGEM basin prioritization program (CDWR, 2014a) and has also placed it on the Draft List of Critically Overdrafted Groundwater Basins (Table 3.7-2) (CDWR, 2015b).

The Pajaro Valley groundwater basin does not contain any oil and gas fields with Federal mineral estate.

Leases Subject to Settlement Agreement

The 14 leases subject to the settlement agreement are located in Monterey and San Benito Counties, as shown in purple on Figures 3.7-1 and 3.7-3.

In Monterey County, most of the leases subject to the settlement agreement do not occur within a groundwater basin. For the most part, the leases are located in the hills of the Coast Ranges between the Lockwood Valley groundwater basin (3-6) to the west, and the Salinas Valley to the east (Upper Valley Aquifer subbasin 3-4.05 and the Paso Robles Area subbasin 3-4.06). However, a small portion of the southernmost lease within Monterey County intersects the edge of the Salinas Valley, Paso Robles Area subbasin (3-4.06). None of the leases in Monterey County are in existing oil and gas fields.

The leases subject to the settlement agreement in San Benito County are predominantly located around the periphery of the Vallecitos Creek Valley groundwater basin (5-71), which is described above. Portions of several of the leases are within the basin boundary. Several of the leases are within or overlap portions of the Vallecitos oil field (see geologic cross section across portions of the Vallecitos oil field on Figure 3.7-4).

3.7.5 Recent Well Stimulation Treatment Studies

Several significant studies on well stimulation treatments have been published recently, including studies by the California Council on Science and Technology (2014 and 2015), the United States Geological Survey (Taylor et al., 2014), and the EPA (2015). These studies, along with other published scientific literature and information generated in compliance with recent legislation on well stimulation in California (SB 4), provide the framework for analyzing potential impacts to groundwater resources from well stimulation treatments. Key elements of these studies are summarized below. Potential impacts on groundwater resources from well stimulation treatments are analyzed in more detail in Section 4.7 of this EIS.

In August 2014, the California Council on Science and Technology (CCST) released a report on well stimulation entitled, "Advanced Well Stimulation Technologies in California, An Independent Review of Scientific and Technical Information." This report was commissioned in September 2013 to provide BLM with information to be used for "future planning, leasing, development decisions regarding oil and gas issues on the Federal mineral estate in California" (CCST, 2014). This report summarizes information available through February 2014, addressing hydraulic fracturing and well stimulation treatments in onshore oil reservoirs in California. The study also includes a section on Potential Direct Environmental Effects of Well Stimulation (Section 5), which includes an analysis of the potential impacts to water including groundwater (Section 5.1).

In December 2014, the USGS California Water Science Center completed a preliminary discussion paper entitled, "Oil, Gas, and Groundwater Quality in California — a discussion of issues relevant to monitoring the effects of well stimulation at regional scales" (Taylor et al., 2014). This study, prepared with the cooperation of the State Water Resources Control Board (SWRCB), is intended to provide the public, SWRCB, and experts convened by Lawrence Livermore National Laboratory (LLNL) with information on key policy issues, a potential scientific approach for regional groundwater monitoring, and potential strategies for implementation of groundwater monitoring criteria. This process was part of the development of groundwater monitoring criteria for well stimulation treatments in California as required by SB 4.

In June 2015, the EPA released a report entitled, "Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources" (EPA, 2015a). This report is in draft form and is subject to change. Because the study focuses on hydraulic fracturing across the nation, it does not contain as much California-specific information as the CCST report (2014). In fact, EPA's report relies heavily on CCST's findings. However, EPA's findings on the potential impacts of well stimulation on a national level may be applicable to California and are reviewed for the impacts assessment provided in Section 4.7 of this EIS.

In 2015, CCST completed a study on well stimulation entitled, "An Independent Scientific Assessment of Well Stimulation in California." The report was prepared for the California Natural Resources Agency pursuant to SB 4 and was published in three volumes:

- Volume 1: Well Stimulation Technologies and their Past, Present, and Potential Future Use in California (January 2015)
- Volume II: Potential Environmental Impacts of Hydraulic Fracturing and Acid Stimulations (July 2015)
- Volume III: Case Studies of Hydraulic Fracturing and Acid Stimulations in Select Regions: Offshore, Monterey Formation, Los Angeles Basin, and San Joaquin Basin (July 2015)

Numerous additional publications from the scientific literature support the analysis of impacts to groundwater from hydraulic fracturing conducted herein (e.g., Carey et al., 2013; Chilingar and Endes, 2005; Horsley Witten Group, 2011; Howarth et al., 2012; Jackson et al., 2013; MRS, 2008). Because most of these papers were incorporated into the CCST analyses and support their conclusions, the additional papers are not cited or described separately.

3.8 Surface Water Resources

3.8.1 Introduction

This section describes baseline conditions for surface waters for the area covered by the Central Coast Oil and Gas Leasing and Development Resource Management Plan. The baseline conditions described herein are confined to surface waters relevant to oil and gas well exploration and production, including relevant regulatory issues, the regional setting, and current conditions and trends. The regional setting summarizes the topography, climate and major watersheds of the area. Current conditions and trends describe baseline floodplain conditions, water quality, and water use and supply.

3.8.2 Regulatory Framework

Surface water resources are managed and regulated by Federal, State and local regulations covering water quality, flooding, streambed alteration, and water management. Several regulations governing oil and gas activities cover surface water.

Federal Regulations

Clean Water Act (CWA) (33 USC Section 1251 et seq.). Formerly the Federal Water Pollution Control Act of 1972, the CWA was enacted with the intent of restoring and maintaining the chemical, physical, and biological integrity of the waters of the United States. The CWA, enforced by the United States Environmental Protection Agency (EPA), requires states to set standards to protect, maintain, and restore water quality through the regulation of point source and certain non-point source discharges to surface water. Discharges are regulated by the National Pollutant Discharge Elimination System (NPDES) permit process (CWA Section 402). NPDES permitting authority is delegated to, and administered by, the California State Water Resources Control Board (SWRCB) and its nine regional water quality control boards (RWQCBs).

Discharges from point sources are covered under the Industrial General Permit administered by the RWQCB. Discharges from construction activity are covered under the California General Permit for Discharges of Storm Water Associated with Construction Activity (General Construction Storm Water Permit). Both are described further below under State Regulations.

Section 401 of the CWA requires that any activity that may result in a discharge into waters of the U.S. be certified by the RWQCB. This certification ensures that the proposed activity not violate State and/or Federal water quality standards.

Section 404 of the CWA authorizes the U.S. Army Corps of Engineers to regulate the discharge of dredged or fill material to the waters of the U.S. and adjacent wetlands. Discharges to waters of the U.S. must be avoided where possible, and minimized and mitigated where avoidance is not possible. Permits are issued by the Corps of Engineers.

Section 303(d) of the Clean Water Act requires states to assess surface water quality and prepare a list of waters (known as the Section 303(d) list of water quality limited segments) considered to be impaired by not meeting water quality standards and not supporting their beneficial uses. Impairment may result from point-source pollutants or non-point source pollutants. The SWRCB, through its nine regional boards, assesses water quality and establishes Total Maximum Daily Load (TMDL) programs for streams, lakes and coastal waters that do not meet water quality standards.

Bureau of Land Management: Onshore Oil and Gas Operations (43 CFR Part 3160 et seq.). Regulations administered by the BLM to govern oil and gas operations require that operators conduct operations in a manner which protects the mineral resources, other natural resources, and environmental quality. Before approving any application for permit to drill, the BLM evaluates and considers environ-

mental impacts. Operators are required to exercise care and diligence to assure that leasehold operations not result in undue damage to surface or subsurface resources or surface improvements, which would include surface water. All produced water must be disposed of by injection into the subsurface, by approved pits, or by other methods which have been approved by the authorized officer. Upon the conclusion of operations, the operator must reclaim the disturbed surface in a manner approved or reasonably prescribed by the BLM. Spills or leakages of oil, gas, produced water, toxic liquids, or waste materials, and blowouts are reported to the BLM. Operators are required to control and remove pollutants that could affect surface waters.

The BLM rule on hydraulic fracturing complements existing regulations (set out at 43 CFR 3162.3–1 and Onshore Oil and Gas Orders 1, 2, and 7) designed to ensure the environmentally responsible development of oil and gas resources on Federal and Indian lands. Existing regulations establish that the BLM has authority to regulate oil and gas operations within its administrative areas, and set forth rules for the approval and conduct of these operations. Relevant to surface waters, the BLM rule on hydraulic fracturing and previous existing regulations require:

- Identification and documentation of surface waters and water supply in the application process.
- Restoration of disturbed areas.
- Waste handling requirements.
- Disposal of produced water into injection wells or lined pits with freeboard.
- Disclosure of the chemicals used in hydraulic fracturing fluids.
- Avoidance of riparian areas, floodplains, lakeshores, and/or wetlands except as approved in a plan of operations.
- Disclosure of information concerning the source and location of water supply, such as reused or recycled water, rivers, creeks, springs, lakes, ponds, and water supply wells, and the anticipated access route and transportation method for all water planned for use in hydraulic fracturing.
- Disclosure of the estimated total volume of fluid to be used in hydraulic fracturing.
- Disclosure of the estimated volume of fluid to be recovered and the proposed methods of handling and disposal of recovered fluids used in hydraulic fracturing.
- A surface plan of operation.
- Disposal of fluids recovered in hydraulic fracturing operations and in rigid enclosed, covered, or netted and screened above-ground tanks. Disposal in pits is allowed only if the distance to the nearest intermittent watercourse is 300 feet or more and 500 feet or more to perennial watercourses, and in a manner that would not interfere with the hydrologic function of the 100-year flood.

National Flood Insurance Act/Flood Disaster Protection Act. The National Flood Insurance Act of 1968 made flood insurance available for the first time. The Flood Disaster Protection Act of 1973 made the purchase of flood insurance mandatory for the protection of property located in Special Flood Hazard Areas. These laws led to mapping of regulatory floodplains and to local management of floodplain areas according to Federal guidelines which include prohibiting or restricting development in flood hazard zones. Local management of flood areas is described further under Local Regulations below.

State Regulations

California Streambed Alteration Agreement. Sections 1600–1616 of the California Fish and Game Code require that any entity that proposes an activity that will substantially divert or obstruct the natural flow of any river, stream or lake, substantially change or use any material from the bed, channel, or bank of any river, stream, or lake, or deposit material where it may pass into any river, stream, or lake,

must notify the California Department of Fish and Wildlife (CDFW). If the CDFW determines the alteration may adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement (LSAA) will be prepared. The LSAA includes conditions necessary to protect those resources. The Agreement applies to any stream including ephemeral streams and desert washes.

California Porter Cologne Water Quality Control Act. The Porter Cologne Water Quality Control Act of 1967, Water Code Section 13000 et seq., requires the SWRCB to adopt water quality criteria to protect State waters. Each RWQCB has developed a Water Quality Control Plan (Basin Plan) specifying water quality objectives, beneficial uses, numerical standards of pollution concentrations, and implementation procedures for Waters of the State. Waters of the State is defined by the Porter Cologne Water Quality Control Act as "any surface water or groundwater, including saline waters, within the boundaries of the State." General objectives of the Basin Plans state that all waters (of the State) shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or aquatic life. The water quality control plans are intended to protect designated beneficial uses of waters, avoid altering the sediment discharge rate of surface waters, and avoid introducing toxic pollutants to the water resource. The Porter Cologne Water Quality Control Act requires anyone proposing to discharge waste that could affect the quality of the waters of the State to report the waste discharge to the appropriate RWQCB.

SWRCB Storm Water Program General Permit for Discharges of Storm Water Associated with Construction Activity (General Construction Storm Water Permit). The General Construction Storm Water Permit, required by the Federal Clean Water Act, regulates stormwater runoff from construction sites of 1 acre or more in size. The Construction General Permit is a statewide, standing permit. Qualifying construction activities, which would include oil well projects where total disturbance is 1 acre or greater, must obtain coverage under the permit by filing a Notice of Intent with the Regional Water Quality Control Board, and development of and compliance with a Storm Water Pollution Prevention Plan (SWPPP) describing Best Management Practices (BMPs) the discharger will use to protect stormwater runoff. The SWPPP must contain a visual monitoring program, a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs, and a sediment monitoring plan if the site discharges directly to a water body listed on the Section 303(d) list (described below) for sediment.

The General Permit prohibits the discharge of pollutants other than stormwater and non-stormwater discharges authorized by the General Permit or another NPDES permit, and prohibits all discharges which contain a hazardous substance in excess of reportable quantities established in 40 CFR Sections 117.3 and 302.4 (pursuant to Section 311 of the Clean Water Act), unless a separate NPDES Permit has been issued to regulate those discharges. In addition, the General Permit incorporates discharge prohibitions contained in water quality control plans, as implemented by the nine Regional Water Boards. Discharges to Areas of Special Biological Significance are prohibited unless covered by an exception that the State Water Board has approved. Authorized non-stormwater discharges must be infeasible to eliminate; comply with BMPs as described in the SWPPP; filter or treat, using appropriate technology, all dewatering discharges from sedimentation basins; meet the established numeric action levels for pH and turbidity; and, not cause or contribute to a violation of water quality standards. Discharges to stormwater that cause or threaten to cause pollution, contamination, or nuisance are prohibited. Pollutant controls must utilize best available technology (BAT) economically achievable for toxic pollutants and non-conventional pollutants and best conventional pollutant control technology (BCT) for conventional pollutants.

The CWA provides definitions for the types of controls that can be used to satisfy BAT and BCT requirements. Specific BAT and BCT pollution controls and BMPs may include runoff control, soil stabilization, sediment control, proper stream crossing techniques, waste management, spill prevention and control, and a wide variety of other measures depending on the site and situation.

SWRCB Industrial Storm Water General Permit. The Industrial Storm Water General Permit regulates discharges to surface waters associated industrial activities including those associated with the oil

and gas industry. The General Industrial Permit requires the implementation of management measures that will achieve the performance standard of BAT and BCT. The General Industrial Permit also requires the development of a SWPPP and a monitoring plan. Through the SWPPP, sources of pollutants are to be identified and the means to manage the sources to reduce stormwater pollution are described.

Best Management Practices may include, but not be limited to, spill and overflow protection, stormwater control, covering of fueling areas, proper clean-up methods, spill prevention, preventative maintenance on equipment, inspections, and training. Specific best management practices will vary by situation and site. Guidance on the use of BMPs is available from the SWRCB.

California Code of Regulations Title 23. Title 23 regulates discharges of hazardous waste to land and establishes waste and site classifications and waste management requirements for waste treatment, storage, or disposal in landfills, surface impoundments, waste piles, and land treatment facilities.

California Code of Regulations Title 14. Title 14, Division 2, Chapter 4, of the California Code of Regulations authorizes regulation of onshore oil and gas wells by the California Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR). Relevant provisions specific to surface water resources include a wide variety of water quality protections such as blowout prevention requirements; control, testing and disposal of drilling fluids; spill contingency plans; plugging and abandonment; freshwater protection; oilfield sumps (not permitted in natural drainage channels); secondary containment requirements; tank construction and leak detection; pipeline construction, maintenance and management; oilfield waste and refuse disposal; well site restoration; and special safety devices for wells within 100 feet of any navigable body of water or watercourse.

DOGGR regulations were added to Title 14 to address well stimulation treatments for oil and gas pursuant to California Senate Bill 4 (SB 4), amending Division 3, Chapter 1, of the Public Resources Code. The regulations specify actions that must be complied with prior to, during, and after an oil or gas well is stimulated or hydraulically fractured. The regulations require a variety of surface water protections for well stimulation activities including: disclosure, control and reporting of stimulation additives; development of a water management plan; storage and handling requirements for additives; waste control and disposal requirements; secondary containment requirements; testing, inspection, and maintenance requirements; spill contingency plans; notification and clean up in the event of an unauthorized release; and monitoring requirements.

California Water Right Law. California water law is embodied in the California Water Code and the Water Commission Act of 1914. There are two basic kinds of rights to surface water: riparian and appropriative.

Riparian rights usually come with owning a parcel of land that is adjacent to a source of water. A riparian right entitles the landowner to use a correlative share of the water flowing past his or her property, and do not require permits, licenses, or government approval. Riparian rights apply only to the water which would naturally flow in the stream, and do not entitle a water use to divert water to storage in a reservoir for use in the dry season or to use water on land outside of the watershed. Riparian rights remain with the property when it changes hands, although parcels severed from the adjacent water source generally lose their right to the water. Riparian rights have a higher priority than appropriative rights, and among themselves the priorities of riparian right holders generally carry equal weight. During a drought all share the shortage.

Appropriative rights are granted by the SWRCB. Anyone seeking to appropriate surface water must obtain a permit from the SWRCB. Water right permits spell out the amounts, conditions, and construction timetables for the proposed water project. Before the Board issues a permit, it must take into account all prior rights and the availability of water in the basin. The Board also considers environmental impacts and the flows needed to preserve instream uses such as recreation and fish and wildlife habitat. The hierarchy of priorities for appropriative rights is such that in times of shortage the most recent ("junior") right holder must be the first to discontinue use in favor of senior rights holders (SWRCB, 2014a).

Local Regulations

The project area includes all or portions of Monterey, Fresno, San Benito, Santa Clara, Santa Cruz, Alameda, Merced, Stanislaus, San Joaquin, Contra Costa, San Mateo, and San Francisco Counties. Cities are primarily in the San Francisco Bay area (San Francisco, Oakland, San Jose, and others), the Monterey Bay area (Santa Cruz, Marina, Monterey and others), and along the Salinas and San Benito Rivers or Pacific Coast (Hollister, Salinas, Soledad, King City, Carmel, and others). Most counties and cities have or are covered by urban water management plans and integrated regional water management plans that describe water planning, sources and supplies, agencies, water demand, water quality, goals and objectives, and other water use issues.

Counties and cities participating in the National Flood Insurance Program have floodplain and drainage regulations that regulate floodplain development. These regulations generally prohibit floodplain development that will result in flooding of the development itself, require flood proofing of new structures, and prohibit floodplain development that will result in adverse flooding impacts on other property.

Municipalities operating local municipal storm sewer systems are required to obtain NPDES permits from the RWQCB and develop and implement stormwater management programs to reduce the contamination of stormwater runoff and prohibit illicit discharges.

3.8.3 Regional Setting

Topography and Climate. The BLM Central Coast Field Office (CCFO) Planning Area terrain consists primarily of low, rolling hills and moderately sized mountains rising to elevations generally not more than about 5,000 feet above mean sea level, intersected by long, narrow, flat valleys. Mild winters and cool summers prevail in the northern and western portions of the CCFO Planning Area, with warmer summers and cooler winters in the south and further inland. Rainfall is seasonal, nearly all occurring in winter. At King City, near the center of the Federal mineral estate lands, summer maximum temperatures average 84 to 87 degrees Fahrenheit, with winter minimums 34 to 37 degrees. Annual rainfall is 11.25 inches, with 85% occurring between November and March (WRCC, 2015).

Watersheds and Surface Waters. The CCFO Planning Area is covered by 19 watersheds in four hydrologic regions as shown in Figure 3.8-1 and listed in Table 3.8-1. Most is in the Central California Coastal hydrologic region. These watersheds drain directly to the Pacific Ocean either at Monterey Bay (Estrella, Pajaro, Salinas, San Lorenzo–Soquel, and Alisal–Elkhorn Slough watersheds) or along the coast south of Monterey Bay (Carmel and Central Coast watersheds). With the exception of the San Francisco Coastal South watershed, which drains directly to the Pacific Ocean, all of the rest of the watersheds drain to the Pacific Ocean through San Francisco, San Pablo or Suisun Bays. Watersheds in the San Joaquin Hydrologic Region reach the San Francisco Bay by way of the San Joaquin River in the California Central Valley. The Tulare–Buena Vista Lakes hydrologic region is essentially a closed system, draining to the San Joaquin River only in extreme rainfall years (CDWR, 2013a).

Figure 3.8-2 shows the stream network and major rivers, which include the San Benito River, the Salinas River, and others. The major rivers are generally perennial through most of their length, carrying some flow at all seasons of the year, although summer and fall flows can be low due to lack of rainfall. For instance, the Salinas River at Soledad, in the vicinity of the Federal mineral estate within the CCFO Planning Area, averages a low of 121 cubic feet per second (cfs) in November and a high of 1,270 cfs in February (USGS, 2015a). The San Benito River in the vicinity of the main body of the Federal mineral estate approximately 40 miles upstream of Hollister averages 28 cfs in January and 0.8 cfs in September (USGS, 2015b).

Most of the streams shown in Figure 3.8-2 are small collector drainageways. The high map density of these streams is due to the hilly terrain, with a stream at the bottom of every small canyon. Due to the arid climate (about 11 inches of rain per year), most of these minor streams are dry during much of the year carrying flow only in response to rainfall.

Table 3.8-1. Hydrologic Regions and Watersheds of the CCFO Planning Area

Hydrologic Region	Watershed
San Francisco Bay	San Francisco Coastal South
	San Francisco Bay
	San Pablo Bay
	Suisan Bay
	Coyote
San Joaquin	San Joaquin Delta
	Middle San Joaquin–Lower Merced–Lower Stanislaus
	Panoche–San Luis Reservoir
	Middle San Joaquin–Lower Chowchilla
Central California Coastal	Pajaro
	Salinas
	San Lorenzo–Soquel
	Alisal–Elkhorn Slough
	Carmel
	Central Coast
	Estrella
Tulare–Buena Vista Lakes	Tulare–Buena Vista Lakes
	Upper Los Gatos–Avenal

3.8.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Floodplains. Figure 3.8-3 shows 100-year flood areas mapped by the Federal Emergency Management Agency (FEMA) (FEMA, 2015). Two floodplain zones are shown. The Zone A Approximate zone is delineated by approximate methods and could be substantially revised by detailed hydrologic and hydraulic analysis. The Detailed Study zone represents all of the other FEMA 100-year floodplain zones developed using detailed computations more accurate than the approximate methods.

The floodplains shown in Figure 3.8-3 represent only those floodplains that have been studied and approved by FEMA for inclusion on regulatory flood maps. Any watercourse carrying natural flow can produce a flood hazard and have a 100-year floodplain. Many watercourses, including most outside of urban areas, have not been mapped by FEMA and do not appear on these maps as hazard areas. Consequently, flood hazards, and related water quality contamination from flooded areas, could occur outside of the flood areas that are shown in Figure 3.8-3.

Surface Water Quality, Sediment and Erosion. The CCFO Planning Area is within the jurisdiction of the Central Coast, Central Valley and San Francisco Bay RWQCBs. The RWQCBs assess surface water quality throughout the State, and prepare a list of waters (the Section 303(d) list of water quality limited segments) considered to be impaired. Impairment may result from both point-source and non-point source pollutants. Figure 3.8-4 shows the location of waters considered by the RWQCBs to be impaired. Specific impairments are listed in the 2010 Statewide Integrated Report (SWRCB, 2015).

The following is a brief watershed-specific overview of water quality issues from the 2013 California Water Plan (CDWR, 2013b; CDWR, 2013c):

- **San Francisco Bay Hydrologic Region Watersheds.** Surface water quality issues include pathogens, nutrients, sediments, and toxic residues from urban runoff. Some toxic residues are from past human activities such as mining; industrial production; and the manufacture, distribution, and use of agricul-

tural pesticides. These residues include mercury, polychlorinated biphenyls (PCBs), selenium, and chlorinated pesticides.

Emerging pollutants in the San Francisco Bay region include flame retardants, perfluorinated compounds, nonylphenol fipronil, and pharmaceuticals. Sanitary sewer spills can occur because of aging collection systems and treatment plants. San Francisco Bay and a number of the streams, lakes, and reservoirs in the San Francisco Bay Region have elevated mercury levels from local mercury mining and mining activities in the Sierra Nevada and coastal mountains. Wastewater treatment plants and urban runoff also are a source of mercury, and some wetlands may contain significant amounts from contaminated sediments.

- **San Lorenzo River and Santa Cruz Area Watersheds.** Anthropogenic disturbances have accelerated the natural processes of erosion and sedimentation, resulting in declines in anadromous fisheries and the quality of fish habitat. Fecal coliform exceeds the basin plan criteria in many streams and sloughs.
- **Pajaro Watershed.** Water quality problems include erosion and sedimentation, pesticides, nutrients, heavy metals, pathogens, streambed flow alterations, endangered habitat, and riparian vegetation removal. Agriculture is the dominant land use in the watershed and grazing is common in the remote areas of the watershed such as along the upper San Benito River. Agricultural lands are the major source of nutrient and sediment loading into the Pajaro River. Low-density residential development, flood control projects, sand, gravel, and mercury mining, and off-road vehicle activity, have contributed to accelerated erosion and sedimentation, impacting steelhead habitat for migration and spawning. Fecal coliform levels in the Pajaro River and many of its tributaries exceed water quality objectives. Cyanobacteria cause harmful algal blooms in Pinto Lake near Watsonville.
- **Elkhorn Slough Watershed.** Water quality concerns include erosion, pesticides, bacteria, and scour. Agriculture and Moss Landing harbor activities, including ongoing dredging, are impacting the slough.
- **Carmel River Watershed.** There are currently no segments of the Carmel River identified as impaired. Tularcitos Creek is impaired for chloride, fecal coliform and sodium.
- **Salinas River Watershed.** Agriculture is the dominant land use within the Salinas watershed, and some agricultural practices have resulted in degradation of water resources. Surface waters are impacted by high levels of nitrate, as well as toxicity and pesticides. Impairments also include fecal coliform, nutrients, toxicity, and pesticides. Elevated nutrient concentrations have led to the degradation of municipal and domestic water supplies and have impaired most aquatic freshwater habitat beneficial uses for the lower Salinas River and its tributaries. The pesticides chlorpyrifos and diazinon are present in several areas at levels that are not protective of aquatic-life beneficial uses, such as fish habitat, migration, spawning and development.

The Clean Water Act mandates development of total maximum daily loads (TMDL) for water bodies listed as impaired. The TMDL is a limit on the amount of a pollutant that water body can regularly assimilate and still maintain beneficial uses. An approved TMDL establishes responsibility for controlling the pollutant, and implementation strategies to achieve the allowable amount of pollutant loading. TMDLs are currently being prepared by the RWQCBs for impaired waters within the CCFO Planning Area. Several, for instance TMDLs for Nitrate on the San Lorenzo and Pajaro rivers and TMDLs for sediment on the Pajaro River and San Benito River, have been approved (CDWR, 2009).

Each RWQCB develops a basin plan summarizing the assessment of surface water quality, outlining steps to improve water quality, and designating beneficial uses of surface waters. California State waters are protected against water quality degradation in order to preserve beneficial uses.

Examples of beneficial uses relevant to the Federal mineral estate within the CCFO Planning Area include (RWQCB, 2011):

- Salinas River: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Industrial Process Supply (PRO), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Cold Freshwater Habitat (COLD), Warm Freshwater Habitat (WARM), Migration of Aquatic Organisms (MIGR), Freshwater Replenishment (FRSH), Spawning, Reproduction, and/or Early, Development (SPWN), and Commercial and Sport Fishing (COMM).
- San Lorenzo Creek: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Warm Freshwater Habitat (WARM), Spawning, Reproduction, and/or Early Development (SPWN), and Commercial and Sport Fishing (COMM).
- San Benito River: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Warm, Freshwater Replenishment (FRSH), Warm Freshwater Habitat (WARM), and Commercial and Sport Fishing (COMM).
- Tres Pinos Creek: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Warm Freshwater Habitat (WARM), and Commercial and Sport Fishing (COMM).
- Arroyo Seco River: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Cold Freshwater Habitat (COLD), Freshwater Replenishment (FRSH), Warm Freshwater Habitat (WARM), Spawning, Reproduction, and/or Early, Development (SPWN), and Commercial and Sport Fishing (COMM).

Water Use and Supply. The San Francisco Bay Hydrologic Region depends heavily on surface water supplies, mostly imported from outside the region. Local streams are a significant water source in certain areas, especially in the South Bay, within the CCFO Planning Area. Groundwater provides only about 15 percent. Water use is predominantly urban, of which approximately 50 percent is residential. Agricultural use is minor, amounting to about 1percent of the total (CDWR, 2013c).

Water supplies in the San Joaquin Hydrologic Region consist of groundwater and surface water supplies. Surface water is mostly imported by the Central Valley Project or State Water Project, or derived from local sources. Rivers on the east side of the Central Valley, outside the CCFO Planning Area, provide most of the local sources. Agriculture is the largest user of water in this region, with urban use only a small portion of the total (CDWR, 2013d). The Tulare–Buena Vista Lakes Hydrologic Region has a similar pattern of supply and use, with substantial reliance on rivers on the eastern side of the Central valley (CDWR, 2013a).

The Central Coast Hydrologic Region within the CCFO Planning Area relies on local surface water, imported water and groundwater. The San Lorenzo River supplies the City of Santa Cruz. The Carmel River is an important source of supply for the Monterey area. Imported surface water from the Central Valley Project supplies other portions of this region within the Administrative Area. Overall, agriculture is the largest consumer of water within this hydrologic region (CDWR, 2013b).

The CCFO Planning Area includes surface reservoirs and aqueducts (Figure 3.8-1), some of which are downstream of Federal mineral estate lands. The San Luis Reservoir, on the east side of the Administrative Area and downstream of estate lands, is a storage reservoir for the State Water Project and Central Valley Project. The State Water Project and Central Valley Project also have major aqueducts running along the eastern boundary of the CCFO Planning Area. Hernandez Reservoir, on the San Benito River, in the area of the mineral estate lands, is used for flood control and groundwater recharge (Todd, 2011).

The State Water Project is a system of reservoirs and aqueducts collecting surface water from Northern California and the Sierra Nevada and conveying it to users in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The project, operated by the California Department of Water Resources, makes water deliveries to two-thirds of the population of California, with 70 percent of the supply going to urban users and 30 percent goes to agricultural users (CDWR, 2015).

The State Water Project provides irrigation water to farms in the San Joaquin Valley, and is a major source of supply for cities in Los Angeles, Riverside, San Bernardino, San Diego, and other parts of southern California. The Central Valley Project, operated by the U.S. Bureau of Reclamation, delivers water from northern California to the Central Valley. Both projects have conveyance and storage facilities along the eastern boundary of the CCFO Planning Area.

Naturally occurring asbestos occurs within the Clear Creek Management Area (CCMA). Water transport of asbestos to the California Aqueduct from the CCMA was detected in 1980. The asbestos was believed to have originated from the Atlas Asbestos Mine and was transported by water in White Creek to Los Gatos Creek and finally into the aqueduct (BLM, 2009, pg. 611). The Atlas Asbestos Mine, no longer operating, has been remediated by the EPA. The Aqueduct is protected by detention systems between the mine and the Aqueduct. Potential impacts to downstream users of the Aqueduct water are additionally protected by filtration and settling pond systems (EPA, 2015).

Water supplies within the State of California have been severely constrained in recent years due to an ongoing drought. During 2015, the Central Coast Oil and Gas Leasing and Development Resource Management Plan area remained in a severe to exceptional drought status (NDMC, 2015), and there are mandatory water restrictions statewide.

Aquatic Intactness. Aquatic intactness utilizes a common conservation planning approach of subwatershed-scale (HUC12) data summary and scoring, synthesizing and interpreting spatial data for 43 metrics consolidated into 22 indicators within the categories of surface water quality and quantity, sedimentation and erosion, surrounding surface management practices, habitat connectivity, and water temperature. The Aquatic Species Status group of indicators summarizes the findings of a new database for aquatic-dependent species, including all BLM Special Status Species that use freshwater habitats. The Aquatic Habitats Status indicators provide multiple summaries of a multi-source aquatic feature and land cover dataset. A group of Habitat Integrity indicators includes assessment of watershed condition, temperature conditions, habitat connectivity, water quality, water quantity, and land stewardship factors. Future threats are anticipated within indicators related to land conversion, resource extraction, climate change, water quality risk, and introduced species. The combined results map the pattern of relative condition of aquatic species, habitats, condition, and threats across a broad landscape. HUC12 subwatersheds with the highest aquatic intactness score are indicated on Figure 3.8-1 and include the Robinson Creek–South Fork Orestimba Creek, Red Creek–South Fork Orestimba Creek, Upper North Fork Pacheco Creek, Willow Creek, Salmon Creek–Frontal Pacific Ocean, and Upper Cantua Creek Subwatersheds.

Leases Subject to Settlement Agreement

The leases subject to the Settlement Agreement are primarily within the Salinas Watershed (southern lease grouping near Lockwood) or the Panoche–San Luis Reservoir Watershed (northern lease grouping). Most of the runoff from the northern grouping drains to the Central Valley via Panoche Creek. A small portion (roughly 1,800 acres) of the northern group is within the Upper Los Gatos–Avenal Watershed, and a smaller portion, roughly 60 acres, is within the Pajaro Watershed. The southern lease group is located in the hills between the San Antonio River (a tributary to the Salinas River) and the Salinas River. Runoff from these lease lands drains to the San Antonio River and the Salinas River. Drainage that reaches the San Antonio River passes through Lake San Antonio, operated by the Monterey County Water Resources

Agency for flood protection and water conservation. The northern lease lands drain primarily to the Panoche Creek watershed and into the Central Valley, although small portions drain to the Central Valley.

All of the lease lands are in hilly terrain. Local watercourses are numerous, but consist of small watersheds that are dry except following periods of rainfall due to the arid climate. None of the lease lands are in designated floodplains. Undesignated flood zones within the lease lands would be narrow and confined to the local canyon bottoms due to the steep terrain and relatively low discharges from the small watersheds.

Although there are no impaired waters within the area of the leases, all of the major receiving waters downstream of the lease areas are impaired. The San Antonio Reservoir is impaired for mercury. The San Antonio River is impaired for E. coli and fecal coliform. The Salinas River is impaired for E. coli, fecal coliform, pesticides, pH, temperature, turbidity, and unknown toxicity. A portion of Panoche Creek is impaired for mercury, sediment toxicity, sedimentation, and selenium.

Beneficial uses of the Salinas River are described above. Beneficial uses of the San Antonio River, San Antonio Reservoir, and Panoche Creek, are as follows (RWQCB, 1998, RWQCB, 2011):

- San Antonio River: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial Service Supply (IND), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Cold Freshwater Habitat (COLD), Warm Freshwater Habitat (WARM), Migration of Aquatic Organisms (MIGR), Freshwater Replenishment (FRSH), Spawning, Reproduction, and/or Early, Development (SPWN), Preservation of Rare and Endangered Species (RARE), and Commercial and Sport Fishing (COMM).
- San Antonio Reservoir: Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Cold Freshwater Habitat (COLD), Navigation (NAV), Warm Freshwater Habitat (WARM), Freshwater Replenishment (FRSH), Spawning, Reproduction, and/or Early, Development (SPWN), Preservation of Rare and Endangered Species (RARE), and Commercial and Sport Fishing (COMM).
- Panoche Creek: Agricultural Supply (AGR), Ground Water Recharge (GWR), Water Contact Recreation (REC 1), Non-contact Water Recreation (REC 2), Wildlife Habitat (WILD), Warm Freshwater Habitat (WARM), Preservation of Rare and Endangered Species (RARE), Industrial Service Supply (IND), and Industrial Process Supply (PRO).

3.9 Soil Resources

3.9.1 Introduction

Soil resources provide the foundation for vegetation and biological communities and safeguard water and air quality. Terrestrial and aquatic systems depend on the presence of suitable quality soils for their function. Soil quality is based on soil attributes, such as water holding capacity, texture, erosion potential, and slope.

Soils are the result of complex interactions among parent material (geology), climate, topography, organisms, and time. Soils are classified by the degree of development into distinct layers or horizons and their prevailing physical and chemical properties. Similar soil types are grouped into soil orders, based on defining characteristics, such as organic matter and clay content, amount of mineral weathering, water and temperature regimes, depth, drainage, slope, particle size or base saturation that give soil its unique properties. The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil surveys provide a detailed report on the soils of an area and identify limiting factors for its use and include interpretive ratings. They are designed to help guide the use of the soils.

Detailed NRCS soil surveys are available for most of the CCFO Planning Area; however, these are too specific for analysis at the regional scale for this RMPA. Individual soil map units would be used during review and approval of individual oil and gas lease applications for permit to drill.

Best Management Practices (BMPs, see Appendix D) for soils are applied to BLM actions and authorizations to limit compaction and reduce the potential for accelerated erosion through minimizing surface disturbance and reclaiming disturbed sites.

3.9.2 Regulatory Framework

Federal

Clean Water Act/National Pollutant Discharge Elimination System. Stormwater runoff from construction activities can have a significant impact on water quality. As stormwater flows over a construction site, it picks up pollutants like sediment, debris, and chemicals. Polluted stormwater runoff can harm or kill fish and other wildlife. Sedimentation can destroy aquatic habitat and high volumes of runoff can cause stream bank erosion. Under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) Stormwater program requires operators of construction sites 1 acre or larger (including smaller sites that are part of a larger common plan of development) to obtain authorization to discharge stormwater under a NPDES construction stormwater permit. Implementation of stormwater pollution prevention plans (SWPPP) is the focus of NPDES stormwater permits for regulated construction activities.

Most states are authorized to implement the Stormwater NPDES permitting program. The United States Environmental Protection Agency (EPA) remains the permitting authority in a few states, territories, and on most land in Indian Country. For construction (and other land disturbing activities) in areas where the EPA is the permitting authority, operators must meet the requirements of the EPA Construction General Permit (CGP). In California, Stormwater NPDES permits on non-tribal and non-Federal land are overseen by the State of California EPA (CalEPA).

The **Resource Conservation and Recovery Act (RCRA)** established a program administered by the U.S. EPA for the regulation of the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the Hazardous and Solid Waste Act (HSWA), which affirmed and extended the "cradle to grave" system of regulating hazardous wastes. The use of certain techniques for the disposal of some hazardous wastes was specifically prohibited by HSWA.

The **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),** including the Superfund program, was enacted by Congress on December 11, 1980. This law provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established requirements concerning closed and abandoned hazardous waste sites; provided for liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for cleanup when no responsible party could be identified. CERCLA also enabled the revision of the National Oil and Hazardous Substances Contingency Plan (NCP). The NCP provided the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, and/or contaminants, spill containment, and cleanup. The NCP also established the National Priorities List. CERCLA was amended by the Superfund Amendments and Reauthorization Act on October 17, 1986.

The **Spill Prevention, Control and Countermeasures Plan (SPCC)** requires facilities that store, handle, or produce significant quantities of hazardous material to prepare plan to ensure that containment and countermeasures are in place to prevent release of hazardous materials to the environment.

State

The California State Water Resource Control Board (SWRCB) administers the Stormwater NPDES program in California. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect stormwater runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for non-visible pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body.

DTSC is a department of CalEPA and is the primary agency in California that regulates hazardous waste, cleans-up existing contamination, and looks for ways to reduce the hazardous waste produced in California. DTSC has authority under RCRA and the California Health and Safety Code (HSC). California's hazardous waste laws and regulations as implemented by DTSC are contained in HSC Division 20, Chapter 6.5, and CCR Title 22, Division 4.5. Activities subject to DTSC oversight include the generation, storage, treatment and disposal of hazardous waste and regulates cleanup of contaminated sites in the State, including industrial sites with soil and groundwater contamination. Other laws that affect hazardous waste are specific to handling, storage, transportation, disposal, treatment, reduction, cleanup, and emergency planning.

Local

Local city and county General Plans and/or SOAR (Save Open-Space & Agricultural Resources) Initiatives may provide regulations or guidelines relating to soil resources as it applies to agriculture.

The CCFO Planning Area contains multiple Certified Unified Program Agencies (CUPAs) that consolidate the administration, permitting, and inspection of hazardous material and hazardous waste programs, including underground and aboveground storage tanks, hazardous materials, and hazardous waste generator and treatment programs. CalEPA oversees the program as a whole, and certifies local government agencies known as CUPAs to implement the hazardous waste and materials standards set by five different State agencies, including CalEPA, DTSC, the Governor's Office of Emergency Services (CalOES), the California Department of Forestry and Fire Protection – Office of the State Fire Marshal (CAL FIRE – OSFM), and the SWRCB.

3.9.3 Regional Setting

Soil Types and Land Form

The CCFO Planning Area is within the southern Coast Ranges geomorphic province (CGS, 2002), which is characterized by summit elevations generally in the range of 2,000 to 4,000 feet (610 to 1,220 meters). Topography is generally not severe and rounded summits predominate; however, there are areas of steep slopes and incised canyons. The northwest trending ranges are subparallel to the San Andreas fault and are the result of extensive folding and faulting. The current landscape is a result of mountain-building episodes that began in the late Miocene and continued into the mid-Pleistocene. The majority of the Coast Ranges contains sedimentary deposits of both marine and terrestrial origin underlain by the basement rock of either the Franciscan Complex or granitic rocks of the Salinian Block. The Franciscan terrane occurs east of the San Andreas fault, and the Salinian Block to the west. The Franciscan Complex is an Early Cretaceous accretionary assortment containing blocks of greywacke, greenstone, blueschist, and serpentinized ophiolite (Oze, 2003).

The eastern edge of the San Joaquin Management Area extends into the Great Valley geomorphic physiographic province. The province is characterized by a great thickness of Jurassic age or younger marine and terrestrial sedimentary deposits. The San Joaquin Valley is known for very rich agriculture soils and large producing oil fields.

Erosion Prone Soils

Several factors affect the potential for soil erosion, including climate, vegetation, slope, and the physical characteristics of soil. Silt and fine sand are the soil textures most prone to erosion due to their small particle size and the lack of cohesion. Clay soils contain small soil particles but are more cohesive and therefore resist erosion by water and wind better than silt and fine sand. Gravel and coarse sand are not very cohesive but contain larger particles that are less susceptible to erosion by water and wind due to their size and weight. In addition to the erosion-prone soil textures described above, areas of high erosion are found on steep slopes, locations with sparse vegetation, and areas with high rainfall amounts and low infiltration capacity. Based on a review of RUSLE K-factor values (a measurement of soil erosivity), erosive soils can be found throughout the CCFO Planning Area. The largest concentration of highly erosive soils is found in the Call Mountains and the southern portion of the Diablo and Gabilan Ranges, south of Hollister, east of Pinnacles National Monument, north of California Highway 198, and west of the Panoche, Griswold, and Ciervo Hills (SWRCB, 2011). Prior to the commencement of any oil and gas production activities, a site-specific geologic and geotechnical analysis would be performed to identify erosion hazards and potentially erosive soils. BMPs for erosion and sediment control would be applied in erosion-prone areas.

Naturally Occurring Hazardous Materials

Some soils within the CCFO Planning Area include naturally occurring hazardous materials, such as asbestos found in serpentine soils and mercury, chromium, and other heavy metals found in soils surrounding past mining operations (BLM, 2013). These materials also can be found at a distance from past mining operations because some of these naturally occurring hazardous materials have been eroded and transported via stormwater runoff to downstream depositional areas (BLM, 2013).

Valley Fever

Valley Fever (*Coccidioidomycosis*) is a disease caused by the inhalation of the spores of *Coccidioides immitis*, a fungus which inhabits soils of the southwestern Unites States and is endemic in parts of California. The distribution and recognition of Valley Fever throughout the southwestern United States is poorly known (BLM, 2012). Portions of the CCFO Planning Area are known or suspected endemic areas

for valley fever (CDC, 2013). *C. immitis* grows as mold in the upper 5-20 cm of the soil in endemic areas and upon maturity can be released into the air as spores during surface disturbing actions; including wind episodes. Some key factors that influence the growth of *C. immitis* include temperature, the amount and timing of rainfall and available moisture (humidity), soil texture, alkalinity, salinity, and the degree of exposure to sunlight and ultraviolet light (BLM, 2012). The risk of infection as a result of inhalation can be reduced by implementing dust control measures.

3.9.4 Current Conditions and Trends

Central Coast Field Office Planning Area

The key soil related issues in the CCFO Planning Area are soil compaction and soil erosion caused by oil and gas leasing and development. Ground disturbance during grading of access roads, drill pads, and oil field facilities could result in soil erosion. Soil compaction due to routine use and vehicle traffic will occur along access roads and staging areas. To a less extent soil compaction may occur where geophysical surveys travel on otherwise undisturbed soil areas. Loose soil from grading and other ground disturbance, as well as compacted soils that reduce infiltration and increase runoff, can both be susceptible to increased erosion.

Central Coast Management Area

Soils in the Central Coast Management Area are generally less susceptible to erosion than the soils in other areas of the CCFO Planning Area. However, the Santa Cruz Mountains northeast of the City of Santa Cruz contain soils that are more highly susceptible to erosion (SWRCB, 2011). The Central Coast Management Area is dominated by the Mollisols soil order, which have a dark colored surface horizon that is relatively rich in organic matter (NRCS, 2015). Mollisols tend to be base rich throughout their horizon profile and tend to be quite fertile. The northern portion of this management area includes a substantial amount of Inceptisols, which occur in semiarid to humid environments and generally exhibit only a moderate amount of weathering and soil development (NRCS, 2015). The southern portion of this management area includes a substantial amount of Entisols, which exhibit little to no soil horizon development and which occur in areas of recently deposited parent materials or in areas where erosion and deposition rates are faster than soil development rates, such as sand dunes, steep slopes, or floodplains (NRCS, 2015).

San Joaquin Management Area

The San Joaquin Management Area covers a large area with diverse geology and soils. This management area contains large areas of soil that is highly susceptible to erosion, including the hills east of San Francisco Bay, the hills surrounding San Luis Reservoir, many areas throughout the Diablo Range, Panoche Valley and the hills west of Panoche Valley, and soils within Pleasant Valley in the southern portion of the management area (SWRCB, 2011). No single soil order dominates this management area. The northern portion of this management area contains Mollisols, Inceptisols, and Entisols, which are described above (NRCS, 2015). The northern portion also contains substantial amounts of Alfisols and Vertisols (NRCS, 2015). Alfisols occur in semiarid to moist areas and form primarily under forest or mixed vegetative cover. Weathering processes for this soil order leach clay minerals and other constituents out of the surface layer and into the subsoil, which then is capable of holding a high moisture content. Vertisols contain a large percentage of expanding clay minerals and tend to shrink and swell with changes in moisture content.

The southern portion of this management area contains substantial amounts of Alfisols, Entisols, Inceptisols, and Mollisols, which are described above (NRCS, 2015). In addition, the southeastern portion of this management area contains a substantial amount of Aridisols, which are too dry for the growth of mesophytic plants (NRCS, 2015). The low moisture content restricts the amount of weathering, and most

soil development is limited to the upper parts of the soils. Aridisols often accumulate gypsum, salt, calcium carbonate, and other materials that would otherwise be leached from soils in more humid environments. Soils in the southern portion of this management area, including those found within the Clear Creek Serpentine ACEC and those within the Big Blue Hills, contain naturally occurring asbestos, which can pose a hazard to human health if mobilized and inhaled (BLM, 2013).

San Benito Management Area

Of the four management areas within the CCFO Planning Area, this management area contains the largest percentage of soils that are highly susceptible to erosion. These soils are found mainly within the mountains and foothills of the Diablo Range (SWRCB, 2011). Roughly half of this management area is underlain by soils that are highly susceptible to erosion (SWRCB, 2011). Mollisols are the dominant soil order in this management area, but this area also contains substantial amounts of Alfisols, Entisols, and Vertisols (NRCS, 2015). All of these soil orders are described above. Soils in the southern portion of this management area, including those found within the Clear Creek Serpentine ACEC, contain naturally occurring asbestos, which can pose a hazard to human health if mobilized and inhaled (BLM, 2013).

Salinas Management Area

Soils within this management area are generally less susceptible to erosion than the soils found in both the San Joaquin and San Benito Management Areas, and are roughly comparable to the erosion susceptibility of the soils found within the Central Coast Management Area (SWRCB, 2011). Soils in this management area with a higher susceptibility to erosion are found in the southern portion of this area and are associated with the steeper slopes of the Santa Lucia Range and the Cholame Hills (SWRCB, 2011). Mollisols are the dominant soil order in this management area (NRCS, 2015). This area also contains a substantial amount of Entisols, and smaller amounts of Alfisols, Inceptisols, and Vertisols (NRCS, 2015). All of these soil orders are described above.

Leases Subject to Settlement Agreement

The 14 non-NSO leases as identified in Case No. 11-06174 and Case No. 13-1749 are located on erodible soils that do support little vegetation (low fertility) combining for high erosion potential.

3.10 Biological Resources – Vegetation

3.10.1 Introduction

The Planning Area consists of structurally and compositionally diverse plant communities that range from annual grasslands to Douglas fir forests. Variations in soils, terrain, climate, and geology support an unusual mosaic of species assemblages. As a result, the Planning Area hosts a number of unique plant communities and rare species. Examples of unique plant assemblages include:

- *Amsinckia furcata* and *Eriogonum nudum var. indictum* stands on the acidic, selenium-rich Moreno shale (eastern Panoche hills south to Coalinga);
- *Quercus x alvordiana* woodland patches in extremely arid locations on the acidic, gypsum-rich, selenium-rich Moreno shale (Cantua Creek drainage);
- *Lepidium jaredii ssp. album*, *Madia radiata*, *Deinandra halliana*, *Monolopia major*, *Convolvulus simulans*, and *California macrophylla* on gypsum-rich, vertic clay soils derived from the Moreno shale and Temblor shale;
- *Ephedra*-topped sand dunes on Monocline Ridge supporting Mojave disjunct species including *Abronia pogonantha*, *Oenothera deltoides*, and *Stipa hymenoides*; and
- mixed conifer forest consisting of *Pinus jeffreyi*, *P. coulteri*, *P. sabiniana*, and *Calocedrus decurrens* on serpentinite on San Benito Mountain.

Examples of rare species are local serpentine-endemic herbaceous plant species, including *Camissonia benitensis*, *Layia discoidea*, *Solidago guiradonis*, *Fritillaria viridea*, *F. falcata*, *Trichostema rubisepalum*, and *Monardella antonina ssp. benitensis*.

Ecological Site Inventories (ESIs) provide the basic inventory of present and potential vegetation on BLM land (Habich, 2001). The BLM monitors lands and vegetation to determine compliance with the Rangeland Health Standards and Guidelines (see Regulatory Framework, below). Corrective measurements are taken through appropriate management actions in areas where noncompliance with one or more of the standards is determined.

Project implementation plans, such as oil and gas extraction plans, provide for the protection, maintenance, and restoration of plant communities. The Central Coast Field Office (CCFO) requires that areas disturbed by oil and gas extraction are reclaimed to the extent possible.

The Planning Area is divided into four large geographic regions referred to as Management Areas: Central Coast, Salinas, San Benito, and San Joaquin. BLM land and split-estate comprises only a small portion of each Management Area. Within Management Areas, there may be smaller units designated as Special Management Areas (SMAs). SMAs are lands that are set aside for protection of important historic, cultural, biological, and natural resource features or restricted for human safety, see Section 3.14, Special Management Areas. SMAs include Areas of Critical Environmental Concern (ACEC) and Wilderness Study Areas (WSAs), as well as other designations. Within SMAs, focused management protects and enhances resource values and minimizes detrimental impacts.

The Proposed Resource Management Plan Final Environmental Impact Statement (RMP FEIS; BLM, 2006) describes the major vegetation communities found within the CCFO Planning Area. Unless otherwise indicated, the information below is summarized from the RMP FEIS and has been updated as needed.

3.10.2 Regulatory Framework

There are several Federal directives that guide BLM management of vegetation resources. These include:

Federal Laws, Regulations, and Agency Guidelines

National Environmental Policy Act (42 USC Section 4321 et seq.). Directs Federal policy regarding environmental protection, including requirements for Federal agencies to evaluate and publicly disclose the environmental effects of proposed projects in published documents such as environmental assessments or environmental impact statements (EISs).

Federal Land Policy and Management Act (43 USC Sections 1701–1787). Directs management of public lands managed by the BLM; addresses land use planning, rights-of-way, wilderness, and multiple use policies.

Wilderness Act (16 USC Sections 1131-1136). The 1964 Federal Wilderness Act provides for the designation of wilderness: Federal lands permanently preserved and protected in their natural condition. These lands are part of the National Wilderness Preservation System and are managed by the BLM, USFS, U.S. Fish and Wildlife Service (USFWS), and NPS.

Plant Protection Act (7 USC Section 7701 et seq.). Prevents importation, exportation, and spread of pests that are injurious to plants, and provides for the certification of plants and the control and eradication of plant pests. The Act consolidates requirements previously contained within multiple Federal regulations including the Federal Noxious Weed Act, the Plant Quarantine Act, and the Federal Plant Pest Act.

Clean Water Act (33 USC Sections 1251-1387). The Clean Water Act (CWA) regulates the chemical, physical, and biological integrity of the nation's waters. Section 401 of the CWA requires that an applicant obtain State certification for discharge into waters of the United States. The Regional Water Quality Control Boards administer the certification program in California. Section 404 of the CWA establishes a permit program, administered by the U.S. Army Corps of Engineers (USACE), to regulate the discharge of dredged or fill material into waters of the United States, including wetlands.

BLM Rangeland Health Standards and Guidelines. Establishes four fundamentals for managing rangelands and includes soils, species, riparian, and water quality standards. The standards describe the conditions needed to promote and sustain rangeland health and apply to all land uses.

Executive Order 13112, Invasive Species. This order established the National Invasive Species Council and directs Federal agencies to prevent the introduction of invasive species, provide for their control, and minimize the economic, ecological, and human health impacts caused by invasive species. It also provides that no Federal agency shall authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species and that all feasible and prudent measures to minimize risk or harm will be taken in conjunction with the actions.

BLM Integrated Vegetation Management Handbook. Describes a management approach to maintain and restore ecologically diverse, resilient, and productive native plant communities on public lands. Includes best management practices to be used in all programs, as appropriate, to mitigate impacts and achieve vegetation objectives, and describes pest management programs within BLM.

State Laws and Regulations

Lake and Streambed Alteration (Fish and Game Code Sections 1600-1616). The California Department of Fish and Wildlife (CDFW) regulates project activities that would divert, obstruct or change the natural flow, bed, channel, or bank of any river, stream, or lake.

3.10.3 Regional Setting

The CCFO Planning Area encompasses approximately 793,000 acres of public and private lands with Federal ownership of subsurface minerals. Varied landforms include the Central Coast Range, the Salinas and San Joaquin valleys, and three major watersheds that include the Pajaro, which drains into the Pacific Ocean, and the Arroyo Pasajero and Silver Creek, which drain east to the San Joaquin Valley. Lands in the Planning Area range in elevation from nearly sea level to over 5,000 feet. The climate is Mediterranean, characterized by hot, dry summers and cool, wet winters. Annual precipitation occurs primarily as winter rain and ranges from 4 to 8 inches in the rugged Panoche Hills on the eastern edge of the Diablo Range and the western edge of the San Joaquin Valley, to approximately 40 inches on the coast at Coast Dairies. The predominant vegetation communities found within the Planning Area are annual grassland, chaparral, and oak woodland.

3.10.4 Current Conditions and Trends

Central Coast Field Office Planning Area

BLM land within the Planning Area supports a variety of vegetation communities that can be grouped into eight major types: Blue Oak Woodland, Blue Oak–Foothill Pine, Valley Oak Woodland, Douglas Fir, Mixed Chaparral, Alkali Desert Scrub, Annual Grassland, and Perennial Grassland. In addition to the major vegetation communities, many other less predominant vegetation and habitat types may also be present. Two of these, riparian vegetation and vernal pools, are included among the descriptions below. In general, these vegetation communities are confined to small areas within the larger landscape; riparian vegetation is typically found in linear corridors along stream channels, and vernal pools are generally found in scattered patches, in nearly flat topography, surrounded by more predominant grassland or other vegetation. A description of each major vegetation community is provided below and the distribution of major vegetation communities within the Planning Area is shown on Figure 3.10-1a and 3.10-1b.

Blue oak woodland is a deciduous woodland found on hilly terrain from sea level to 2000 feet elevation. Dominant species are blue oak (*Quercus douglasii*), coast live oak (*Q. agrifolia*), valley oak (*Q. lobata*), and California juniper (*Juniperus californica*). This vegetation type is found in all four Management Areas and is a substantial component of the Salinas and San Benito Management Areas; see Table 3.10-1.

Blue oak–foothill pine is a mixed woodland found on hilly terrain from 500 to 3000 feet elevation. Dominant species are blue oak, foothill pine (*Pinus sabiniana*), interior live oak (*Quercus wislizeni*), and California buckeye (*Aesculus californica*). This vegetation type is found in the San Joaquin and Salinas Management Areas; see Table 3.10-1.

Valley oak woodland is a deciduous woodland found in valley bottoms and on gentle slopes from sea level to 3000 feet elevation. Dominant species are valley oak, white alder (*Alnus rhombifolia*), boxelder (*Acer negundo*), and Oregon ash (*Fraxinus latifolia*).This vegetation type is a relatively small component of all four management areas; see Table 3.10-1.

Douglas fir is a coniferous, closed-canopy forest found on rugged, steep slopes from 500 to 2000 feet elevation. Dominant species are Douglas fir (*Pseudotsuga menziesii*), tanoak (*Notholithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*), canyon live oak (*Quercus chrysolepis*), black oak (Q. kelloggii), ponderosa pine, Pacific yew (*Taxus brevifolia*), knobcone pine (*Pinus attenuata*). This vegetation type is a small component of the Central Coast and San Joaquin Management Areas and is found at the Coast Dairies and Santa Cruz Mountains; see Table 3.10-1.

Mixed chaparral is shrubland vegetation found on steep slopes and ridges from sea level to 5000 feet elevation. Dominant species are scrub oak (*Quercus berberidifolia*), ceanothus (*Ceanothus spp.*), manzanita (*Arctostaphylos spp.*), chamise (*Adenostoma fasciculatum*), birch leaf mountain mahogany (*Cercocarpus betuloides*), poison oak (*Toxicodendron diversilobum*), sumac (*Rhus spp.*), toyon (*Heteromeles arbutifolia*),

hollyleaf cherry (*Prunus ilicifolia*), and silktassel (*Garrya spp.*). This vegetation type is found in all four management areas and is a substantial component of the Salinas Management Area; see Table 3.10-1.

Alkali desert scrub is scrubland vegetation found on alkali playas and dry lakebeds from sea level to 3000 feet elevation. Dominant species are allscale (*Atriplex polycarpa*), spiny saltbush (*A. spinifera*), and big saltbush (*A. lentiformis*). This vegetation type is a major component of the San Joaquin Management Area; see Table 3.10-1.

Annual grassland is found on flat plains and rolling foothills from sea level to 3000 feet elevation. This vegetation community includes both native and non-native species. These non-natives are typically invasive and tend to dominate annual grasslands in California. Dominant native species are turkey mullein (*Croton setigerus*) and some true clovers (*Trifolium spp.*). Dominant non-native species are wild oats (*Avena spp.*), soft chess (*Bromus hordeaceus*), ripgut brome (*B. diandrus*), red brome (*B. madritensis ssp. rubens*), wild barley (*Hordeum spp.*), foxtail fescue (*Festuca myuros*), broad leaf filaree (*Erodium botrys*), redstem filaree (*E. cicutarium*), true clovers (*Trifolium spp.*), bur clovers (*Medicago spp.*), and popcorn flowers (*Cryptantha spp.* and *Plagiobothrys spp.*). This vegetation type is a major component of all four management areas; see Table 3.10-1.

Perennial grassland is found at higher elevations with higher annual precipitation. Dominant native species are Nevada blue grass (*Poa secunda*; in more arid areas), foothill needle grass (*Stipa lepida*), California melic (*Melica californica*), and western wild-rye (*Elymus glaucus*). This vegetation type is a small component of the San Joaquin Management Area; see Table 3.10-1.

Riparian vegetation is found along the banks and floodplains of streams, rivers, and other bodies of fresh water. Valley foothill riparian is found in the lower elevations, while montane riparian is generally found at higher elevations. Riparian vegetation includes trees, shrubs, and herbaceous plants. Typical species are willow (*Salix* spp.), cottonwood (*Populus* spp.), and alder (*Alnus* spp.). Many riparian areas in arid landscapes may have perennial, intermittent, episodic, or ephemeral surface or subsurface water flow. Isolated springs may create localized patches of riparian vegetation. Riparian vegetation often includes wetlands, such as marshes, bogs, and swamps, which are associated with a permanent or ephemeral source of fresh water. Typical marsh species are cattails (*Typha* spp.), rushes (*Juncus* spp.), and sedges (*Carex* spp.).

Vernal pools are seasonal freshwater wetlands that form when rainwater collects in natural depressions where the soil is relatively impervious to water infiltration. Vernal pools support a unique suite of plants and animals adapted to survive seasonal wetland conditions that vary from year to year depending on rainfall. Typical species are downingia (*Downingia* spp.) and meadow foam (*Limnanthes* spp.). Vernal pools may be found in many portions of the Planning Area.

Jurisdictional Waters

For the purposes of environmental review, wetlands are addressed both as habitat and as waters of the U.S. or waters of the State under the jurisdiction of the USACE, the State Water Resources Control Board (SWRCB), and the CDFW. Wetlands are characterized by (1) permanent or periodical saturation or inundation, (2) specific "hydric" soil conditions resulting from saturation, and (3) vegetation adapted to saturated soil conditions. In addition to wetlands, many streambeds, lakebeds, or other hydrologic features may meet jurisdictional criteria based on presence of bed and bank, or ordinary high water mark. Jurisdictional waters may be found throughout the Planning Area. These waters and wetlands often provide important habitat for plants, fish, and wildlife.

Noxious and Invasive Weeds

Noxious and invasive weeds are an increasing problem on BLM lands throughout the west. Over 180 weed species have been identified in the Planning Area (CCH, 2015; Cal-IPC, 2015). Of particular con-

cern on BLM lands in the Planning Area are tamarisk (*Tamarix* spp.), Russian thistle (*Salsola* spp.), and yellow starthistle (*Centaurea solstitialis*) in the San Joaquin Management Area; iceplant (*Carpobrotus* spp.), pampasgrass (*Cortaderia* spp.), French broom (*Genista monspessulana*), and German ivy (*Delairea odorata*) in the Central Coast Management Area; yellow starthistle and tocalote (*Centaurea melitensis*) in the San Benito Management Area; and yellow starthistle in the Salinas Management Area.

Non-native invasive plants that become established in a new area may displace native species (including special status species or plants that provide food or cover for wildlife), alter natural habitat structure, and increase wildfire frequency (Zouhar et al., 2008, pg. 34; Lovich and Bainbridge, 1999, pg. 313). Some weeds are poisonous or cause physical injury to wildlife, livestock, and people. These plants are considered "weeds" or "pest plants" in natural landscapes (Bossard et al., 2000). Invasive weeds generally spread most readily in disturbed, graded, or cultivated soils, including soils disturbed by construction equipment. Weeds and pest plants are not limited to "noxious weeds" as defined by the USDA, but are defined here to include any species of non-native plants identified on the weed lists of the California Department of Food and Agriculture, the California Invasive Plant Council, or of special concern identified by BLM.

Management Areas

A brief description of each of the four Management Areas within the Planning Area, including major vegetation communities, is provided below. Table 3.10-1 provides the area occupied by each major vegetation type within the Management Areas.

Central Coast Management Area

There are two areas of BLM-administered lands within the Central Coast Management Area — Coast Dairies and the Fort Ord National Monument. Neither of these areas is available for oil and gas development; the following is presented for informational purposes only. In aggregate, major vegetation communities on BLM lands in the Central Coast Management Area are mainly annual grassland with a substantial component of chaparral and relatively small amounts of blue oak woodland, Douglas fir forest, and valley oak woodland; see Table 3.10-1. More detailed vegetation community descriptions of Coast Dairies and Fort Ord National Monument are provided below.

Vegetation communities within the Coast Dairies include a mixture of native and non-native grassland, upland scrubland, wetland, riparian scrub and forest, and upland oak, mixed evergreen, and redwood forests. The Coast Dairies supports high-quality wildlife habitat in those areas that have not been directly affected by agricultural practices or development. The Coast Dairies is managed by BLM, in conjunction with the California Department of Parks and Recreation (CDPR), as outlined in the Long-term Resource Protection and Access Plan (ESA, 2003).

Vegetation communities on Fort Ord National Monument include mainly maritime chaparral, oak woodland, and grassland. Other vegetation types are riparian, coastal strand and dune, coastal scrub, and vernal pool (USACE, 1997; Shaw, 2007). Fort Ord is a former military base, closed in 1994, and the BLM manages Fort Ord as described in a Habitat Management Plan (HMP; USACE, 1997). The Fort Ord Reuse Authority (FORA), a non-profit local government agency, also participates in management of the area. FORA has developed a draft Habitat Conservation Plan (HCP) that, if approved, would replace the management direction in the HMP (FORA, 2015).

Salinas Management Area

This Management Area includes steep rugged terrain in the Sierra de Salinas Range, which parallels the Santa Lucia Range to the west. Vegetation in the Management Area is mainly annual grassland, chaparral, and blue oak woodland, but on BLM lands it is predominantly dense chaparral with small areas of blue oak savannah. The western portion of the Management Area lies in a zone of coastal influence, and

fog often blankets all but the upper elevations during the spring and summer months. There are numerous intermittent drainages, and permanent water sources include the Arroyo Seco, Carmel, and Salinas Rivers. Another permanent water source is the San Antonio River, a perennial tributary to the Salinas River that is dammed to form the San Antonio Reservoir.

San Benito Management Area

The predominant feature in this Management Area is the Diablo Range, with its rugged, steep topography. Serpentine outcrops are common throughout this area. The overall vegetation in the Management Area is highly variable with annual grasslands and oak woodland in valleys and chaparral and oak woodland on slopes. The San Benito River originates near San Benito Mountain, flows northwest through the San Benito Management Area, and out to Monterey Bay.

San Joaquin Management Area

The San Joaquin Management Area lies within the Central Valley of California. Major vegetation communities in the Management Area are mainly annual grassland, blue oak–foothill pine woodland, and blue oak woodland.

The USFWS has prepared the Recovery Plan for Upland Species of the San Joaquin Valley (USFWS, 1998) that addresses 34 special status plant and animal species that occur in this area. A number of these species occur on BLM lands. This Management Area includes several management units with areas designated for special status species. These management units are the Panoche Hills, Griswold-Tumey Hills, Ciervo Hills/Joaquin Rocks, and Coalinga. These areas are further discussed in Section 3.12 (Special Status Species) of this document.

Table 3.10-1. Percent of Management Area Occupied by Each Major Vegetation Community

Vegetation Community	Central Coast	Salinas	San Benito	San Joaquin
Blue Oak Woodland	3	22	34	7
Blue Oak–Foothill Pine	0	2	0	14
Valley Oak Woodland	<1	<1	1	2
Douglas Fir	3	0	0	<1
Mixed Chaparral	15	24	5	3
Alkali Desert Scrub	0	0	0	<1
Annual Grassland	79	52	60	74
Perennial Grassland	0	0	0	<1

Source: BLM, 2006 with updates from BLM staff (2015).

Leases Subject to Settlement Agreement

Below is a brief description of the setting of each of the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749. The leases are described in Sections 2.6 through 2.10 for each alternative and are shown on Figures 2-1 through 2-5. General information on each lease site was derived from inspection of Google Earth imagery (Google, 2015), and should be considered preliminary, subject to field verification. Descriptions include major vegetation communities, but may not include all vegetation types and habitats present on the site.

CACA 052959 is located within the Salinas Management Area and is found on the Espinosa Canyon U.S. Geological Survey (USGS) topographic quadrangle (topo quad). The site is in rugged hilly terrain west of the Salinas Valley and includes a few old trails or fuelbreaks, some of which are at least partially overgrown. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral and annual grassland. Elevation ranges from around 850 to 1800 feet.

CACA 052960 is located within the Salinas Management Area and is found on the Tierra Redondo Mountain and Hames Valley USGS topo quads. The site is in rugged hilly terrain southwest of the Salinas Valley. The site includes several dirt roads or trails, scattered small structures, and areas that may have been grazed or disced. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral and annual grassland with scattered trees, possibly oaks. Elevation ranges from around 900 to 1700 feet.

CACA 053824 is located within the Salinas Management Area in the Williams Hill area, and is found on the Espinosa Canyon and San Ardo USGS topo quads. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails, a few structures, and some areas of disturbance. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral and annual grassland. Elevation ranges from around 900 to 1600 feet.

CACA 053825 is located within the Salinas Management Area in the Williams Hill area, and is found on the Williams Hill, Espinosa Canyon, Hames Valley, and San Ardo USGS topo quads. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails, including Lockwood San Ardo Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral with some annual grassland and scattered trees, possibly oaks. Elevation ranges from around 1000 to 2200 feet.

CACA 053826 is located within the Salinas Management Area in the Williams Hill area, and is found on the Hames Valley USGS topo quad. The site is in rugged hilly terrain west of the Salinas Valley and includes several dirt roads or trails and a corral with associated structures. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are primarily chaparral with annual grassland on some parcels. Elevation ranges from around 1200 to 2400 feet.

CACA 053827 is located within the Salinas Management Area in the Williams Hill area, and is found on the Williams Hill USGS topo quad. The site is in hilly terrain west of the Salinas Valley and includes several dirt roads or trails and an area of disturbance. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral with some annual grassland and oak woodland. There are also some rocky outcrops with minimal vegetation. Elevation ranges from around 1600 to 2300 feet.

CACA 053828 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche and Llanada USGS topo quads. The site is in rugged hilly terrain and includes large areas of grassland that may have been grazed. A few dirt roads or trails are evident, including one to the summit of Buck Peak. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral and annual grassland with some scattered trees, possibly oaks. There are also rocky outcrops with minimal vegetation. Elevation ranges from around 2000 to 3500 feet.

CACA 053829 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche USGS topo quad. The site is in rugged hilly terrain and includes large areas of grassland that may have been grazed. A few dirt roads or trails are evident, including Union Canyon Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are primarily annual grassland with some chaparral. Elevation ranges from around 2100 to 2900 feet.

CACA 053830 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Panoche, Tumey Hills, Hernandez Reservoir, and Idria USGS topo quads. The site is in hilly terrain, rugged in places, and includes large areas of grassland that may have been grazed. There are a few roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are primarily annual grassland with some chaparral. Elevation ranges from around 2100 to 2900 feet.

CACA 053831 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Hernandez Reservoir USGS topo quad. The site is in rugged hilly terrain and includes some areas of grassland that may have been grazed. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are chaparral and annual grassland. Elevation ranges from around 1900 to 4000 feet.

CACA 053832 is located within the San Joaquin Management Area in the Call Mountain–Hernandez Valley area, and is found on the Hernandez Reservoir and Idria USGS topo quads. The site is in rugged hilly terrain and includes some areas of grassland that may have been grazed. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. One larger drainage on the site may have perennial flow. Major vegetation communities are chaparral and annual grassland. Elevation ranges from around 1900 to 3500 feet.

CACA 053833 is located within the San Joaquin Management Area in the Griswold-Tumey Hills area, and is found on the Tumey Hills and Idria USGS topo quads. The site is in rugged hilly terrain and includes areas of grassland that may have been grazed. There are a few dirt roads or trails. Drainages on the site are likely to support intermittent or ephemeral flows. The major vegetation community is annual grassland. Elevation ranges from around 1500 to 2500 feet.

CACA 053834 is mainly located within the San Joaquin Management Area with a small section in the San Benito Management Area. It is in the Griswold-Tumey Hills area, and found on the Idria USGS topo quad. The site is in rugged hilly terrain and includes areas of grassland that may have been grazed. There are a few dirt roads or trails, including Tumey Gulch Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are annual grassland and chaparral. Elevation ranges from around 1900 to 2500 feet.

CACA 053835 is located within the San Joaquin Management Area in the Griswold-Tumey Hills area, and is found on the Idria USGS topo quad. The site is in rugged hilly terrain and includes areas of grassland that may have been grazed. There are a few dirt roads or trails, including New Idria Road. Drainages on the site are likely to support intermittent or ephemeral flows. Major vegetation communities are annual grassland and chaparral. Elevation ranges from around 1600 to 2900 feet.

3.11 Biological Resources – Wildlife Habitat

3.11.1 Introduction

The RMP FEIS (BLM, 2006) describes the key fish and wildlife resources found within the Planning Area. The information below is summarized from the RMP FEIS and has been updated as needed.

Over 300 species of birds, mammals, reptiles, and amphibians occur or have the potential to occur within the Planning Area. These include several species of rare, threatened, and endangered animals, such as the San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia sila*), giant kangaroo rat (*Dipodomys ingens*), mountain plover (*Charadrius montanus*), and burrowing owl (*Athene cunicularia*).

In analyzing management actions, this EIS addresses key species and their habitats. Key species include those of economic interest (e.g., native and non-native game animals); species or groups that serve as indicators of ecosystem health or the effects of management activities; and sensitive, rare, threatened, and endangered (RTE) species. Game animals may also be considered indicator species.

Game and indicator species include California mule deer (*Odocoileus hemionus californicus*) and Columbian black-tailed deer (*O.h. columbianus*), tule elk (*Cervus elaphus nannodes*), wild pig (*Sus scrofa*), mountain lion (*Felis concolor*), wild turkey (*Meleagris gallopavo*), California quail (*Callipepla californica)* and chukar (*Alectoris chukar*), and small game, nongame, and fur-bearing mammals.

Small game includes desert cottontail rabbit (*Sylvilagus auduboni*), brush rabbit (*Sylvilagus bachmani*), blacktailed jackrabbit (*Lepus californicus*), and western gray squirrel (*Sciurus griseus*). Nongame species include bobcat (*Lynx rufus*), coyote (*Canis latrans*), and California ground squirrel (*Spermophilus beecheyi*). Fur-bearing mammals that occur within the Planning Area are gray fox (*Urocyon cinero-argenteus*), raccoon (*Procyon lotor*), and American badger (*Taxidea taxus*).

RTE plant and wildlife species are described in Section 3.12 (Special Status Species) of this document.

The Planning Area is within habitat that supports fauna representative of the central coast and the Central Valley. Vegetation communities are described in Section 3.10 (Vegetation) of this document. Table 3.11-1 lists the major vegetation communities found within the Planning Area and the key wildlife species typically associated with each.

Table 3.11-1. Major Vegetation Communities and Associated Key Wildlife Resources

Vegetation Community	Associated Key Wildlife Resources
Blue Oak Woodland Blue Oak–Foothill Pine Valley Oak Woodland Douglas Fir	Game and indicator: game species, mountain lion RTE: bats, raptors (nesting and roosting)
Mixed Chaparral	Game and indicator: game species, mountain lion RTE: bats, big-eared kangaroo rat, Bell's sage sparrow, coast horned lizard
Alkali Desert Scrub	RTE: Buena vista lake shrew, Fresno kangaroo rat, San Joaquin (Nelson's) antelope squirrel, San Joaquin kit fox, Tipton kangaroo rat, Tulare grasshopper mouse, giant kangaroo rat, San Joaquin Valley woodrat, riparian brush rabbit, short-nosed kangaroo rat, San Joaquin LeConte's thrasher, blunt-nosed leopard lizard, Ciervo aegialian scarab beetle, Doyen's trigonascuta dune weevil, San Joaquin dune beetle
Annual Grasslands Perennial Grasslands	Game and indicator: game species, mountain lion RTE: coast horned lizard, Buena Vista Lake shrew, Fresno kangaroo rat, San Joaquin (Nelson's) antelope squirrel, San Joaquin kit fox, Tipton kangaroo rat, Tulare grasshopper mouse, giant kangaroo rat, San Joaquin Valley woodrat, riparian brush rabbit, short-nosed kangaroo rat, San Joaquin LeConte's thrasher, blunt-nosed leopard lizard, Ciervo aegialian scarab beetle, Doyen's trigonascuta dune weevil, San Joaquin dune beetle

Table 3.11-1. Major Vegetation Communities and Associated Key Wildlife Resources

Vegetation Community	Associated Key Wildlife Resources
Riparian	Game, indicator, and RTE species may utilize riparian areas for movement corridors, water sources, or refugia, and foraging, roosting, or sheltering habitat
Vernal Pool	RTE: fairy and tadpole shrimp, California tiger salamander, western spadefoot toad

3.11.2 Regulatory Framework

There are several directives that guide BLM management of wildlife resources and habitat. In addition to those listed in Section 3.10.2, these include:

Federal Laws and Regulations

Endangered Species Act (16 USC Sections 1531–1544). BLM Handbook H-6840. The Endangered Species Act (ESA) establishes legal requirements for the conservation of endangered and threatened species and the ecosystems upon which they depend. The ESA is administered by the U.S. Fish and Wildlife Service (USFWS) for terrestrial species, and by the National Marine Fisheries Service (NMFS) for marine species and anadromous fish. Under the ESA, the USFWS or NMFS may designate critical habitat for listed species. Section 7 of the ESA requires Federal agencies to consult with USFWS or NMFS to ensure that their actions are not likely to jeopardize listed threatened or endangered species, or cause destruction or adverse modification of critical habitat. Section 10 of the ESA requires similar consultation for non-Federal applicants.

Migratory Bird Treaty Act (16 USC 703–712). The Migratory Bird Treaty Act (MBTA) prohibits take of any migratory bird, including eggs or active nests, except as permitted by regulation (e.g., licensed hunting of waterfowl or upland game species). Under the MBTA, "migratory bird" is broadly defined as "any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle" and thus applies to most native bird species. The MBTA does not cover non-native species such as house sparrows, European starlings, and rock doves.

Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996. Establishes procedures designed to identify, conserve, and enhance essential fish habitat (EFH) for those species regulated under a Federal fisheries management plan. EFH includes those waters and substrates necessary for fish to spawn, breed, feed, and grow to maturity. Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include historic areas if appropriate. Freshwater EFH for pacific salmonids includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassible man-made, and long standing, naturally impassable barriers. The act requires Federal agencies to consult with the National Oceanic and Atmospheric Administration Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH.

Clean Water Act (33 USC Sections 1251–1387). The Clean Water Act (CWA) regulates the chemical, physical, and biological integrity of the nation's waters. Section 401 of the CWA requires that an applicant obtain State certification for discharge into waters of the United States. The Regional Water Quality Control Boards administer the certification program in California. Section 404 of the CWA established a permit program, administered by the U.S. Army Corps of Engineers (USACE), to regulate the discharge of dredged or fill material into waters of the United States, including wetlands.

Coastal Zone Management Act (16 USC 1451–1464). The Coastal Zone Management Act (CZMA) established a Federal and State partnership for coastal resource management. Federal projects must be consistent with the State's certified program. A Federal agency must provide a consistency determination

to the Federal Consistency Unit of the California Coastal Commission (which implements the Federal CZMA as it applies to Federal activities in California) no later than 90 days before final approval of the Federal activity.

Executive Order 13186. Directs Federal agencies that take actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement a Memorandum of Understanding (MOU) with USFWS to promote the conservation of migratory bird populations.

Executive Order 11990, Protection of Wetlands. This order directs Federal agencies to avoid to the extent possible the long- and short-term adverse impacts from the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Executive Order 11988, Floodplain Management. This order directs Federal agencies to avoid the long-term and short-term adverse impacts of occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.

State Laws and Regulations

Birds (Fish and Game Code Sections 3503 and 3513). The California Fish and Game Code prohibits take, possession, or needless destruction of birds, nests, or eggs except as otherwise provided by the code. Section 3503.5 prohibits take or possession of birds of prey or their eggs, and Section 3513 prohibits take or possession of any migratory nongame bird. Section 3513 provides for the adoption of the provisions of the Federal Migratory Bird Treaty Act (see Section 3.11.2).

3.11.3 Regional Setting

The fish and wildlife resources on BLM land within the Planning Area are managed by two agencies, the BLM and the California Department of Fish and Wildlife (CDFW), in consultation with the U.S. Fish and Wildlife Service (USFWS) as needed. The BLM is responsible for managing the habitat that supports fish and wildlife, while CDFW is responsible for managing fish and wildlife species. Both agencies coordinate many of their activities to meet objectives to maintain, protect, and enhance the abundance and diversity of native fish and wildlife resources.

3.11.4 Current Conditions and Trends

Central Coast Field Office Planning Area

The current conditions and trends for game and indicator wildlife species are summarized in Table 3.11-2. More detailed information can be found in the RMP FEIS (BLM, 2006). Game populations are managed based on habitat condition and the quality of the animals being produced. Population levels are linked to a variety of factors, including vegetation quality and quantity, adequate space, shelter, cover, water distribution, and regional weather patterns and trends such as prolonged drought.

RTE plant and wildlife species are addressed in Section 3.12 (Special Status Species) of this document.

Table 3.11-2. Habitat Conditions and Population Trends for Key Game and Indicator Species in the Planning Area

Species	Habitat Condition	Population Trend
California mule deer Columbian black-tailed deer	Poor to good,[1-4] highly variable throughout planning area	Stable to declining
Tule elk	Poor to good,[1-4] highly variable throughout planning area	Increasing since the 1970s

Table 3.11-2. Habitat Conditions and Population Trends for Key Game and Indicator Species in the Planning Area

Species	Habitat Condition	Population Trend
Wild horse and burro	Not applicable	No herd units and no wild free-roaming horses and burros within the Planning Area
Wild pig	Poor to good[1-4], highly variable throughout planning area	Increasing and expanding
Wild turkey	Fair[1]	Increasing
Mountain lion	Fair[2,3]	Increasing
Upland game birds – California quail and chukar	Good[1]	Wide annual fluctuations, primarily due to timing and amount of rainfall
Small game, nongame, and fur-bearing mammals	Good[1,4]	Most species stable to increasing; badger decreasing

Basis of habitat condition assessment:
1 - Vegetation resource condition
2 - Development/density of intrusions
3 - Competition with other resources
4 - as reflected by population levels.

Fisheries

The coastal and inland drainages, watersheds, and small streams and rivers within the Planning Area support cool and warm water fisheries. Cold water fisheries include the coastal drainages in coastal Santa Cruz County; Molino, Ferrari, San Vicente, Liddell, Yellow Bank, and Laguna Creeks in the Central Coast Management Area; and "Y" creeks. Each of these waters supports or has the potential to support coastal rainbow trout and steelhead and coho salmon fisheries. Warm water fisheries include the San Benito River and Laguna and Warthan Creeks.

All waters in the Planning Area are managed as wild fisheries, maintained by natural recruitment rather than stocking. With the exception of the coastal rainbow trout (*Oncorhynchus mykiss irideus*), the native fish species that occur within the Planning Area are considered nongame species. RTE fish species are addressed in Section 3.12 (Special Status Species) of this document.

Birds

A wide diversity of bird life is found throughout the CCFO Planning Area, including raptors, shorebirds, songbirds, and many others. Many of these species nest within BLM managed lands within the CCFO Planning Area, while others may overwinter in the area, or be present seasonally, during migration. Most of these birds have no special conservation status (see Section 3.12 for special status species), but most birds are protected under State and Federal statutes; see Section 3.11.2. With the exception of a few non-native birds such as European starling, the take of any birds or active bird nests or young is regulated by these statutes.

Wildlife Movement and Biological Connectivity

Within the Planning Area, areas of habitat may be fragmented or isolated by development. Fragmentation and isolation of natural habitat may cause loss of native species diversity. Fish and wildlife movement among habitat areas is important to long-term genetic variation and demography. In the short term, fish and wildlife movement may also be important to individual animals' ability to occupy their home ranges, if their ranges extend across a potential movement barrier. These considerations are especially important for rare, threatened, or endangered species, and wide-ranging species such as large mammals, which exist in low population densities.

In landscapes where native habitats exist as partially isolated patches surrounded by other land uses, planning for fish and wildlife movement generally focuses on local "wildlife corridors" to provide animals with access routes among habitat patches. In largely undeveloped areas, fish and wildlife habitat is available in extensive open space areas throughout the region, but specific land uses or linear barriers may impede or prevent movement. In these landscapes, fish and wildlife movement planning focuses on sites where animals can cross linear barriers, but may not emphasize corridors among habitat areas.

Leases Subject to Settlement Agreement

Habitat condition and population trends for key game and indicator species on the 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, would be expected to be generally similar to those for the remainder of the Planning Area. The vegetation for these leases is described generally in Section 3.10.4. Field surveys would be required to provide more detailed information.

3.12 Biological Resources – Special Status Species

3.12.1 Introduction

The RMP FEIS (BLM, 2006) describes the special status species that occur or may occur within the Planning Area. Unless otherwise cited, the information below is summarized from the RMP FEIS (BLM, 2006) and has been updated as needed.

Special status species are those with populations that have declined to the point of substantial Federal or State agency concern. BLM considers special status species to include the designations listed in Table 3.12-1.

Table 3.12-1. Definitions of Special Status Species

Species Designation	Agency	Definition
Federal Endangered	USFWS	A species that is in danger of extinction throughout all or a significant portion of its range.
Federal Threatened	USFWS	A species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Federal Candidate	USFWS	A species the USFWS has designated as a candidate for listing under Section 4 of the ESA, published in its annual candidate review, and defined as a species that has sufficient information on its biological status and threats to propose it as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.
Federal Proposed	USFWS	A species that the USFWS has proposed for listing under Section 4 of the ESA, by publishing a Proposed Rule in the Federal Register.
Bald and Golden Eagle Protection Act	USFWS	Prohibits take of bald and golden eagles without a permit issued by the Secretary of the Interior.
Birds of Conservation Concern	USFWS	The migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities.
Species of Concern	USFWS	Species of Concern is an informal term that refers to species that are declining or appear to be in need of conservation actions. Species of Concern receive no legal protection and the use of the term does not necessarily mean that the species will eventually be proposed for listing as a threatened or endangered species. The Sacramento USFWS Office does not maintain a Species of Concern list. However, the RMP FEIS (BLM, 2006) listed several species with this designation, and it has been retained here for consistency with that document.
Marine Mammal Protection Act	NOAA	Prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

Table 3.12-1. Definitions of Special Status Species

Species Designation	Agency	Definition
BLM Sensitive Species	BLM	BLM sensitive species are designated by the BLM California State Director in cooperation with the CDFW, as species that meet one or more of the following criteria: ▪ Could become endangered in or extirpated from a state or within a significant portion of their distribution; ▪ Status is under review by the USFWS or NMFS; that are undergoing or are predicted to undergo significant downward trends in habitat capability that would reduce their distribution; ▪ Populations or densities are declining significantly or that are predicted to decline significantly such that it becomes necessary to designate their Federal status as listed, proposed, or candidate or to designate their State status as listed; Typically have small and widely dispersed populations; Inhabit ecological refugia or other specialized or unique habitats; State listed, but that may be better conserved under BLM sensitive species status. BLM sensitive species also include CRPR 1B plant species (see below) that are not federally listed or proposed for listing.
State Endangered	CDFW	A species that is in serious danger of becoming extinct throughout all or a significant portion of its range due to one or more causes, including loss or change in habitat, overexploitation, predation, competition, or disease.
State Threatened	CDFW	A species that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts.
State Candidate	CDFW	A species that is under review by the CDFW for addition to the threatened or endangered species lists, on direction from the California Fish and Game Commission. Take of CESA candidate species is prohibited unless authorized by CDFW under Fish and Game Code Section 2081.
Fully Protected	CDFW	Animal species fully protected under the California Fish and Game Code. The CDFW may not issue take authorization except for scientific purposes or under the terms of a natural community conservation plan (NCCP).
Protected furbearers	CDFW	Applies to fisher, marten, river otter, desert kit fox, and red fox.
Species of Special Concern	CDFW	A species, subspecies, or distinct population of an animal native to California that currently satisfies one or more of the following (not necessarily mutually exclusive) criteria: ▪ Is extirpated from the State or, in the case of birds, from its primary seasonal or breeding role; ▪ Is on the Federal, but not State list, of threatened or endangered species; ▪ Meets the State definition of threatened or endangered but has not formally been listed; ▪ Is experiencing or formerly experienced serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for State threatened or endangered status; or ▪ Has naturally small populations exhibiting high susceptibility to risk from any factor(s) that, if realized, could lead to declines that would qualify it for State threatened or endangered status. SSC is an administrative designation and carries no formal legal status. This designation is intended to focus attention on animals at conservation risk, to stimulate research on poorly known species, and to achieve conservation and recovery before these species meet the California Endangered Species Act (CESA) criteria for listing. California SSC are considered under the California Environmental Quality Act (CEQA) and require a discussion of impacts and appropriate mitigation to reduce impacts.

Table 3.12-1. Definitions of Special Status Species

Species Designation	Agency	Definition
Watch List	CDFW	Taxa that were previously SSCs but no longer meet SSC status, or do not meet SSC criteria, but for which there is concern and a need for additional information to clarify status.
Protected	CDFW	An animal species that is not federally or State-listed, FP, or SSC, but is protected under the California Fish and Game Code.
Special Animals	CDFW	All of the species the CNDDB is tracking, regardless of their legal or protection status. CDFW considers these species to be those of greatest conservation need.
Rare Plant	CDFW	Plants designated by the State Fish and Game Commission as rare and protected under the Native Plants Protection Act.
CRPR 1A	CDFW	Plants presumed to be extinct in California.
CRPR 1B	CDFW	Plants rare or endangered in California and elsewhere.
CRPR 2	CDFW	Plants rare or endangered in California, but more common elsewhere.
CRPR 3	CDFW	Plants about which more information is needed – a review list.
CRPR 4	CDFW	Plants of limited distribution – a watch list.

Source: BLM, 2006, 2012, 2013; CDFW, 2015a; CNPS, 2015b; NOAA Fisheries, 2014; USFWS, 2012a, 2012b, 2014.
CRPR = California Rare Plant Rank.

The USFWS officially designates critical habitat under the ESA. Critical habitat is a designation that indicates areas that have the physical and biological features believed to be essential to the conservation of the species and may require special management considerations or protection. A critical habitat designation does not necessarily restrict future development. Only projects that have a Federal nexus (e.g., Federal permitting, licensing, or funding) and are likely to impact the critical habitat will be subject to ESA review. An affected project may be able to proceed if it can be amended to avoid or mitigate adverse effects to the critical habitat (USFWS, 2015).

The ESA mandates that all Federal agencies use their authorities to further the purposes of the ESA by carrying out programs for conserving endangered and threatened species. The ESA also requires a Federal agency to ensure that any action it authorizes, funds, or implements is not likely to jeopardize the continued existence of any endangered or threatened species or to destroy or adversely modify designated critical habitat. BLM policy is to conserve federally listed species and the ecosystems on which they depend. It is also BLM policy to ensure that BLM actions are consistent with the conservation needs of all special status species and not to contribute to a need for ESA listing of any special status species.

3.12.2 Regulatory Framework

There are several Federal and State directives that guide BLM management of special status plant and wildlife resources and their habitat. In addition to those listed in Section 3.10.2 and 3.11.2, these include:

Federal Laws and Regulations

Endangered Species Act (16 USC Sections 1531–1544). BLM Handbook H-6840. The Endangered Species Act (ESA) establishes legal requirements for the conservation of endangered and threatened species and the ecosystems upon which they depend. The ESA is administered by the U.S. Fish and Wildlife Service (USFWS) for terrestrial species, and by the National Marine Fisheries Service (NMFS) for marine species and anadromous fish. Under the ESA, the USFWS or NMFS may designate critical habitat for listed species. Section 7 of the ESA requires Federal agencies to consult with USFWS or NMFS to ensure that their actions are not likely to jeopardize listed threatened or endangered species, or cause

destruction or adverse modification of critical habitat. Section 10 of the ESA requires similar consultation for non-Federal applicants.

Bald and Golden Eagle Protection Act (16 USC Section 668). The Bald and Golden Eagle Protection Act (BGEPA) prohibits the take, possession, and commerce of bald eagles and golden eagles. Under the BGEPA and subsequent rules published by the USFWS, "take" may include actions that injure an eagle, or affect reproductive success (productivity) by substantially interfering with normal behavior or causing nest abandonment. The USFWS can authorize incidental take of bald and golden eagles for otherwise lawful activities.

State Laws and Regulations

California Endangered Species Act (Fish and Game Code Section 2050 et seq.). The California Endangered Species Act (CESA) prohibits take of State-listed threatened or endangered species, or candidates for listing, except as authorized by CDFW. Authorization may be issued as an Incidental Take Permit or, for species listed under both CESA and the Federal ESA, through a Consistency Determination with the Federal incidental take authorization.

Fully Protected Designations (Fish and Game Code Sections 3511, 4700, 5050, and 5515). The California Fish and Game Code designates 36 fish and wildlife species as "fully protected" from take, including hunting, harvesting, and other activities. The CDFW may only authorize take of designated fully protected species through a natural community conservation plan (NCCP) or for necessary scientific research.

Protected Furbearers (California Code of Regulations Title 14 Section 460). Title 14 specifies that "[f]isher, marten, river otter, desert kit fox and red fox may not be taken at any time." The CDFW may permit capture or handing of these species for scientific research, but does not issue Incidental Take Permits for other purposes.

Native Plant Protection Act (Fish and Game Code Sections 1900–1913). Prior to enactment of CESA and the Federal ESA, California adopted the Native Plant Protection Act (NPPA). CESA (above) generally replaces the NPPA for plants originally listed as endangered under the NPPA. However, plants originally listed as rare retain that designation, and take is regulated under provisions of the NPPA. The California Fish and Game Commission has adopted revisions to the NPPA allowing CDFW to issue incidental take authorization for listed rare plants, effective January 1, 2015. The BLM designates rare plants State-listed under the NPPA as BLM sensitive species.

3.12.3 Regional Setting

The BLM has completed or is in the process of identifying areas of ecological importance, designating priority species and habitats, and identifying restoration strategies, opportunities, and management decisions to protect or prevent avoidable loss of habitat supporting special status species within each of the Management Areas.

The BLM involves regulatory agencies in the planning process via Memoranda of Agreement (MOAs) and Memoranda of Understanding (MOUs). In addition, consultation with the USFWS and NOAA Fisheries is required by the Endangered Species Act for Federal actions that may affect listed species and designated critical habitat. The consultation process ensures that actions taken are not likely to jeopardize the continued existence of any threatened or endangered species or their critical habitat.

3.12.4 Current Conditions and Trends

Central Coast Field Office Planning Area

A number of special status species occur within the Planning Area. Tables 3.12-2 and 3.12-3 identify known or potential occurrences of special status species within the Planning Area. This information is based on the RMP FEIS (BLM, 2006) and current CNDDB (CDFW, 2015c) and Calflora (2015) records of species within the Planning Area.

Critical habitat for 14 animal species or DPS and 13 plant species occurs within the Planning Area. Critical habitat for six of these species includes BLM surface or split estate lands; see Table 3.12-2. Critical habitat found within the Planning Area is shown on Figure 3.12-1a and b.

Figures 3.12-2a through 2e and 3.12-3a through 3e depict special status species occurrences within the Planning Area, with federally listed species shown on Figure 3.12-2 and other special status species on 3.12-3. A brief description of many of these species can be found in Appendix E of the RMP FEIS (BLM, 2006). Note that some species occurrences may not have been documented in the CNDDB and site-specific analysis is required to determine the presence or absence of a particular species.

There are 88 federally listed or candidate species or distinct population segments (DPS) that occur within the Planning Area, including 46 plants and 42 animals. Several of these species are known to occur or are likely to occur on BLM lands; see Table 3.12-2.

There are 197 additional special status species (137 plant and 60 animal species) that occur within the Planning Area, 129 of these are designated as BLM sensitive species (100 plant and 29 animal species). Several of these species are known to occur or are likely to occur on BLM lands; see Table 3.12-3.

Federally Listed Species

Species that are federally listed, proposed for listing, or candidates for listing under the ESA are shown in Table 3.12-2, along with current conservation status, presence of designated critical habitat within the Planning Area (on BLM surface, split estate, and non-BLM lands), and known occurrence within the Planning Area (on BLM surface, split estate, and non-BLM lands). A brief description of many of these species can be found in Appendix E of the RMP FEIS (BLM, 2006).

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat			Occurrence
		BLM Surface	Split Estate	Non-BLM	
INVERTEBRATES: CRUSTACEANS					
Conservancy fairy shrimp *Branchinecta conservatio*	Fed: END BLM: none CA: SA				Non-BLM land May occur area-wide
Longhorn fairy shrimp *Branchinecta longiantenna*	Fed: END BLM: none CA: SA			x	Non-BLM land San Joaquin Management Area May occur area-wide
Vernal pool fairy shrimp *Branchinecta lynchi*	Fed: THR BLM: none CA: SA	x	x	x	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Vernal pool tadpole shrimp *Lepidurus packardi*	Fed: END BLM: none CA: SA			x	Non-BLM land San Joaquin Management Area

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat: BLM Surface	Critical Habitat: Split Estate	Critical Habitat: Non-BLM	Occurrence
INVERTEBRATES: INSECTS					
Bay checkerspot butterfly *Euphydryas editha bayensis*	Fed: THR BLM: none CA: SA			x	Split estate, non-BLM land Central Coast, Salinas, and San Joaquin Management Areas
Callippe silverspot butterfly *Speyeria callippe callippe*	Fed: END BLM: none CA: SA				Non-BLM land San Joaquin Management Area
Mission blue butterfly *Plebejus icarioides missionensis*	Fed: END BLM: none CA: SA				Non-BLM land San Joaquin Management Area
Mount Hermon June beetle *Polyphylla barbata*	Fed: END BLM: none CA: SA				Non-BLM land Central Coast Management Area
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	Fed: END BLM: none CA: SA				Non-BLM land San Joaquin Management Area
Ohlone tiger beetle *Cicindela ohlone*	Fed: END BLM: none CA: SA				Non-BLM land Central Coast Management Area
San Bruno elfin butterfly *Callophrys [Incisalia] mossii bayensis*	Fed: END BLM: none CA: SA				Split estate, non-BLM land San Joaquin Management Area
Smith's blue butterfly *Euphilotes enoptes smithi*	Fed: END BLM: none CA: SA				BLM surface, split estate, non-BLM land Central Coast and Salinas Management Areas
Valley elderberry longhorn beetle *Desmocerus californicus dimorphus*	Fed: THR BLM: none CA: SA				Non-BLM land San Joaquin Management Area
Zayante band-winged grasshopper *Trimerotropis infantilis*	Fed: END BLM: none CA: SA			x	Non-BLM land Central Coast Management Area
FISH					
Coho salmon – central coast ESU *Oncorhynchus kisutch* Note: Federal listing limited to naturally spawning populations between Punta Gorda, Humboldt Co. and San Lorenzo River, Santa Cruz Co.	Fed: END BLM: none CA: END				BLM surface, split estate, non-BLM land Central Coast Management Area
Delta smelt *Hypomesus transpacificus*	Fed: THR BLM: none CA: END		x	x	Non-BLM land San Joaquin Management Area
Longfin smelt *Spirinchus thaleichthys* Note: Federal Candidate status is for the San Francisco Bay-Delta DPS	Fed: Cand BLM: none CA: THR, SSC				Non-BLM land San Joaquin Management Area
Steelhead – central coast DPS *Oncorhynchus mykiss irideus*	Fed: THR BLM: none CA: SA			x	BLM surface, split estate, non-BLM land Central Coast, Salinas, and San Joaquin Management Areas

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat: BLM Surface	Critical Habitat: Split Estate	Critical Habitat: Non-BLM	Occurrence
Steelhead – south/central coast DPS *Oncorhynchus mykiss irideus*	Fed: THR BLM: none CA: SSC			x	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Tidewater goby *Eucyclogobius newberryi*	Fed: END BLM: none CA: SSC			x	Non-BLM land Central Coast and San Joaquin Management Areas
AMPHIBIANS					
Arroyo toad *Anaxyrus californicus*	Fed: END BLM: none CA: SSC				Non-BLM land Salinas Management Area
California red-legged frog *Rana aurora draytonii*	Fed: THR BLM: none CA: SSC	x	x	x	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
California tiger salamander (Central Valley Distinct Population Segment) *Ambystoma californiense*	Fed: THR BLM: none CA: THR, SSC	x	x	x	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Santa Cruz long-toed salamander *Ambystoma macrodactylum croceum*	Fed: END BLM: none CA: END, FP				Non-BLM land Central Coast Management Area
REPTILES					
Alameda whipsnake (striped racer) *Masticophis lateralis euryxanthus*	Fed: THR BLM: none CA: THR		x	x	Split estate, non-BLM land San Joaquin Management Area
Blunt-nosed leopard lizard *Gambelia sila*	Fed: END BLM: none CA: END, FP				BLM surface, split estate, non-BLM land San Joaquin Management Area
Giant garter snake *Thamnophis gigas*	Fed: THR BLM: none CA: THR				Non-BLM land San Joaquin Management Area
San Francisco garter snake *Thamnophis sirtalis tetrataenia*	Fed: END BLM: none CA: END, FP				Split estate, non-BLM land Central Coast and San Joaquin Management Areas
BIRDS					
California condor *Gymnogyps californianus*	Fed: END BLM: none CA: END, FP				Split estate, non-BLM land San Benito Management Area
California least tern *Sternula antillarum browni*	Fed: END BLM: none CA: END, FP				Non-BLM land San Joaquin Management Area
Least Bell's vireo *Vireo bellii pusillus*	Fed: END BLM: none CA: END				Split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat: BLM Surface	Critical Habitat: Split Estate	Critical Habitat: Non-BLM	Occurrence
Marbled murrelet *Brachyramphus marmoratus*	Fed: THR BLM: none CA: END		x	x	Non-BLM land Central Coast Management Area
Ridgway's (California clapper) rail *Rallus longirostris obsoletus*	Fed: END BLM: none CA: END, FP				Non-BLM land Central Coast and San Joaquin Management Areas
Western snowy plover *Charadrius alexandrinus nivosus*	Fed: THR, BCC BLM: none CA: SSC			x	BLM surface, non-BLM land Central Coast and San Joaquin Management Areas
Western yellow-billed cuckoo *Coccyzus americanus occidentales*	Fed: THR, BCC BLM: S CA: END				Non-BLM land San Benito Management Area
MAMMALS					
Giant kangaroo rat *Dipodomys ingens*	Fed: END BLM: none CA: END				BLM surface, split estate, non-BLM land San Joaquin Management Area
Guadalupe fur seal *Arctocephalus townsendi*	Fed: THR, MMPA BLM: none CA: THR, FP				Unknown occurrence in the Planning Area, known from Farallon Islands in San Francisco County
Salt-marsh harvest mouse *Reithrodontomys raviventris*	Fed: END BLM: none CA: END, FP				Non-BLM land San Joaquin Management Area
San Joaquin kit fox *Vulpes macrotis mutica*	Fed: END BLM: none CA: THR				BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Southern sea otter *Enhydra lutris nereis*	Fed: THR, MMPA BLM: none CA: FP				Unknown occurrence in the Planning Area, species is known from Marin County
Tipton kangaroo rat *Dipodomys nitratoides nitratoides*	Fed: END BLM: none CA: END				Non-BLM land San Joaquin Management Area
PLANTS					
Antioch Dunes evening-primrose *Oenothera deltoides ssp. howellii*	Fed: END BLM: none CA: END, CRPR 1B.1			x	Non-BLM land San Joaquin Management Area
Beach layia *Layia carnosa*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
Ben Lomond spineflower *Chorizanthe pungens var. hartwegiana*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land Central Coast Management Area
Butano Ridge cypress *Hesperocyparis abramsiana var. butanoensis*	Fed: END BLM: none CA: END, CRPR 1B.2				Split estate, non-BLM land Central Coast Management Area
California jewelflower *Caulanthus californicus*	Fed: END BLM: none CA: END, CRPR 1B.1				BLM surface, split estate, non-BLM land San Joaquin Management Area

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat: BLM Surface	Critical Habitat: Split Estate	Critical Habitat: Non-BLM	Occurrence
California seablite *Suaeda californica*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land San Joaquin Management Area
Coastal dunes milk-vetch *Astragalus tener var. titi*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
Contra Costa goldfields *Lasthenia conjugens*	Fed: END BLM: none CA: CRPR 1B.1			x	BLM surface, non-BLM land Central Coast and San Joaquin Management Areas
Contra Costa wallflower *Erysimum capitatum ssp. angustatum*	Fed: END BLM: none CA: END, CRPR 1B.1			x	Non-BLM land San Joaquin Management Area
Coyote ceanothus *Ceanothus ferrisiae*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Crystal Springs fountain thistle *Cirsium fontinale var. fontinale*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land San Joaquin Management Area
Franciscan manzanita *Arctostaphylos franciscana*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land San Joaquin Management Area
Gowen cypress *Hesperocyparis (Cupressus) goveniana*	Fed: THR BLM: none CA: CRPR 1B.2				Non-BLM land Central Coast Management Area
Hickman's cinquefoil *Potentilla hickmanii*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Large-flowered fiddleneck *Amsinckia grandiflora*	Fed: END BLM: none CA: END, CRPR 1B.1			x	Split estate, non-BLM land San Joaquin Management Area
Marin western (dwarf) flax *Hesperolinon congestum*	Fed: THR BLM: none CA: THR, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Marsh sandwort *Arenaria paludicola*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Menzies's wallflower *Erysimum menziesii*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
Metcalf Canyon jewel-flower *Streptanthus albidus ssp. albidus*	Fed: END BLM: S CA: CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Mexican flannelbush *Fremontodendron mexicanum*	Fed: END BLM: none CA: Rare, CRPR 1B.1				Non-BLM land Salinas Management Area
Monterey clover *Trifolium trichocalyx*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
Monterey spineflower *Chorizanthe pungens var. pungens*	Fed: THR BLM: none CA: CRPR 1B.2			x	BLM surface, non-BLM land Central Coast and Salinas Management Areas

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat BLM Surface	Critical Habitat Split Estate	Critical Habitat Non-BLM	Occurrence
Pallid manzanita *Arctostaphylos pallida*	Fed: THR BLM: none CA: END, CRPR 1B.1				Non-BLM land San Joaquin Management Area
Palmate-bracted salty bird's-beak *Chloropyron palmatum* (*Cordylanthus palmatus)*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land San Joaquin Management Area
Presidio clarkia *Clarkia franciscana*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land San Joaquin Management Area
Presidio (San Francisco) manzanita *Arctostaphylos montana ssp. ravenii*	Fed: END BLM: none CA: END, CRPR 1B.1			x	Non-BLM land San Joaquin Management Area
Robust spineflower *Chorizanthe robusta var. robusta*	Fed: END BLM: S CA: CRPR 1B.1			x	Non-BLM land Salinas, Central Coast, and San Joaquin Management Areas
San Benito evening-primrose *Camissonia benitensis*	Fed: THR BLM: none CA: CRPR 1B.1				BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Sand gilia (Monterey gilia) *Gilia tenuiflora ssp. arenaria*	Fed: END BLM: none CA: THR, CRPR 1B.2				BLM surface, non-BLM land Central Coast Management Area
San Francisco lessingia *Lessingia germanorum*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land San Joaquin Management Area
San Joaquin woollythreads *Monolopia congdonii*	Fed: END BLM: none CA: CRPR 1B.2				BLM surface, split estate, non-BLM land San Joaquin Management Area
San Mateo thorn-mint *Acanthomintha duttonii*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
San Mateo woolly sunflower *Eriophyllum latilobum*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Santa Clara Valley dudleya *Dudleya abramsii ssp. setchellii*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Santa Cruz cypress *Hesperocyparis (Cupressus) abramsiana var. abramsiana*	Fed: END BLM: none CA: END, CRPR 1B.2				Non-BLM land Central Coast Management Area
Santa Cruz tarplant *Holocarpha macradenia*	Fed: THR BLM: none CA: END, CRPR 1B.1			x	Non-BLM land Central Coast and San Joaquin Management Areas
Santa Cruz wallflower *Erysimum teretifolium*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
Santa Lucia purple amole *Chlorogalum purpureum var. purpureum*	Fed: THR BLM: none CA: CRPR 1B.1			x	Split estate, non-BLM land Salinas Management Area

Table 3.12-2. Federally Listed Species Present in the Planning Area

Common name *Scientific name*	Status	Critical Habitat: BLM Surface	Critical Habitat: Split Estate	Critical Habitat: Non-BLM	Occurrence
Scott's Valley polygonum *Polygonum hickmanii*	Fed: END BLM: none CA: END, CRPR 1B.1			x	Non-BLM land Central Coast Management Area
Scott's Valley spineflower *Chorizanthe robusta var. hartwegii*	Fed: END BLM: none CA: CRPR 1B.1			x	Non-BLM land Central Coast Management Area
Showy rancheria clover *Trifolium amoenum*	Fed: END BLM: none CA: CRPR 1B.1				Non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
Soft salty bird's-beak *Chloropyron (Cordylanthus) molle ssp. molle*	Fed: END BLM: none CA: Rare, CRPR 1B.2			x	Non-BLM land San Joaquin Management Area
Tiburon paintbrush *Castilleja affinis var. neglecta*	Fed: END BLM: none CA: THR, CRPR 1B.2				Non-BLM land San Joaquin Management Area
Tidestrom's lupine *Lupinus tidestromii*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast Management Area
White-rayed pentachaeta *Pentachaeta bellidiflora*	Fed: END BLM: none CA: END, CRPR 1B.1				Non-BLM land Central Coast and San Joaquin Management Areas
Yadon's rein orchid *Piperia yadonii*	Fed: END BLM: none CA: CRPR 1B.1			x	Non-BLM land Central Coast and Salinas Management Areas

Sources: BLM (2006), CNPS (2015a), and CDFW (2015a, 2015b, 2015c), with additional information from Calflora (2015). Occurrence within Planning Area is based on CDFW (2015c), Calflora (2015), BLM (2006), and updates from BLM staff.

Status Codes

U.S. Fish and Wildlife Service (FED) Designations:

END: Federally listed, endangered.
THR: Federally listed, threatened.
Cand: Candidate for listing.
Delisted: Removed from Federal listing.
BGEPA: Bald and Golden Eagle Protection Act.
BCC: Bird of Conservation Concern.
SC: Species of Concern. The Sacramento USFWS Office does not maintain a Species of Concern list. However, the RMP FEIS (BLM, 2006) listed several species with this designation and it has been retained here for consistency with that document.

National Oceanic and Atmospheric Administration Fisheries (FED) Designations:

MMPA: Marine Mammal Protection Act.

Bureau of Land Management (BLM) Designations

S: BLM sensitive species. BLM sensitive species status based on BLM, 2010, 2013a, 2013b; CDFW, 2015a, 2015b.

***California Department of Fish and Wildlife (CA) Designations*:**

END: State listed, endangered.
THR: State listed, threatened.
Cand: Candidate for listing.
Delisted: Removed from State listing.
CSC: Species of Special Concern: Considered vulnerable to extinction due to declining numbers, limited geographic ranges, or ongoing threats.
FP: Fully protected. May not be taken or possessed without permit from CDFW.
SA: Special Animal: An animal species that is tracked in the CNDDB, but has no other status at the State or Federal level.
WL: Watch list.
PFM: Protected fur-bearing mammal.
Rare: Rare plant listed under the Native Plants Protection Act.

California Rare Plant Rank (CRPR) designation

1A	Plants presumed extinct in California.
1B	Plants rare, threatened, or endangered in California and elsewhere.
2B	Plants rare, threatened, or endangered in California, but more common elsewhere.
3	Plants about which we need more information – a review list.
4	Plants of limited distribution – a watch list.
.1	Seriously threatened in California (high degree/immediacy of threat).
.2	Fairly threatened in California (moderate degree/immediacy of threat).
.3	Not very threatened in California (low degree/immediacy of threats or no current threats known).

Other Special Status Species

Table 3.12-3 provides current conservation status and occurrence within the Planning Area for special status species that are not federally listed. A brief description of many of these species can be found in Appendix E of the RMP FEIS (BLM, 2006).

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name ***Scientific name***	**Status**	**Occurrence**
INVERTEBRATES: CRUSTACEANS		
Western fairy shrimp (California linderiella) *Linderiella occidentalis*	Fed: SC BLM: none CA: SA	BLM surface, non-BLM land May occur area-wide
INVERTEBRATES: INSECTS		
Ciervo aegialian scarab beetle *Aegialia concinna*	Fed: SC BLM: S CA: SA	BLM surface, non-BLM land San Joaquin Management Area
Doyen's dune weevil *Trigonoscuta sp.*	Fed: SC BLM: none CA: SA	Non-BLM land Central Coast and San Joaquin Management Area
Molstan blister beetle *Lytta molesta*	Fed: SC BLM: none CA: SA	Split estate, non-BLM land San Joaquin Management Area
Monarch – California overwintering population *Danaus plexippus*	Fed: none BLM: none CA: SA	Split estate, non-BLM land Central Coast, Salinas, and San Joaquin Management Areas
Morrison's blister beetle *Lytta morrisoni*	Fed: SC BLM: none CA: SA	BLM surface, split estate, non-BLM land San Joaquin Management Area
San Joaquin dune beetle *Coelus gracilis*	Fed: SC BLM: S CA: SA	BLM surface, split estate, non-BLM land San Joaquin Management Area
AMPHIBIANS		
Foothill yellow-legged frog *Rana boylii*	Fed: SC BLM: S CA: SSC	BLM surface, split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
Western spadefoot toad *Spea hammondii*	Fed: SC BLM: S CA: SSC	Split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
REPTILES		
Black (California) legless lizard *Anniella pulchra nigra*	Fed: none BLM: none CA: SSC	Split estate, non-BLM land Salinas and Central Coast Management Areas

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Coast horned lizard *Phrynosoma blainvillii*	Fed: none BLM: S CA: SSC	BLM surface, split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
San Joaquin whipsnake *Masticophis flagellum ruddocki*	Fed: none BLM: none CA: SSC	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Silvery legless lizard *Anniella pulchra pulchra*	Fed: none BLM: none CA: SSC	BLM surface, non-BLM land Central Coast, San Benito, Salinas, and San Joaquin Management Areas
Two-striped garter snake *Thamnophis hammondii*	Fed: none BLM: S CA: SSC	BLM surface, non-BLM land Central Coast, San Benito, Salinas, and San Joaquin Management Areas
Western pond turtle *Emys marmorata*	Fed: none BLM: S CA: SSC	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Joaquin, and San Benito Management Areas
BIRDS		
Alameda song sparrow *Melospiza melodia pusillula*	Fed: BCC BLM: none CA: SSC	Split estate, non-BLM land San Joaquin Management Area
American peregrine falcon *Falco peregrinus anatum*	Fed: Delisted, BCC BLM: none CA: Delisted, FP	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Bald eagle *Haliaeetus leucocephalus*	Fed: Delisted, BGEPA, BCC BLM: S CA: END, FP	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Bank swallow *Riparia riparia*	Fed: none BLM: S CA: THR	Split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Bell's sage sparrow *Artemisiospiza belli ssp. belli*	Fed: BCC BLM: none CA: WL	BLM surface, split estate, non-BLM land San Benito Management Area
Burrowing owl *Athene cunicularia*	Fed: BCC BLM: S CA: SSC	BLM surface, split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
California black rail *Laterallus jamaicensis coturniculus*	Fed: BCC BLM: S CA: THR, FP	Non-BLM land Central Coast and San Joaquin Management Areas
California brown pelican *Pelecanus occidentalis californicus*	Fed: Delisted BLM: S CA: Delisted, FP	Non-BLM land Central Coast Management Area
Ferruginous hawk *Buteo regalis*	Fed: BCC BLM: none CA: WL	Split estate, non-BLM land Central Coast and San Joaquin Management Areas Potential to occur area-wide
Golden eagle *Aquila chrysaetos*	Fed: BGEPA, BCC BLM: S CA: WL, FP	Split estate, non-BLM land May occur area-wide

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name ***Scientific name***	**Status**	**Occurrence**
Grasshopper sparrow *Ammodramus savannarum*	Fed: none BLM: none CA: SSC	Non-BLM land Central Coast Management Area
LeConte's thrasher *Toxostoma lecontei*	Fed: BCC BLM: S CA: SSC BLM S and CA SSC status only for San Joaquin ssp. *T.l. macmillanorum*	Non-BLM land San Joaquin Management Area
Loggerhead shrike *Lanius ludovicianus*	Fed: BCC BLM: none CA: SSC	Non-BLM land San Joaquin Management Area Potential to occur area-wide
Long-eared owl *Asio otus*	Fed: none BLM: none CA: SSC	Non-BLM land Central Coast, San Benito, and San Joaquin Management Areas Potential to occur area-wide
Mountain plover *Charadrius montanus*	Fed: BCC BLM: S CA: SSC	Non-BLM land San Joaquin Management Area
Northern harrier *Circus cyaneus*	Fed: none BLM: none CA: SSC	Split estate, non-BLM land Salinas, San Benito, San Joaquin Management Areas Potential to occur area-wide
Osprey *Pandion haliaetus*	Fed: none BLM: none CA: WL	Non-BLM land Central Coast Management Area Potential to occur area-wide
Prairie falcon *Falco mexicanus*	Fed: BCC BLM: none CA: WL	BLM surface, split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
Rhinoceros auklet *Cerorhinca monocerata*	Fed: none BLM: none CA: WL	Non-BLM land Central Coast and Salinas Management Areas
Sharp-shinned hawk *Accipiter striatus*	Fed: none BLM: none CA: WL	Non-BLM land San Benito and San Joaquin Management Areas Potential to occur area-wide
Short-eared owl *Asio flammeus*	Fed: none BLM: none CA: SSC	Non-BLM land Central Coast, Salinas, and San Joaquin Management Areas
Swainson's hawk *Buteo swainsoni*	Fed: BCC BLM: S CA: THR	Split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
Tri-colored blackbird *Agelaius tricolor*	Fed: BCC BLM: S CA: END, SSC	Split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas Potential to occur area-wide
White-tailed kite *Elanus leucurus*	Fed: none BLM: S CA: FP	Split estate, non-BLM land Central Coast, San Benito, and San Joaquin Management Areas
Willow flycatcher *Empidonax traillii*	Fed: BCC BLM: none CA: END	Non-BLM land Potential to occur area-wide

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Yellow-breasted chat *Icteria virens*	Fed: none BLM: none CA: SSC	Non-BLM land San Benito Management Area Potential to occur area-wide
Yellow warbler *Setophaga (Dendroica) petechia*	Fed: BCC BLM: none CA: SSC	Non-BLM land Salinas and San Joaquin Management Areas Potential to occur area-wide
MAMMALS		
American badger *Taxidea taxus*	Fed: none BLM: none CA: SSC	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Big-eared kangaroo rat *Dipodomys venustus elephantinus*	Fed: none BLM: none CA: SSC	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Fringed myotis *Myotis thysanoides*	Fed: none BLM: S CA: SA	Non-BLM land San Benito and San Joaquin Management Areas Potential to occur area-wide
Hoary bat *Lasiurus cinereus*	Fed: none BLM: none CA: SA	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Long-eared myotis *Myotis evotis*	Fed: none BLM: S CA: SA	Non-BLM land San Benito and San Joaquin Management Areas Potential to occur area-wide
Monterey dusky-footed woodrat *Neotoma macrotis luciana*	Fed: none BLM: none CA: SSC	BLM surface, split estate, non-BLM land Salinas and San Benito Management Areas
Northern elephant seal *Mirounga angustirostris*	Fed: MMPA BLM: none CA: FP	Unknown occurrence in the Planning Area, species is not tracked by CNDDB but range includes the central coast
Pallid bat *Antrozous pallidus*	Fed: none BLM: S CA: SSC	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Ringtail (ring-tailed cat) *Bassariscus astutus*	Fed: none BLM: none CA: FP	Unknown occurrence in the Planning Area, species is not tracked by CNDDB but range includes most of California Potential to occur area-wide
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	Fed: none BLM: none CA: SSC	Non-BLM land Central Coast and San Joaquin Management Areas
San Joaquin (Nelson's) antelope squirrel *Ammospermophilus nelsoni*	Fed: SC BLM: S CA: THR	BLM surface, split estate, non-BLM land San Joaquin and San Benito Management Areas
San Joaquin pocket mouse *Perognathus inornatus inornatus*	Fed: none BLM: S CA: SA	BLM surface, split estate, non-BLM land San Joaquin Management Area
Short-nosed kangaroo rat *Dipodomys nitratoides brevinasus*	Fed: none BLM: S CA: SSC	BLM surface, non-BLM land San Joaquin Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Townsend's big-eared bat *Corynorhinus townsendii*	Fed: none BLM: S CA: Cand, SSC	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas
Tulare grasshopper mouse *Onychomys torridus tularensis*	Fed: none BLM: S CA: SSC	BLM surface, split estate, non-BLM land San Joaquin and San Benito Management Areas
Western mastiff bat *Eumops perotis californicus*	Fed: none BLM: S CA: SSC	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas Potential to occur area-wide
Western small-footed myotis *Myotis ciliolabrum*	Fed: none BLM: S CA: SA	Non-BLM land San Benito Management Area Potential to occur area-wide
Yuma myotis *Myotis yumanensis*	Fed: none BLM: S CA: SA	Non-BLM land Central Coast, San Benito, and San Joaquin Management Areas Potential to occur area-wide
PLANTS		
Abbott's bush-mallow *Malacothamnus abbottii*	Fed: none BLM: S CA: CRPR 1B.1	Split estate, non-BLM land Salinas Management Area
Adobe sanicle *Sanicula maritima*	Fed: none BLM: S CA: Rare, CRPR 1B.1	Non-BLM land Central Coast, Salinas, and San Joaquin Management Areas
Anderson's manzanita *Arctostaphylos andersonii*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast Management Area
Arburua Ranch jewelflower *Streptanthus insignis ssp. lyonii*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area
Arcuate bush-mallow *Malacothamnus arcuatus*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast Management Area
Arroyo de la Cruz manzanita *Arctostaphylos cruzensis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Arroyo Seco bush mallow *Malacothamnus palmeri var. lucianus*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast and Salinas Management Areas
Bay buckwheat *Eriogonum umbellatum var. bahiiforme*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Benito and San Joaquin Management Areas
Brandegee's eriastrum *Eriastrum brandegeeae*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface San Benito Management Area
Brewer's clarkia *Clarkia breweri*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Brewer's western flax *Hesperolinon breweri*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Bristlecone fir *Abies bracteata*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land Salinas Management Area
Butterworth's buckwheat *Eriogonum butterworthianum*	Fed: none BLM: S CA: Rare, CRPR 1B.3	Non-BLM land Salinas Management Area
California androsace *Androsace elongata ssp. acuta*	Fed: none BLM: none CA: CRPR 4.2	Split estate, non-BLM land San Joaquin Management Area
Carlotta Hall's lace fern *Aspidotis carlotta-halliae*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
Carmel Valley bush mallow *Malacothamnus palmeri var. involucratus*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Central Coast and Salinas Management Areas
Carmel Valley cliffaster *Malacothrix saxatilis var. arachnoidea*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast, Salinas, and San Benito Management Areas
Chaparral harebell *Campanula exigua*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Chaparral ragwort *Senecio aphanactis*	Fed: none BLM: none CA: CRPR 2B.2	BLM surface, non-BLM land San Joaquin Management Area
Clay buckwheat *Eriogonum argillosum*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Cleveland's milk-vetch *Astragalus clevelandii*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land Clear Creek Management Area
Club-haired mariposa lily *Calochortus clavatus var. clavatus*	Fed: none BLM: none CA: CRPR 4.3	BLM surface San Joaquin Management Area
Coast wallflower *Erysimum ammophilum*	Fed: none BLM: S CA: CRPR 1B.2	Non-BLM land Central Coast Management Area
Coastal triquetrella *Triquetrella californica*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area
Congdon's tarplant *Centromadia (Hemizonia) parryi ssp. congdonii*	Fed: none BLM: S CA: CRPR 1B.1	Non-BLM land Central Coast, Salinas, and San Joaquin Management Areas
Crownscale *Atriplex coronata var. coronata*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, non-BLM land San Joaquin Management Area
Davidson's bush-mallow *Malacothamnus davidsonii*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Delicate bluecup *Githopsis tenella*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land Salinas Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name ***Scientific name***	**Status**	**Occurrence**
Delta button-celery *Eryngium racemosum*	Fed: none BLM: S CA: END, CRPR 1B.1	Non-BLM land San Joaquin Management Area
Diablo helianthella *Helianthella castanea*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area
Diablo Range hare-leaf *Lagophylla diabolensis*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Douglas' fiddleneck *Amsinckia douglasiana*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, non-BLM land San Joaquin Management Area
Dudley's lousewort *Pedicularis dudleyi*	Fed: none BLM: S CA: Rare, CRPR 1B.2	Split estate, non-BLM land Central Coast and Salinas Management Areas
Dwarf soaproot *Chlorogalum pomeridianum var. minus*	Fed: none BLM: S CA: Rare, CRPR 1B.2	Split estate San Joaquin Management Area
Eastwood's buckwheat *Eriogonum eastwoodianum*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land Salinas and San Joaquin Management Areas
Elegant wild buckwheat *Eriogonum elegans*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land Benito Management Area
Fragrant fritillary *Fritillaria liliacea*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast and San Joaquin Management Areas
Forked fiddleneck *Amsinckia furcata*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Joaquin and San Benito Management Areas
Forked hare-leaf *Lagophylla dichotoma*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface San Benito Management Area
Gabilan Mountains manzanita *Arctostaphylos gabilanensis*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, non-BLM land Salinas Management Area
Guirado's goldenrod *Solidago guiradonis*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
Gypsum-loving larkspur *Delphinium gypsophilum*	Fed: none BLM: none CA: CRPR 3.2 for *D.g.* ssp. *parviflorum*	BLM surface, non-BLM land San Joaquin Management Area
Hall's bush-mallow *Malacothamnus hallii*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area
Hall's tarplant *Deinandra halliana*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Hardham's bedstraw *Galium hardhamiae*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land Salinas Management Area
Hardham's evening-primrose *Camissoniopsis hardhamiae*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Hernandez bluecurls *Trichostema rubisepalum*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
Hernandez spineflower *Chorizanthe biloba var. immemora*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Hickman's checkerbloom *Sidalcea hickmanii ssp. hickmanii*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land Salinas Management Area
Hooked popcornflower *Plagiobothrys uncinatus*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas and San Benito Management Areas
Hooker's manzanita *Arctostaphylos hookeri ssp. hookeri*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast Management Area
Hoover's woollystar, Hoover's eriastrum *Eriastrum hooveri*	Fed: Delisted BLM: none CA: CRPR 4.2	Non-BLM land San Joaquin Management Area
Hospital Canyon larkspur *Delphinium californicum ssp. interius*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Benito and San Joaquin Management Areas
Idria buckwheat *Eriogonum vestitum*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land San Joaquin Management Area
Indian Valley bush-mallow *Malacothamnus aboriginum*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Indian Valley spineflower *Aristocapsa insignis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Jepson's milk-vetch *Astragalus rattanii var. jepsonianus*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate Clear Creek Management Area
Jolon clarkia *Clarkia jolonensis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Jones' layia *Layia jonesii*	Fed: none BLM: S CA: CRPR 1B.2	Non-BLM land Salinas Management Area
Late-flowered mariposa-lily *Calochortus fimbriatus*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Lemmon's jewelflower *Caulanthus lemmonii*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas and San Joaquin Management Areas
Lime Ridge navarretia *Navarretia gowenii*	Fed: none BLM: S CA: CRPR 1B.1	Split estate, non-BLM land San Joaquin Management Area
Lost Hills crownscale *Atriplex coronata var. vallicola*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area
Mariposa cryptantha *Cryptantha mariposae*	Fed: none BLM: S CA: CRPR 1B.3	BLM surface Clear Creek Management Area
Marsh microseris *Microseris paludosa*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas and Central Coast Management Areas
Mason's lilaeopsis *Lilaeopsis masonii*	Fed: none BLM: S CA: Rare, CRPR 1B.1	Non-BLM land San Joaquin Management Area
Michael's rein orchid *Piperia michaelii*	Fed: none BLM: none CA: CRPR 4.2	Split estate, non-BLM land San Joaquin Management Area
Mojave spineflower *Chorizanthe spinosa*	Fed: none BLM: none CA: CRPR 4.2	BLM surface San Joaquin Management Area
Mt. Day rockcress *Boechera rubicundula*	Fed: none BLM: S CA: CRPR 1B.1	Split estate, non-BLM land San Joaquin Management Area
Mt. Diablo bird's-beak *Cordylanthus nidularius*	Fed: none BLM: S CA: Rare, CRPR 1B.1	Non-BLM land San Joaquin Management Area
Mt. Diablo buckwheat *Eriogonum truncatum*	Fed: none BLM: S CA: CRPR 1B.1	Split estate, non-BLM land San Joaquin Management Area
Mt. Diablo jewelflower *Streptanthus hispidus*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land San Joaquin Management Area
Mt. Diablo phacelia *Phacelia phacelioides*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Mt. Hamilton coreopsis *Leptosyne hamiltonii*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area
Mt. Hamilton fountain thistle *Cirsium fontinale var. campylon*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area
Mt. Hamilton jewelflower *Streptanthus callistus*	Fed: none BLM: S CA: CRPR 1B.3	Split estate, non-BLM land San Joaquin Management Area
Mt. Hamilton lomatium *Lomatium observatorium*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Munz's tidy-tips *Layia munzii*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area
Narrow-petaled rein orchid *Piperia leptopetala*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, split estate Benito Management Area
Nuttall's scrub oak *Quercus dumosa*	Fed: none BLM: S CA: Rare, CRPR 1B.1	BLM surface, split estate, non-BLM land Salinas and San Benito Management Areas
Otay manzanita *Arctostaphylos otayensis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate San Joaquin Management Area
Oval-leaved snapdragon *Antirrhinum ovatum*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Pacific Grove clover *Trifolium polyodon*	Fed: none BLM: S CA: Rare, CRPR 1B.1	Non-BLM land Central Coast Management Area
Pajaro manzanita *Arctostaphylos pajaroensis*	Fed: none BLM: S CA: CRPR 1B.1	Non-BLM land Central Coast, Salinas, and San Benito Management Areas
Pale-yellow layia *Layia heterotricha*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Panoche peppergrass *Lepidium jaredii ssp. album*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin, San Benito, and Clear Creek Management Areas
Pinnacles buckwheat *Eriogonum nortonii*	Fed: none BLM: S CA: CRPR 1B.3	BLM surface, split estate, non-BLM land Salinas and San Benito Management Areas
Point Reyes meadowfoam *Limnanthes douglasii ssp. sulphurea*	Fed: none BLM: S CA: END, CRPR 1B.2	Non-BLM land Central Coast Management Area
Prostrate vernal pool navarretia *Navarretia prostrata*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land San Benito and San Joaquin Management Areas
Protruding buckwheat *Eriogonum nudum var. indictum*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Benito, Salinas, San Joaquin, and Clear Creek Management Areas
Rayless layia *Layia discoidea*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land San Benito and Clear Creek Management Areas
Recurved larkspur *Delphinium recurvatum*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Area
Red-flowered bird's-foot-trefoil *Acmispon rubriflorus*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land San Joaquin Management Area
Rock sanicle *Sanicula saxatilis*	Fed: none BLM: S CA: Rare, CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Round-leaved filaree *California macrophylla*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Salinas milk-vetch *Astragalus macrodon*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Salinas Valley goldfields *Lasthenia leptalea*	Fed: none BLM: none CA: CRPR 4.3	Non-BLM land Salinas Management Area
San Antonio collinsia *Collinsia antonina*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas Management Area
San Benito fritillary *Fritillaria viridea*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
San Benito monardella *Monardella antonina ssp. benitensis*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
San Benito pentachaeta *Pentachaeta exilis ssp. aeolica*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Benito, Salinas, and Clear Creek Management Areas
San Benito poppy *Eschscholzia hypecoides*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, non-BLM land San Joaquin, San Benito, and Salinas Management Areas
San Benito thorn-mint *Acanthomintha obovata ssp. obovata*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Joaquin, San Benito, Salinas, and Clear Creek Management Areas
San Bruno Mountain manzanita *Arctostaphylos imbricata*	Fed: none BLM: S CA: END, CRPR 1B.1	Non-BLM land San Joaquin Management Area
San Francisco popcorn-flower *Plagiobothrys diffusus*	Fed: none BLM: S CA: END, CRPR 1B.1	Non-BLM land Central Coast and San Joaquin Management Areas
San Joaquin spearscale *Extriplex joaquinana*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Benito Management Area
San Luis Obispo sedge *Carex obispoensis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Santa Clara thorn-mint *Acanthomintha lanceolata*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Joaquin, San Benito, Salinas, and Clear Creek Management Areas
Santa Cruz clover *Trifolium buckwestiorum*	Fed: none BLM: S CA: CRPR 1B.1	Non-BLM land Central Coast Management Area
Santa Cruz Mountains beardtongue *Penstemon rattanii var. kleei*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast Management Area
Santa Cruz Mountains pussypaws *Calyptridium parryi* var. *hesseae*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land Central Coast, Salinas, San Benito, and San Joaquin Management Areas

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Santa Lucia dwarf rush *Juncus luciensis*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas and San Benito Management Areas
Santa Lucia gooseberry *Ribes sericeum*	Fed: none BLM: none CA: CRPR 4.3	Split estate, non-BLM land Central Coast Management Area
Santa Lucia mint *Pogogyne clareana*	Fed: none BLM: S CA: END, CRPR 1B.2	Non-BLM land Salinas Management Area
Santa Lucia monkeyflower *Erythranthe hardhamiae*	Fed: none BLM: S CA: CRPR 1B.1	Split estate, non-BLM land Salinas Management Area
Seaside bird's-beak *Cordylanthus rigidus ssp. littoralis*	Fed: none BLM: S CA: END, CRPR 1B.1	Non-BLM land Central Coast Management Area
Serpentine leptosiphon *Leptosiphon (Linanthus) ambiguus*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Serpentine phlox-leaf bedstraw *Galium andrewsii ssp. gatense*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land San Joaquin, San Benito, and Salinas Management Areas
Sharsmith's harebell *Campanula sharsmithiae*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land San Joaquin Management Area
Sharsmith's onion *Allium sharsmithiae*	Fed: none BLM: S CA: CRPR 1B.3	BLM surface, split estate, non-BLM land San Joaquin Management Area
Sharsmith's western flax *Hesperolinon sharsmithiae*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area
Shining navarretia *Navarretia nigelliformis ssp. radians*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas and San Benito Management Areas
Showy golden madia *Madia radiata*	Fed: none BLM: S CA: CRPR 1B.1	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Small-flowered morning-glory *Convolvulus simulans*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
Smooth lessingia *Lessingia micradenia var. glabrata*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Central Coast and San Joaquin Management Areas
South Coast Range morning glory *Calystegia collina ssp. venusta*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, split estate, non-BLM land Salinas, San Benito, and San Joaquin Management Areas
Spring lessingia *Lessingia tenuis*	Fed: none BLM: none CA: CRPR 4.3	Split estate, non-BLM land San Joaquin Management Area

Table 3.12-3. Other Special Status Species Present in the Planning Area

Common name *Scientific name*	Status	Occurrence
Stinkbells *Fritillaria agrestis*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, split estate, non-BLM land Central Coast, San Benito, Salinas, San Joaquin, and Clear Creek Management Areas
Straight-awned spineflower *Chorizanthe rectispina*	Fed: none BLM: S CA: CRPR 1B.3	BLM surface, split estate, non-BLM land Salinas Management Area
Talus fritillary *Fritillaria falcata*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas, San Benito, San Joaquin, and Clear Creek Management Areas
Temblor buckwheat *Eriogonum temblorense*	Fed: none BLM: S CA: CRPR 1B.2	BLM surface, split estate, non-BLM land Salinas and San Joaquin Management Areas
Toro manzanita *Arctostaphylos montereyensis*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land Salinas Management Area
Tracy's eriastrum *Eriastrum tracyi*	Fed: none BLM: none CA: Rare, CRPR 3.2	Split estate, non-BLM land San Joaquin Management Areas
Umbrella larkspur *Delphinium umbraculorum*	Fed: none BLM: S CA: CRPR 1B.3	BLM surface, split estate, non-BLM land Central Coast and Salinas Management Areas
Western Hermann's buckwheat *Eriogonum heermannii var. occidentale*	Fed: none BLM: none CA: CRPR 4.2	BLM surface, non-BLM land San Benito and Clear Creek Management Areas
Western lessingia *Benitoa occidentalis*	Fed: none BLM: none CA: CRPR 4.3	BLM surface, split estate, non-BLM land San Benito, San Joaquin, and Clear Creek Management Areas
Woodland woollythreads *Monolopia gracilens*	Fed: none BLM: S CA: CRPR 1B.2	Split estate, non-BLM land San Joaquin Management Area

Sources: BLM (2006), CNPS (2015a), CDFW (2015a, 2015b, 2015c), with additional information from Calflora (2015). Occurrence within Planning Area is based on CDFW (2015c),Calflora (2015), BLM (2006), and updates from BLM staff (2015).
Key to status codes listed at the bottom of Table 3.12-2.

Management Areas

See Tables 3.12-2 and 3.12-3 for a list of the special status species known or likely to occur in each Management Area and the conservation status for each. Additional information on a few notable species is summarized from the RMP FEIS (BLM, 2006) and provided below.

Central Coast Management Area

There are two areas of BLM-administered lands within the Central Coast Management Area — the Coast Dairies and the Fort Ord National Monument. Neither of these lands are open to oil and gas development so the discussion below is provided for informational purposes only.

Coast Dairies. Designated critical habitat for the federally listed threatened western snowy plover (*Charadrius alexandrinus nivosus*) is located on or adjacent to the Coast Dairies at Scotts Creek Beach and Laguna Creek Beach, and breeding plovers have occupied both sites (ESA, 2003, pg. III-7).

The federally listed threatened California red-legged frog (*Rana aurora draytonii*) is widely distributed on the Coast Dairies, and breeds in a number of ponds on the property (ESA, 2003, pg. III-7).

One of the six perennial watersheds situated partially or entirely within Coast Dairies Property lines, San Vicente Creek supports a self-sustaining population of federally listed threatened steelhead (*Oncorhynchus mykiss irideus*) and also contains one of the last remnant populations of the State-listed endangered coho salmon (*Oncorhynchus kisutch*) south of San Francisco Bay (ESA, 2003, pg. III-10).

The State Fully Protected American peregrine falcon (*Falco peregrinus anatum*) has been observed soaring over the coastal cliffs. The area also provides important habitat for wintering raptors (ESA, 2003, pg. III-9).

Fort Ord National Monument. Fort Ord has extensive suitable habitat for the federally listed endangered sand gilia (*Gilia tenuiflora ssp. arenaria*) and constitutes at least half of this species' range. Fort Ord also supports large populations of the federally listed threatened Monterey spineflower (*Chorizanthe pungens var. pungens*) (USACE, 1997, pg. S-18).

Beaches at Fort Ord support breeding populations of the federally listed threatened western snowy plover. Fort Ord has also been identified as important habitat for the federally listed endangered Smith's blue butterfly (*Euphilotes enoptes smithi*) (USACE, 1997, pg. S-21).

Salinas Management Area

Although the Salinas management area falls within the range of multiple special status species, only the prairie falcon has been recorded as occurring on these lands (BLM, 2006). The following special status species are expected to occur area-wide, or their specialized habitat criteria are met within this management area: California red-legged frog, western pond turtle (*Emys marmorata*), western spadefoot toad (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), California tiger salamander (*Ambystoma californiense*), coast horned lizard (*Phrynosoma blainvillii*), two-striped garter snake (*Thamnophis hammondii*), Smith's blue butterfly, and least Bell's vireo (*Vireo bellii pusillus*).

San Benito Management Area

Special status plants occurring on Federal mineral estate within the San Benito Management Area include the San Benito evening-primrose (*Camissonia benitensis*). Previously known only from serpentine alluvial flats, terraces, and alluvial outwash terraces and deposits near San Benito Mountain (USFWS, 2009, pg. 2), the known range of the species has recently been extended south into Monterey County at Highway 198 just west of Priest Valley, and its habitat type has been broadened to include serpentine alluvial stream terraces, serpentine geologic transition zone (serpentine soils in uplands along geologic boundaries), serpentine rock outcrops, and greywacke outcrops.

Sensitive wildlife species occurring on BLM-managed lands within the San Benito Management Area include the foothill yellow-legged frog (*Rana boylii*), two-striped garter snake, western pond turtle, silvery legless lizard (*Anniella pulchra pulchra*), coast horned lizard, and multiple birds and mammals that occur area-wide. Species that have not been encountered during surveys on BLM-managed lands but may occur within the area include special status invertebrates, California red-legged frog, western spadefoot toad, and California tiger salamander.

San Joaquin Management Area

The San Joaquin Management Area lies within the Central Valley of California, which is comprised of the San Joaquin and Sacramento Valleys. Historically, the habitats found in the Central Valley were valley grasslands, freshwater wetlands, and riparian woodlands. This area has been impacted by agriculture and development, with resulting habitat loss and degradation. A number of upland species of the San

Joaquin Valley have been federally listed. The USFWS published the Recovery Plan for Upland Species of the San Joaquin Valley, California in 1998 (USFWS, 1998). This recovery plan addresses 34 species of plants and animals that occur within the San Joaquin Valley, the majority of which occur in arid grasslands and scrublands. The ultimate goal of this recovery plan is to delist the 11 endangered and threatened species and ensure the long-term conservation of the 23 species of concern. Multiple species presented within the recovery plan occur on lands managed by the CCFO and are classified as threatened or endangered or are considered sensitive species. This recovery plan is further detailed below.

The California jewelflower (*Caulanthus californicus*) is found on BLM-managed land in the Kreyenhagen Hills in Fresno County (USFWS, 1998, pg. 27). San Joaquin woollythreads (*Monolopia congdonii*) is found on BLM-managed land in the Jacalitos Hills and Panoche Hills (USFWS, 1998, pg. 46) and at Panoche Creek, Monocline Ridge, and Kettleman North Dome.

The Panoche Hills management unit includes approximately 7,800 acres of significant habitat areas for sensitive species in the "plateau area" of the Panoche Hills, designated as an Area of Critical Environmental Concern (ACEC). There are four sensitive wildlife species found in the management unit: the San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia silus*), the giant kangaroo rat (*Dipodomys ingens*), and the San Joaquin antelope squirrel (*Ammospermophilus nelsoni*). The BLM has documented giant kangaroo rat colonies within the Panoche Hills plateau area. Additional colonies occur adjacent to the management unit in the extreme southeastern portion of the Panoche Hills outside of BLM-managed land.

The Griswold-Tumey Hills management unit has also designated 2,500 acres of significant habitat areas for sensitive species in the "plateau area" in the northern Tumey Hills. Three sensitive species — the San Joaquin kit fox, giant kangaroo rat, and San Joaquin antelope squirrel — have been observed in the Tumey Hills Plateau area. The blunt-nosed leopard lizard has also been observed on private lands adjacent to the Tumey Hills management unit in eastern Panoche Valley. Several kit fox dens and kangaroo rat colonies occur within the management unit and on adjacent private lands. Both the Panoche Hills and Tumey Hills management units may have some of the largest active giant kangaroo rat colonies outside of San Luis Obispo County.

The Ciervo Hills/Joaquin Rocks management unit has approximately 9,700 acres designated for sensitive species. The San Joaquin kit fox, giant kangaroo rat, and San Joaquin dune beetle (*Coelus gracilis*) have been documented within the management unit. The San Joaquin dune beetle has been confirmed at five of the seven duneland soil areas. These duneland soil areas support Mojave Desert vegetation communities in seven distinctly separate areas comprising approximately 1,000 acres along the Monocline Ridge.

The Coalinga management unit has 14,660 acres designated for sensitive species, which include the San Joaquin kit fox and the blunt-nosed leopard lizard. The management unit also has habitat that may support the giant kangaroo rat, and species surveys for its presence are ongoing.

In addition to those species noted above, other sensitive species occurring within management units of the San Joaquin Management Area are: the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), Ciervo aegilian scarab beetle (*Aegiala concinna*), Doyen's trigonoscuta dune weevil (*Trigonoscuta sp.*), molestan blister beetle (*Lytta molesta*), and the Morrison's blister beetle (*Lytta morrisoni*).

San Joaquin Valley Recovery Plan

Portions of the Planning Area are within the San Joaquin Valley. The *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS, 1998) uses an ecosystem-level strategy to address recovery and conservation of 11 listed species and 23 additional special status species. The strategy includes several elements that relate to the management of public land:

- The primary focus of recovery should be on publicly owned lands;
- Conservation efforts should focus on fewer larger blocks of land rather than smaller more numerous parcels;
- Blocks of conservation lands should be connected by natural land or land with compatible uses that allow for movement between blocks;
- Emphasis should be placed on the San Joaquin kit fox as an umbrella species. Since most other species require less habitat, fulfilling the management and habitat needs of the San Joaquin kit fox will also meet the needs of many other species;
- The giant kangaroo rat and San Joaquin kangaroo rat are keystone species in their communities. Protection of these keystone species should be a high priority since they provide an important or essential function for many other listed and special status species;
- Uses and actions on public land, such as livestock grazing, oil, gas, and mineral exploration and extraction, hunting, and recreation should occur so as minimize degradation of habitat for special status species;
- Use specialty preserves or small reserves to manage species with highly restricted geographic ranges or specialized habitat requirements or that are vulnerable to traditional land uses;
- Target existing natural lands occupied by special status species over unoccupied natural land and retired farm land for conservation;
- Coordinate carefully agricultural land retirement with endangered species recovery for species where sufficient occupied natural land does not exist, but where it is needed to increase population size or promote movement between populations;
- Enhance landscape features that allow successful survival and movement from population centers on the valley floor to the valley perimeter for species such as the kit fox that can live in or move through the farmland matrix; and
- Implementing the recovery plan should be complementary to existing and future habitat conservation plans.

The foundation of the regional conservation strategy is a system of reserves and connecting corridors. Through assessments of remaining natural land habitats, a reserve system concept was developed to conserve the best remaining habitats of the San Joaquin Valley natural communities (USFWS, 1998). Several large keystone reserves, several small specialty reserves, and connecting corridors linking many of the reserves have been established or proposed. The large reserves are intended to maintain and conserve multiple plant and animal listed species as a natural community, while the small reserves are designed to conserve a particular species or unique natural feature. These reserves are managed for long-term conservation of the listed plants and animals and the natural communities on which they depend, but allow for a variety of land uses managed in a compatible manner. Both large and small reserves are necessary to conserve the valley's biological resources.

Reserves include both large multispecies reserves and small specialty reserves that would be managed primarily for listed plants and animals. While other compatible resource uses could occur, habitat quality and species' populations would be maintained through implementing specific design features for these resource uses. Management of the reserves would be assured by fee acquisition, by Federal, State, or local agencies, chartered conservation organizations, conservation easements, or long-term cooperative agreements with landowners. The goal is to maintain a certain percentage of the native lands as high-quality habitat and to rehabilitate lands with nonnative species as they become available for purchase, easement, or agreement. A threshold for habitat disturbance from energy mineral development, roads, and facilities would be established. Reserves and connecting corridors would have different thresholds for habitat disturbance. Compensation for new habitat disturbance within the threshold would be at a

standard rate for uses that are considered permanent habitat loss and at another standard rate for temporary habitat loss. Compensation is generally in the form of preserving additional habitat to make up for the loss of habitat associated with approved projects.

Connecting corridors are composed of native and agricultural lands to be managed for maintaining interchange and gene flow between the primary reserves and for maintaining supplemental populations between reserves. Emphasis is to maintain a certain percentage of native lands as moderate- to high-quality habitat and to maintain a certain percentage of the agricultural lands in agricultural production or fallow. A certain percentage of these lands would be available for urban, industrial, or other land uses that are considered permanent habitat loss. Land use design would maintain corridor integrity as extant habitat and for wildlife movements. Permanent habitat loss from urban-industrial uses would not sever wildlife corridors. Compensation for habitat loss in corridors would be directed to the reserve areas; however, limited compensation could be directed back to the corridor. The compensation ratio is the same as for reserves. Corridors would not normally involve purchase but would be secured through conservation easements and agreements. However, some parcels essential to maintain corridors or buffers may need to be purchased.

As part of the recovery plan, a generalized reserve system map has been developed that identifies the keystone reserves, small specialty reserves, and connecting corridors.

On native lands outside the reserve and corridor system, management for the retention of habitat values has not been the focus. Most of these lands have some habitat value, and many of these areas may be valuable sources of plant and animal populations in the short term. Most of these values will continue to exist, unless there are dramatic changes in current land uses.

Leases Subject to Settlement Agreement

The 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749, are located in the Salinas and San Joaquin Management Areas, with a small section of one parcel within the San Benito Management Area. These leases are not located on any ACECs, but some are within or partially within the Ciervo Panoche Natural Area. The species listed in Tables 3.12-2 and 3.12-3 for these Management Areas and species that may occur area-wide have the potential to occur on the lease lands. There are records in the CNDDB (CDFW, 2015c) of several special status species on or within 1 mile of the lease lands; see Figures 3.12-4 for plant species and 3.12-5 for wildlife occurrences. There is no designated critical habitat on the lease lands, but critical habitat for steelhead, vernal pool fairy shrimp, and Santa Lucia purple amole is located in the vicinity of lease lands; see Figure 3.12-1a and b. Field surveys would be required to determine if these species are present or potentially present on the lease lands.

3.13 Visual Resource Management

Visual resources refer to visual considerations in the physical environment. Visual resources analysis is a systematic process to logically assess visible change in the physical environment and the anticipated viewer response to that change. Landforms, water, and vegetation patterns are among the natural landscape features that define an area's visual character, whereas buildings, roads, and other structures reflect human modifications to the landscape. These natural and built landscape features are considered visual resources that contribute to the public's experience and appreciation of the environment. Visual resource management (VRM) involves evaluating landscapes and determining appropriate techniques and strategies for maintaining visual quality and reducing adverse impacts. The purpose of visual resource management is to manage the quality of the visual environment and reduce the visual impact of development activities while maintaining the viability of all resource programs.

3.13.1 Introduction

This Visual Resource Management section includes the regulatory framework for visual resources, a description of the regional setting for visual resources for the U.S. Bureau of Land Management (BLM) Central Coast Field Office (CCFO) Planning Area (Planning Area) and addresses the current conditions and trends in the Planning Area. The Planning Area encompasses a 12-county region in central California (while San Francisco County is within the Planning Area, there are no BLM-managed public lands currently located in that county).

3.13.2 Regulatory Framework

Visual resources on BLM-managed lands are regulated by guidance provided by the BLM's VRM system, as documented in the BLM Handbook H-8410-1 (BLM, 1986). The VRM system facilitates inventory, management, and planning for public lands under its jurisdiction and assigns one of four VRM classes (I through IV) to inventoried lands with specific management prescriptions for each class. VRM classification consists of two stages:

- An inventory of visual resources (VRI) and
- Analysis of the inventory and designation of the management class.

Classifications are determined by rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. The four inventory and management classes and their objectives are defined as follows:

- **Class I Objective:** To *preserve the existing character* of the landscape. The *level of change* to the characteristic landscape *should be very low* and must not attract attention.
- **Class II Objective:** To *retain the existing character* of the landscape. The *level of change* to the characteristic landscape *should be low* and not attract the attention of a casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **Class III Objective:** To *partially retain the existing character* of the landscape. The *level of change* to the characteristic landscape *should be moderate (or lower*) and may attract the attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- **Class IV Objective:** To manage activities that require *major modification of the existing character of the landscape*. The *level of change* to the characteristic landscape *can be high* and may dominate the view and be the major focus of the viewer's attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements in the predominant natural features of the characteristic landscape.

The VRM class designations for each of the four BLM Management Areas (MAs) in the Planning Area are presented in Table 3.13-1. It should be noted that any BLM-administered lands in the Planning Area not specifically addressed in Table 3.13-1 are presumed to be VRM Class IV.

Table 3.13-1. Existing VRM Class Designations*

Management Area	Location with VRM Class I, II, or III Designations	VRM Class and BLM Current Decision
VRM CLASS IV STANDARDS APPLY TO ALL BLM-MANAGED PUBLIC LANDS UNLESS OTHERWISE STATED IN THIS TABLE.		
CENTRAL COAST	Santa Cruz Coast Dairies	Assumed to be VRM Class II (see Section 3.13.4)
	Ford Ord National Monument	VRM Class II
SAN JOAQUIN	Panoche Hills	VRM Class III ▪ Limit communications sites and utility rights-of-way (ROW) to existing locations.
	Panoche Hills Wilderness Study Area (WSA)	VRM Class I ▪ Panoche Hills WSA is to be managed as VRM Class I until Congress acts to either designate wilderness or release the WSA from wilderness suitability, at which point the area would be evaluated to determine the appropriate VRM designation based on laws, regulations, and policies in place at that time.
	Griswold-Tumey Hills	VRM Class III ▪ Restrict new facilities to existing routes or established utility corridors. Consider communication sites on a case-by-case basis.
	Ciervo Hills	VRM Class III ▪ Restrict new facilities to existing routes or established utility corridors. Consider communication sites on a case-by-case basis.
	Joaquin Rocks	VRM Class II
	Coalinga Mineral Springs	VRM Class III ▪ Permit no communication sites on Juniper Ridge. ▪ Consider utility ROWs on a case-by-case basis (no designated corridors).

Table 3.13-1. Existing VRM Class Designations*

Management Area	Location with VRM Class I, II, or III Designations	VRM Class and BLM Current Decision
SALINAS	Sierra de Salinas	VRM Class III ▪ Allow communication sites where visual impacts can be substantially reduced or mitigated. ▪ Limit dozer use on wildfires and prescribed burns where possible (pending BLM Fire Management Plan).
	Ventana (and Silver Peak) Wilderness Area and Pinnacles National Park Bear Mountain and Bear Canyon WSAs	VRM Class I ▪ While not managed by the BLM, Ventana (and Silver Peak) Wilderness Area and Pinnacles National Park would typically be afforded visual resource protections comparable to BLM's VRM Class I objective by the managing agencies. ▪ Bear Mountain and Bear Canyon WSAs are to be managed as VRM Class I until Congress acts to either designate wilderness or release the WSA from wilderness suitability, at which point the area would be evaluated to determine the appropriate VRM designation based on laws, regulations, and policies in place at that time.
SAN BENITO	Hernandez Valley, Call Mountain, Laguna Mountain	VRM Class III
	Pinnacles National Park and San Benito WSA	VRM Class I ▪ While not managed by the BLM, Pinnacles National Park would typically be afforded visual resource protections comparable to BLM's VRM Class I objective by the managing agency. ▪ San Benito WSA is to be managed as VRM Class I until Congress acts to either designate wilderness or release the WSA from wilderness suitability, at which point the area would be evaluated to determine the appropriate VRM designation based on laws, regulations, and policies in place at that time.

*In the event that a river or stream is designated a Wild and Scenic River (WSR) by Congress, the WSR would be managed as VRM Class I.
Source: BLM 2005, 2007

3.13.3 Regional Setting

The Planning Area consists of non-contiguous lands and isolated parcels in 11 counties in central California, and the landscape varies greatly from nearly level to rugged, mountainous terrain. Elevations range from near sea level to more than 5,000 feet. The lands managed by the CCFO are bounded by the Pacific Ocean on the west and the San Joaquin Valley on the east. They include a variety of settings and landforms including the Central Coast Range, the Salinas and San Joaquin valleys, and three major watersheds: the Pajaro, which drains into the Pacific Ocean; and Arroyo Pasajero and Silver Creek, which drain into the San Joaquin Valley.

Vegetation in the Planning Area includes forested areas, chaparral, and grassland. About two-thirds of the public lands managed by the CCFO consist of chaparral and oak woodland vegetation. Approximately one-third of the public lands (primarily on the eastern slopes of the Diablo Range and the southern Salinas Valley) consist of annual grassland and half-shrub vegetation. A stand of redwood trees is located on the Santa Cruz Coast Dairies property.

3.13.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Currently within the Planning Area, approximately 683,900 acres of BLM oil and gas Federal mineral estate are identified as open to oil and gas leasing; 67,200 acres are closed to leasing, and 41,800 acres are open to leasing subject to No Surface Occupancy (NSO) stipulations. BLM-managed lands in the Planning Area have been divided into four Management Areas (MAs): Central Coast MA (13,100 acres), San Joaquin MA (164,700 acres), Salinas MA (31,100 acres), and San Benito MA (70,500 acres). The current conditions within the Planning Area are the same as those for the No Action Alternative (Alternative A) shown on Figure 2-1. A brief description of the current conditions in each MA is provided below.

Central Coast Management Area. There are seven small, widely scattered BLM holdings in this MA. The BLM also manages 7,200 acres of Fort Ord National Monument (VRM Class II), which holds some of the last undeveloped natural wildlands along the Monterey Peninsula and is designated a Special Recreation MA. Also, as of April 2014, the BLM manages approximately 5,600 acres of the Santa Cruz Coast Dairies but does not have mineral estate rights. The Santa Cruz Coast Dairies have also been designated a Special Recreation MA that supports redwood forest and is also a gateway to the Santa Cruz Mountains. In January 2015, a public initiative was announced to establish the Santa Cruz Redwoods National Monument on the property. While no VRM class has yet been assigned to the Santa Cruz Coast Dairies, it can be assumed the property would be designated VRM Class II similar to Ford Ord National Monument.

Currently, there are areas designated active oil and gas fields in the northern and central portions of the MA. There are also areas of Federal mineral estate open to oil and gas leasing Only Fort Ord National Monument is closed to oil and gas leasing in the MA. There are no areas open to oil and gas leasing with NSO lease stipulations (Figure 2-1).

San Joaquin Management Area. BLM public lands in this MA are highly visible from Interstate (I-) 5. Scenery in this area is typical of the grassy hills along the western edge of the San Joaquin Valley. In the Panoche Hills area (VRM Class III except for the Panoche Hills WSA, which is VRM Class I), west of I-5, two large communication sites are visible on the ridgeline but do not dominate the landscape, which is characterized by annual grasslands and scattered California junipers.

The Griswold-Tumey Hills area (VRM Class III) lies due east of the Call Mountain–Hernandez Valley area (VRM Class III), just west of the I-5 corridor. Major drainages in the area are Panoche Creek, Silver Creek, Griswold Creek, and Tumey Gulch — all intermittent streams with some portions flowing during most of the year. Vegetation and topography are similar to the Panoche Hills. Much of the rolling, grassy hills of this area are visible from I-5 and, therefore, are an important visual resource. The Griswold-Tumey Hills area contains a portion of one active oil and gas field.

South of the Griswold-Tumey Hills area and also adjacent to the I-5 corridor lies the Ciervo Hills (VRM Class III)–Joaquin Rocks (VRM Class II) area. The predominant feature in this area is the Diablo Range culminating in Joaquin Ridge, Joaquin Rocks, and Black Mountain. These arid foothills in the rain shadow of the Diablo Range are characterized by annual grassland/shrub vegetation and steep, chaparral- and oak-covered slopes. Cantua Creek is the major drainage in the area. The Joaquin Rocks area contains three, 300-foot high sandstone monoliths that jut from Joaquin Ridge and are visible from the Central Valley attracting viewers along a 20-mile stretch of I-5.

In the southern portion of the San Joaquin MA lies the Coalinga Mineral Springs area (VRM Class III). The predominant feature in the landscape is Juniper Ridge culminating in Sherman Peak (3,857 feet), Kreyenhagen Peak (3,561 feet), and Bald Mountain–Center Peak (4,541 feet). The topography in this area is typical of the inner Central Coast Range with steep, rugged canyons; sandstone cliffs; and escarpments. Warthan Canyon offers views of considerable visual interest along Highway 198. Vegetation in this region is typically mixed chaparral and chamise chaparral. There are some areas of oak savannah and oak

woodland, especially in canyon bottoms and on north-facing slopes. Yucca and California juniper are also common in this region and contribute to the scenic quality of the area. There are many springs in the area including Coalinga Mineral Springs.

In the Coalinga area east of Coalinga Mineral Springs, the predominant features are the low, rolling foothills and valley grasslands along the western edge of the San Joaquin Valley. Significant topographic features include the Kettleman Hills, the Kreyenhagen Hills, the Alcalde Hills, and Anticline Ridge. This very arid area lies in the rain shadow of the Diablo Range to the west.

Currently in the San Joaquin MA, there are designated active oil and gas fields in the northern and southern portions of the MA. There are also areas of Federal mineral estate open to oil and gas leasing, areas closed to oil and gas leasing, and areas open to oil and gas leasing with NSO lease stipulations. The Panoche Hills WSA is closed to leasing (Figure 2-1).

Salinas Management Area. The Sierra de Salinas area (VRM Class III) is visible from Highway 101, from the U.S. Forest Service Ventana Wilderness Area, and from BLM-managed lands adjacent to the Ventana Wilderness Area. Most of BLM's holdings in this area lie east of Los Padres National Forest and its steep, rugged mountains. BLM-managed lands lie primarily along the base and lower slopes of the Santa Lucia Range in Arroyo Seco Canyon, Reliz Canyon, and at the north end of the Ventana Wilderness Area. The area is characterized by dense chaparral with small areas of blue oak savannah. In this MA, the Sierra de Salinas Mountains are deeply dissected by many intermittent drainages, as well as by the Arroyo Seco and Carmel rivers.

The Williams Hill area (Class IV) in the southern portion of the Salinas MA offers views of the surrounding Salinas Valley. Pine trees, chamise, scrub oak, and shale formations characterize the hilly terrain.

A few other isolated BLM parcels (VRM Class IV) lie in eastern Monterey County at the San Benito County line, about 5 miles west of the National Park Service Pinnacles National Park. BLM-managed lands in this area generally lack features of notable visual quality and are typical of the region.

Currently in the Salinas MA, there are designated active oil and gas fields in the central and southern portions of the MA. There are also areas of Federal mineral estate open to oil and gas leasing, areas closed to oil and gas leasing, and areas open to oil and gas leasing with NSO lease stipulations (Figure 2-1).

San Benito Management Area. BLM-managed lands in this area lie in the southern portion of the MA. The Call Mountain–Hernandez Valley area (VRM Class III) lies in the east-central portion of the MA. The most predominant feature of the MA is the rugged Diablo Range, and the area is characterized primarily by chaparral vegetation with some small stands of blue oak savannah. The San Benito River flows northwest from the Hernandez Reservoir through the central portions of the MA. Laguna Creek is the other major perennial stream in the MA, flowing into Hernandez Reservoir. The remaining BLM-managed lands in this MA are in two areas in the south: one adjacent to the Clear Creek–Condon Peak area and the other a block of BLM-managed lands west of Clear Creek called Laguna Mountain (VRM Class III). Laguna Mountain contains somewhat rugged terrain in an area of rolling hills covered in dense brush. This area is popular with hikers and has a small waterfall accessible by a hiking trail.

Currently in the San Benito MA, there are designated active oil and gas fields in the northern and southern portions of the MA. There are also areas of Federal mineral estate open to oil and gas leasing, areas closed to oil and gas leasing, and areas open to oil and gas leasing with NSO lease stipulations. The San Benito WSA is closed to leasing (Figure 2-1).

Leases Subject to Settlement Agreement

The leases subject to the settlement agreement are located in the Salinas and San Joaquin MAs (see above for landscape descriptions). In the Salinas MA, these leases occur in the Williams Hill area that is designated VRM Class IV. In the San Joaquin MA, they are located in the Griswold-Tumey Hills area that is designated VRM Class III and on lands designated VRM Class IV south of Griswold-Tumey Hills.

3.14 Special Management Areas

3.14.1 Introduction

The Federal Land Policy and Management Act (FLPMA) directs the BLM to consider and evaluate lands for a number of special designations during its land use planning process. In general, lands are eligible for special designations based on the presence of particular values and qualities; lands found to possess these qualities are characterized as Special Management Areas (SMAs). SMAs receive designation or special management through different processes and are managed under special considerations.

According to the BLM's Land Use Planning Handbook, special designations fall into two categories: (1) Congressional designations (i.e., those applied by statute or Presidential proclamation), and (2) Administrative designations (i.e., those applied by the BLM through the land use planning process) (BLM, 2005). Congressional and Administrative designations that are applicable to this Draft RMPA/EIS include national monuments, national recreation and historic trails, Areas of Critical Environmental Concern, Research Natural Areas, Wilderness Areas, and Wilderness Study Areas. These designations are described in Section 3.14.3. Wild and Scenic Rivers, also a BLM special designation, is discussed in Section 3.21.

The Central Coast Field Office has partially inventoried the BLM-administered lands in their jurisdiction for wilderness characteristics. Prior to release of the Final EIS for this RMPA, an interdisciplinary team of resource specialists will inventory all remaining units of BLM-administered lands in the Central Coast Field Office to determine their potential for wilderness characteristics. This team will conduct field inventories of all units with potential wilderness characteristics. Based on the inventories, the Final EIS would identify lands with wilderness characteristics and how they would be affected by the BLM's oil and gas leasing and development program.

3.14.2 Regulatory Framework

During development of a BLM resource management plan (RMP) or an amendment to an existing plan, the BLM must integrate planning for special designations (i.e., SMAs) with the general RMP planning process (BLM, 2009). Each BLM Field Office must ensure that the RMP identifies the objects or resources for which the area was designated and illustrate how those objects or resources are protected by the plan. The RMP must also clearly distinguish between the planning area for the RMP and the planning area for the special designation. Additionally, an integrated planning process should conclude with an independent Record of Decision for both the RMP planning area and the special designation planning area (BLM, 2009).

The CCFO Planning Area is divided into five discrete management areas (MAs): Central Coast MA, San Joaquin MA, Salinas MA, San Benito MA, and Clear Creek MA. The boundaries for these management areas are shown in Figure 3.14-1. While the RMP establishes regulations and policies that guide public land management across the entire CCFO Planning Area, the BLM has also adopted management plans that are specific to a particular SMA and that provide special management guidance for that SMA. The following regulations and policies are applicable to SMAs in the CCFO Planning Area:

National Monuments

California Coastal National Monument Resource Management Plan (September 2005)

The California Coastal National Monument was established through a Presidential proclamation in January 2000. The California Coastal National Monument RMP provides the guidance, objectives, policies, and management actions for the monument's public lands that are administered by the BLM. The management goals of the RMP include: (1) protect the monument's geological formations and the habitat that they provide for biological resources; (2) protect the monument's scenic and cultural values; (3) pro-

vide and promote research opportunities; (4) provide interpretive information and educational initiatives regarding the values and significance of the monument; and (5) coordinate planning and management activities with the monument's numerous jurisdictions. The decisions in the RMP apply only to BLM-managed lands within the boundary of the national monument.

The following management action from the California Coastal National Monument RMP is applicable to oil and gas leasing:

- **AU-GEO-2 (Mineral Removal):** Specific resource protections contained in existing BLM land withdrawals and guidance contained in the Presidential Proclamation prohibit removal of minerals with commercial value from the California Coastal National Monument.

Fort Ord National Monument

In April 2012, a Presidential proclamation established 14,650 acres of Federal lands as the Fort Ord National Monument. The monument currently includes 7,200 acres of BLM-administered land and 7,450 acres of land managed by the U.S. Army. The Army is currently overseeing environmental remediation activities on the Fort Ord land within its jurisdiction. As stated in the proclamation, the Army will transfer this land to the BLM in accordance with a 1995 Memorandum of Understanding (MOU) between these two agencies. The MOU describes the responsibilities of each agency related to such lands, the implementing actions required of each agency, the process for transferring administrative jurisdiction over such lands to the Secretary of the Interior (i.e., BLM), and the processes for resolving interagency disputes. Fort Ord has been withdrawn from mineral entry and mineral leasing.

National Trails

National Trails System Act

The National Trails System Act of 1968, as amended, instituted a national system of recreation, scenic and historic trails and prescribed the methods and standards to which additional components may be added to the system (16 USC 1241-1251). National recreation trails are established to provide a variety of outdoor recreation uses in or reasonably accessible to urban areas. National historic trails closely follow a historic trail or route of travel of national significance, and are established to protect historic remnants and artifacts for public use and enjoyment. National scenic trails provide maximum outdoor recreation potential, conservation, and enjoyment of the various qualities of the areas they pass through (i.e., scenic, historical, natural, and cultural).

National Scenic and Historic Trails Strategy and Work Plan

In 2006, the BLM approved a National Scenic and Historic Trails Strategy and Work Plan, which provides a framework for the development of program guidance and direction for improved management of its National Trails (BLM, 2006, pg. 7-8). The following objectives and actions from the Trails Strategy and Work Plan would be applicable to the RMPA/EIS:

- **Objective 1:** Establish and implement national policy and guidance to identify and protect trail resources in conjunction BLM's multiple-use mandate.
  - **Action 5 (Develop Manuals or Handbooks):** Develop a series of BLM manuals or handbooks that would address resource assessment, protection, and proper utilization of the National Scenic and Historic Trails. Documents would emphasize and expand proper trail management, address on-the-ground information, reference appropriate existing handbooks, and provide guidance. Topics to be considered would include Trail-specific Best Management Practices (e.g., energy and minerals, livestock grazing, riparian, watershed, fisheries, wildlife, recreation, wilderness, lands and realty).

- **Objective 2:** Ensure National Scenic and Historic Trail management is addressed within the BLM's planning system.
  - **Action 3 (Prepare Management Plan Where Required or Necessary):** Prepare guidance and develop plans as required or needed that consider special management areas along trails (e.g., Areas of Critical Environmental Concern and Special Recreation Management Areas). Consider withdrawals or lease and permit stipulations as management tools.

Areas of Critical Environmental Concern and Research Natural Areas

Areas of Critical Environmental Concern

An Area of Critical Environmental Concern (ACEC) is defined in FLPMA, Public Law 94-579, Section 103(a) as an area within the public lands where special management attention is required to protect and prevent irreparable damage to important historic, cultural, or scenic values, fish and wildlife resources or other natural systems or processes, or to protect life and safety from natural hazards. Restrictions that arise from an ACEC designation are determined at the time the designation is made, and are designed to protect the values or serve the purposes for which the designation was made. The BLM has prepared regulations for implementing the ACEC provisions of FLPMA, which are found at 43 CFR 1610.7-2(b). BLM Manual 1613 (Areas of Critical Environmental Concern) provides policy and procedural guidance on the identification, evaluation, and designation of ACECs (BLM, 1988a). The following is a brief summary of the specific planning guidance for each ACEC within the CCFO administrative area.

Clear Creek Management Area Resource Management Plan. The Clear Creek MA Resource Management Plan (RMP) provides guidance for the management of approximately 63,000 acres of public lands in southern San Benito and western Fresno Counties (BLM, 2014a, pg. 1-5). This management area includes the Clear Creek Serpentine ACEC and the Joaquin Rocks ACEC. Objectives and actions from the Clear Creek MA RMP that would be applicable to this RMPA/EIS include:

- **ENERG-DEF1 (Land Use Plan Decision).** Allow no mineral leasing or sales on public lands in the Serpentine ACEC. Recommend withdrawal of the entire 30,000-acre ACEC from locatable mineral entry.
- **ENERG-DEF2 (Land Use Plan Decision).** Allow mineral leasing or sales on public lands outside the Serpentine ACEC, and stipulate that "No Surface Occupancy" is allowed on occupied special status species habitat within oil and gas lease areas.

Panoche-Coalinga ACEC Management Plan of 1987. This ACEC management plan provides special guidance for management of the Panoche-Coalinga ACEC. The management plan recognizes significant habitat areas for sensitive plants and animals and recommends measures for their management including guidelines for surface disturbing activities, limitations on grazing, policies for land acquisition, and monitoring requirements.

Research Natural Areas

A Research Natural Area (RNA) is a BLM designation that establishes and maintains lands for the primary purpose of research and education. These areas have one or more of the following characteristics: (1) typical representation of a common plant or animal association; (2) unusual plant or animal association; (3) threatened or endangered plant or animal species; (4) typical representation of common geologic, soil, or water features; or (5) outstanding or unusual geologic, soil, or water features. According to the BLM's Land Use Planning Handbook, RNAs are considered a type of ACEC. The criteria that apply to evaluating existing or proposed ACECs would also apply to RNAs (BLM, 2005).

Wilderness and Wilderness Study Areas

In 1964, Congress passed the Wilderness Act that established a national system of lands for the purpose of preserving a representative sample of ecosystems in a natural condition for the benefit of future generations. Wilderness Study Areas (WSAs) contain wilderness characteristics such as naturalness, solitude, and opportunities for primitive and/or unconfined recreation and are managed to preserve those values until Congress either designates them as wilderness or releases them for other uses. Until 1976, most land considered for, and designated as, wilderness was managed by the National Park Service and the U.S. Forest Service. With the passage of FLPMA in 1976, Congress directed the BLM to inventory, study, and recommend which public lands under its administration should be designated wilderness. The BLM published its California Statewide Wilderness Study Report in 1991 (BLM, 1991). Areas identified as WSAs are to be managed according to the BLM Manual 6330 (Management of BLM Wilderness Study Areas), until they are designated wilderness or released by Congress (BLM, 2012).

Areas that are designated as wilderness are managed under the provisions of the Wilderness Act of 1964 and their establishing legislation. The following activities are prohibited in Wilderness Areas: commercial enterprises; construction of temporary or permanent roads; use of motorized vehicles and other mechanical transport; aircraft landings; and construction of structures and other installations.

Three categories of exceptions to prohibited activities in Wilderness Areas include:

- **Valid Existing Rights.** Prior existing rights may continue. Discretionary uses that create new rights are not permitted;
- **Administrative Actions.** New roads or commercial roads are not authorized. However, the BLM may re-evaluate and authorize any of the other prohibitions listed above by invoking the "minimum requirements exception" in order to meet the minimum requirements to administer and protect the lands, and the health and safety of people in the area; and
- **General Allowances.** These are subject to limitations set by the BLM State Director. These allowances may include actions to control fire and insects and diseases and facilitate Federal mineral surveys, livestock grazing, access to landholdings, and commercial services compatible with wilderness values and necessary to realize the recreation or other wilderness character purposes of the land.

Proposed Recreation Area

H.R. Bill 1838, which was introduced to Congress in April 2015, proposes the establishment of the Clear Creek National Recreation Area across portions of San Benito and Fresno Counties that are currently within the BLM's Clear Creek MA. The proposed recreation area would be managed by the BLM and would allow off-highway vehicle recreation, hunting, and rock and gem collecting. Per H.R. Bill 1838 Section 4(k), all Federal lands within the proposed recreation area would be withdrawn from operation of the mineral leasing, mineral materials, and geothermal leasing laws. This bill has currently been referred to the Subcommittee on Federal Lands (Congress.Gov, 2015). Until such time that the proposed designation for the Clear Creek National Recreation Area is approved by Congress, this proposed recreation area would continue to be managed per the objectives and actions of the Clear Creek MA RMP.

3.14.3 Regional Setting

For the SMA analysis, the planning area for this RMPA/EIS is defined as the SMAs that are currently designated within the CCFO Planning Area boundary and are managed by the BLM (see Figure 3.14-1). Amendments to the BLM's RMP to address oil and gas leasing and development would apply only to BLM-managed lands. Consequently, SMAs located within the CCFO Planning Area boundary that are managed by other Federal agencies, and are not located on BLM-administered lands, are also not included in the planning area.

National Monuments

There are currently two national monuments within the planning area (see Figure 3.14-1):

- **California Coastal National Monument.** The monument includes more than 20,000 rocks, islands, exposed reefs, and pinnacles along the California coast (BLM, 2015a). The BLM manages the portions of the monument that extend within its CCFO Planning Area boundary in San Mateo, Santa Cruz, and Monterey Counties.
- **Ford Ord National Monument.** The monument was established to protect its scenic and natural resources, and to maintain the cultural and historic significance of this former U.S. Army training center and deployment staging ground (BLM, 2015b).

National Trails

The planning area includes the following two national trails (see Figure 3.14-1):

- **Juan Bautista de Anza National Historic Trail.** This trail was designated in the National Trails System Act of 1968 and designated a Millennium Trail in 2000. The trail follows portions of the overland route traveled by Captain Juan Bautista de Anza of Spain from Sonora, Mexico, to the vicinity of San Francisco, California. Portions of the trail traverse Federal mineral estate in Santa Clara County. The BLM also manages a 12-mile portion of the trail route across the Fort Ord National Monument.
- **Coalinga Mineral Springs National Recreation Trail.** This trail was designated under the National Trails System Act in 1981. The trail is located on the southern tip of the Diablo Mountains, and extends approximately 2.5 miles to Kreyenhagen Peak. The area around the trail is popular for hunting, especially for wild pigs that inhabit the surrounding area (BLM, 2015c).

Areas of Critical Environmental Concern and Research Natural Areas

There are currently two RNAs and three ACECs within the planning area (see Figure 3.14-1):

Research Natural Areas

- **Monvero Dunes.** This proposed RNA is characterized as a sand dune ecosystem dominated by disjunct plant species that typically occur in the Mojave Desert such as Mojave sand verbena (*Abronia pogonantha*), birdcage evening primrose (*Oenothera deltoides*), wild rhubarb (*Rumex hymenosepalus*), and sand grass (*Stipa hymenoides*) The following federally endangered species are known to occur within or along the edges of the proposed Monvero Dunes RNA: San Joaquin woollythreads (*Monolopia congdonii*), blunt-nosed leopard lizard (*Gambelia sila*), and San Joaquin kit fox (*Vulpes macrotis mutica*) (BLM, 2015d).
- **San Benito Mountain.** This RNA was designated by the BLM in 1999 to encourage scientific research and provide protection for the unique conifer forest and serpentine vegetation communities on and around San Benito Mountain. The San Benito Mountain Forest is the only forest in the world that supports Jeffrey (*Pinus jeffreyi*), Coulter (*Pinus coulteri*), and Foothill pine (*P. sabinaiana*) incense cedar (*Calocedrus decurrens*), and Jeffrey-Coulter hybrids. The federally listed threatened San Benito evening-primrose (*Camissonia benitensis*) also occurs in this area (BLM, 2015e).

Areas of Critical Environmental Concern

- **Clear Creek Serpentine ACEC.** This 31,000-acre ACEC was designated in the 1984 Hollister RMP based on the human health risk associated with the naturally occurring asbestos and the occurrence of special status plant species endemic to the area (BLM, 2014a, pg. 1-1).
- **Panoche/Coalinga ACEC.** This ACEC was established to protect its significant habitat for rare, threatened, and endangered plants and wildlife, as well as its important historic and paleontological resources

(BLM, 2015f). The ACEC stretches from the Panoche Hills southwards to Coalinga connecting a vast landscape of ancient desert-like habitats and open space with outstanding scenic and recreational values in the western San Joaquin Valley. These lands, administered by the CCFO, are known as the "San Joaquin Desert Hills" (BLM, 2014b).

- **Joaquin Rocks ACEC.** This 8,000-acre ACEC is accessible only by traveling through the Clear Creek Serpentine ACEC. This rugged and remote area is notable for its 300-foot high sandstone monoliths that jut from Joaquin Ridge.

Wilderness/Wilderness Study Areas

A total of three Wilderness Areas and five WSAs are located within the CCFO Planning Area boundary. However, only a small acreage of designated wilderness would be located on BLM-administered lands. The following Wilderness Areas are not managed by the BLM and are not included in the SMA planning area: 240,000 acres of Ventana Wilderness [managed by the U.S. Forest Service] (USFS, 2015), Silver Peak Wilderness [managed by the U.S. Forest Service], and Pinnacles Wilderness [managed by the National Park Service].

Since the passage of Public Law 107-370-(2)(2) on December 19, 2002, the following Wilderness Area and WSAs are recognized within the SMA planning area. The WSAs are currently being managed to preserve their wilderness values according to the BLM Manual 6330 (Management of BLM Wilderness Study Areas), and would continue to be managed in that manner until Congress either designates them as wilderness or releases them for other uses (BLM, 2012). If these areas are released from WSA status by Congress, they would be managed consistent with the rest of the management area and area-wide decisions.

- **Ventana Wilderness.** Congress designated 736 acres of BLM lands as the "Ventana Wilderness Additions" in 2002. This site is contiguous to the Ventana Wilderness Area in the Los Padres National Forest. The BLM-managed Ventana Wilderness encompasses approximately 40 acres in Anastasia canyon, 680 acres surrounding Black Rock Ridge, and 16 acres near Horse Canyon (BLM, 2015g).
- **Bear Mountain WSA.** This 318-acre WSA was determined by the BLM to provide an outstanding opportunity for solitude, and the roadless character of the area provides primitive and unconfined types of recreation. Elevation within the WSA varies from 1,800 to 3,000 feet above sea level. Major vegetation includes pine and oak trees along with chamise (BLM, 2015h).
- **Bear Canyon WSA.** This 3,198-acre WSA was determined by the BLM to provide an outstanding opportunity for solitude, and the roadless character of the area provides primitive and unconfined types of recreation. The WSA is dominated by very steep rugged terrain accentuated by intermittent streams located in the canyon bottoms (BLM, 2015i)
- **Panoche Hills North WSA.** This 6,631-acre area was characterized as unsuitable for wilderness classification. The BLM recommended that this area remain open for oil and gas exploration and development due to the moderate potential for the occurrence of oil and gas reserves in this WSA (BLM, 1988b). However, this WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.
- **Panoche Hills South WSA.** This 11,305-acre area was characterized as unsuitable for wilderness classification. The BLM recommended that this area remain open for oil and gas exploration and development due to the moderate potential for the occurrence of oil and gas reserves in this WSA (BLM, 1988c). However, this WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.

- **San Benito WSA.** This WSA was determined unsuitable for wilderness classification due to its insufficient size and previous development within the area (BLM, 1980). In 1971, the BLM designated this WSA as a Natural Area to preserve its botanically unique vegetative communities, and the area was designated as an RNA in 1999 (see San Benito Mountain RNA discussion). This WSA will continue to be managed according to BLM Manual 6330 until Congress makes a final determination on its designation.

3.14.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Since adoption of the 2007 HFO RMP, specific SMAs have been open to oil and gas leasing (e.g., Panoche/Coalinga ACEC). However, restrictions such as NSO stipulations and an endangered species stipulation currently apply to any leases permitted within an ACEC, as described in Appendix D of the 2007 HFO RMP (BLM, 2007). SMAs that are closed to oil and gas leasing per the 2007 HFO RMP include designated Wilderness Areas, WSAs, and Fort Ord (BLM, 2007). The following is a discussion of the management of SMAs in regards to current oil and gas development within the planning area.

National Monuments

The Fort Ord National Monument and the California Coastal National Monument are closed to oil and gas leasing per Presidential Proclamations 7264 and 8804, which state:

> *All Federal lands and interests in lands within the boundaries of this monument are hereby appropriated and withdrawn from all forms of entry, location, selection, sale, leasing, or other disposition under the public lands laws, including withdrawal from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing other than by exchange that furthers the protective purposes of the monument.*

Specific guidance in existing BLM management plans (e.g., California Coastal National Monument RMP) further identify resource protections and restricted uses that are applicable to its management area, as described in Section 3.14.2.

National Trails

The Juan Bautista de Anza National Historic Trail meanders across Federal, State, and private land within and beyond the BLM's CCFO Planning Area boundary. The trail traverses a total of 4.8 miles of split estate land, and would not cross BLM-administered surface estate. None of the existing trail is located within active oil and gas fields.

Coalinga Mineral Springs National Recreation Trail is located within an area of Federal mineral estate, approximately 7 miles west of active oil and gas fields.

Areas of Critical Environmental Concern and Research Natural Areas

Oil and gas leasing has taken place within existing ACECs in the planning area. Table 3.14-1 lists the oil and gas leases within each ACEC and RNA, as well as the number of existing wells in order to provide a measure of oil and gas activity in that area.

Table 3.14-1. Existing Leases and Wells within Central Coast Field Office ACECs and RNAs

ACEC or RNA	Total within ACEC or RNA		Total Acreage of Leases within ACEC or RNA
	Leases	Wells	
Clear Creek Serpentine ACEC	1	0	116
Panoche/Coalinga ACEC	40	130	9,534
Joaquin Rocks ACEC	0	0	0
Monvero Dunes RNA	0	0	0
San Benito Mountain RNA	0	0	0

Wilderness and Wilderness Study Areas

Wilderness Areas and WSAs are closed to oil and gas leasing per the Wilderness Act of 1964 and BLM Manual 6330 (Management of BLM Wilderness Study Areas). As described in Section 3.14.2, only Congress can designate the WSAs established under Section 603 of FLPMA as wilderness or release them for other uses. The status of the existing WSAs and the management guidance for these areas would not change as a result of this RMPA/EIS.

Leases Subject to Settlement Agreement

The proposed 14 non-NSO leases are located in San Benito and Monterey Counties within the CCFO Planning Area boundary. In San Benito County, eight of the lease sites would be approximately 2.5 miles north of San Benito Mountain RNA and 5.6 miles south of the Panoche Hills South WSA. In Monterey County, 6 of the lease sites would be located across a range of approximately 14 miles to 34 miles south-east of Bear Canyon WSA, which would be the nearest SMA to these leases.

3.15 Cultural and Heritage Resources

3.15.1 Introduction

Cultural resources are locations of human activity, occupation, or use. They include expressions of human culture and history in the physical environment, such as prehistoric or historical period archaeological sites, buildings, structures, objects, districts, or other places. Cultural resources can also be natural features, plants, or animals that are considered to be important to a past or contemporary culture, subculture, or community. The Affected Environment chapter of the Central Coast Field Office (CCFO) Proposed RMP/Final EIS provides a comprehensive review of existing archaeological and historical background information as of 2007 for the Planning Area (BLM, 2007).

Prehistoric resources are recognized as those attributed to Native American groups who occupied the region prior to European contact. Historical period resources are those generally over 50 years old and associated with Native American contact period history, and European, and American exploration, settlement and development. Although a few explorers traversed the region earlier, in California the time of contact between Native Americans and Europeans is generally identified as the 1770s.

Sites of cultural significance to contemporary populations are referred to as Traditional Cultural Properties (TCP). These sites are rooted in the community's history and are important in maintaining cultural identity. Examples of TCPs for Native American communities include natural landscape features, trail systems, places used for ceremonies and worship, places where plants are gathered that are used in traditional medicines and ceremonies, places where artisan materials are found, and places and features of traditional subsistence systems, such as hunting areas.

3.15.2 Regulatory Framework

Federal laws and regulations have been established to protect the nation's historic resources, including archaeological sites containing important scientific or historical data as well as historic buildings, monuments, and other features of the built environment. In addition to the Federal Land Policy and Management Act (FLPMA, Pub. L. 91-579) of 1976, which requires BLM to prepare resource management plans for all resource types, the following authorities are applicable specifically to cultural resources.

Antiquities Act of 1906 (16 USC 431-433). The Antiquities Act provides that penalties shall be assessed against "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" except as granted permission by the appropriate secretary of the department having jurisdiction; authorizes the President to establish national monuments for the preservation of "historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest" on lands owned or controlled by the government; and permits the examination, excavation, or gathering of antiquities from government property by recognized scientific or educational institutions in accordance with uniform rules defined in the act.

National Historic Sites Act (NHSA) of 1935 (16 USC 46-467). The NHSA established as a national policy the preservation of historic resources, including historic sites, buildings, and objects of national significance.

National Historic Preservation Act (NHPA) of 1966, as amended through 2000 (16 USC 470). Under Section 106 of the NHPA, effects of any Federal or federally assisted undertaking on historic properties must be considered and the Advisory Council on Historic Preservation must be afforded a reasonable opportunity to comment on the undertaking before it is approved or licensed or before approving the expenditure of funds on any undertaking that may affect properties listed or eligible for listing in the National Register. Section 110 of the NHPA, as amended, stipulates that each Federal agency shall estab-

lish a preservation program for the identification, evaluation, and nomination to the National Register and protection of historic properties. Section 112, as amended, stipulates that the Office of Budget and Management shall establish qualification standards for archeology, architecture, conservation, curation, history, landscape architecture, and planning that must be met by agency personnel or contractors responsible for cultural resources.

Archeological Resources Protection Act (ARPA) of 1979, as amended (16 USC 470aa–470ll). ARPA imposes both civil and criminal penalties for the excavation or removal of protected resources from Federal or Indian lands without the required permit. Federal land managers are also required to "establish a program to increase public awareness of the significance of the archeological resources located on public lands and Indian lands and the need to protect such resources" (16 USC 470ii). ARPA also requires that the Secretaries of the Interior, Agriculture, and Defense and the Chairman of the Board of the Tennessee Valley Authority (1) develop plans for surveying lands under their control to determine the nature and extent of archeological resources on those lands; (2) prepare a schedule for surveying lands that are likely to contain the most scientifically valuable archeological resources; and (3) develop documents for reporting of suspected violations of this chapter and establish when and how those documents are to be completed by officers, employees, and agents of their prospective agencies (16 USC 470mm).

American Indian Religious Freedom Act (AIRFA) of 1978 (92 Stat. 469). AIRFA states, "It shall be the policy of the United States to protect and preserve for American Indians their inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian… including but not limited to access to sites, use and possession of sacred objects, and the freedom to worship through ceremonial and traditional rights."

Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (104 Stat. 3048-3058). NAGPRA established procedures to determine the ownership and disposition of Native American and native Hawaiian human remains, funerary objects, sacred objects, or objects of cultural patrimony discovered on Federal lands. The law establishes penalties for persons convicted of illegal trafficking in Native American human remains and cultural items and requires Federal agencies to inventory their collections of human remains and associated or unassociated funerary objects, determine ownership, and repatriate cultural items in accordance with the provisions of the law.

36 Code of Federal Regulations, Part 800 – Protection of Historic and Cultural Properties (36 CFR 800). This Federal code contains the Advisory Council on Historic Preservation's implementing regulations for Section 106 of the NHPA. Various sections of Part 800 provide direction on how historic properties (those eligible for listing in the National Register) be identified, and how effects to historic properties be assessed in conjunction with the State Historic Preservation Officer (SHPO) and Advisory Council. 36 CFR Part 800 also provides criteria for assessing adverse effects to historic properties and for consulting on properties inadvertently discovered during undertakings; regulations regarding emergency undertakings; and guidance for entering into programmatic agreements and for coordinating with other authorities, partners, and consulting parties.

Bureau of Land Management (BLM), National Programmatic Agreement (PA) with the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers (2012) provides program-level directives for implementing Section 106 of the National Historic Preservation Act in consultation with SHPO. The national BLM PA streamlines or exempts application of implementing regulations 36 CFR 800 for certain undertakings and guides SHPO participation and review in the BLM land use planning process.

A National Programmatic Agreement (PA) among the BLM, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers (NCSHPO) sets forth the manner in which the responsibilities deriving from the NHPA shall be met (BLM, 2012). The NHPA describes the process for identifying and evaluating historic properties, for assessing the effects of Federal

actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). Potential adverse effects to historic properties must be considered during the course of any Federal action.

In carrying out its responsibilities both under the PA and statutory authorities, the BLM has also developed policies and procedures through its directives system (BLM Manual Series 8100-8170) to guide BLM's planning and decision making as it pertains to historic properties and preservation. In addition, pursuant to the PA, a 2014 *State Protocol Agreement* has been developed providing direct guidance for the management of cultural resources within the CCFO Planning Area (BLM, 2014).

Eligibility determinations are usually completed as part of project impact assessments or proactive NRHP listing actions. As a result, unless a specific action necessitates this determination; all cultural sites are generally treated as if they are eligible historic properties and afforded the associated emphasis on preservation through avoidance of any potential adverse effect. If a cultural resource is evaluated and does not meet the criteria identified for eligibility under the NHPA, it is not recognized as an historic property and as a result it is not commonly managed for preservation. A similar process applies to the assessment of the eligibility of a TCP.

At an area-wide level, the BLM manages cultural resources through the categorization of evaluated cultural resources according to their nature and relative preservation value. These use categories include scientific use, conservation for future use, traditional use, public use, and experimental use or those resources discharged from management (Table 3.15-1).

Table 3.15-1. Cultural Resource Use Allocations and Desired Outcomes

Use Allocation	Desired Outcome
Scientific use	Preserved until research potential is realized
Conservation for future use	Preserved until conditions for use are met
Traditional use	Long-term preservation
Public use	Long-term preservation, on-site interpretation
Experimental use	Protected until used
Discharged from management	Ineligible cultural resources; no use after evaluation/recordation; not preserved

BLM cultural resource management also identifies specific geographic areas which contain significant cultural resources for additional protective measures. These decisions are based on the presence of known cultural resources, a probability for unrecorded significant resources, imminent threats from natural or human-caused deterioration, or potential conflict with other resource uses.

3.15.3 Regional Setting

The CCFO Planning Area is located in west-central California and encompasses all or part of 12 counties extending southward from Contra Costa, San Francisco, and San Joaquin Counties in the north to Monterey, San Benito, and Fresno Counties in the south. Within this region, the BLM manages approximately 270,000 acres of subsurface mineral estate underlying Federal surface land and 588,000 acres of subsurface mineral estate underlying privately owned land, otherwise referred to as "split estate" lands.

Pre-Contact Era Resources

The diverse land area managed by the CCFO encompasses a vast, resource-rich portion of central California containing many hundreds of prehistoric archaeological sites reflecting an occupation of more than 6,000 years and a diversity of site types throughout the interior as well as along the coast. Though few studies have been conducted for land under the jurisdiction of the CCFO, archaeological data has been

collected from sites in the Southern Santa Clara Valley, the Monterrey Bay area, the south-central coast of California in San Luis Obispo County, and the great Central Valley which largely consists of the western flanks of the San Joaquin Valley for this review. All of these provinces are within the overall boundaries of the Planning Area and contribute to a general overview of the region's prehistory (see BLM, 2007). For example in the southern Santa Clara Valley, King and Hickman (1973) concluded that larger occupation sites were concentrated at the mouths of canyons and to a lesser extent along marsh margins and in upper canyon settings. These sites were thought to represent permanent or near-permanent population centers strategically situated near freshwater and a range of subsistence resources. Smaller occupation sites appear more variable in location, occurring most often in upper canyons and around the marsh, and were interpreted as temporary camps established to exploit particular canyon (e.g., acorns) and marsh (e.g., waterfowl) resources. Special-use loci were found predominately near large occupation sites in upper canyon contexts, typically taking the form of milling stations and artifact scatters. While it is likely that the CCFO Planning Area and the greater Central Valley have been populated for approximately 12,000 years, very few archaeological sites have been found that date before 5,000 years ago. The evidence for early human use is likely deeply buried in the valley alluvial sediments that accumulated rapidly during the later Holocene epoch. Moratto (1984) estimates an accumulation of up to 10 meters of sediments in the lower reaches of the Sacramento River drainage during the last 5,000 to 6,000 years.

As of 1984, approximately 6,000 acres of public lands were inventoried to a BLM "Class III" level (e.g., complete survey coverage of a given area), covering approximately 2 percent of the total Decision Area at that time. Ninety sites were recorded in at least two Management Areas, 53 of which were found potentially eligible for listing in the National Register of Historic Places. Locational data are available but are contained on confidential, individual archaeological site records. Sites were identified from the late prehistoric period, the ethnographic period, and the historic period. Prehistoric sites include small and large occupation sites with midden, temporary camp sites, rock shelters, rock art/ceremonial sites, bedrock mortar outcrops (BRMs), and lithic scatters. Archaeological excavations within the CCFO Planning Area have been few thus contributing very little to the knowledge of the prehistoric period.

From 1984 to 2006, approximately 451 additional archaeological sites had been recorded throughout the four management areas of the CCFO. Only a few sites have been evaluated, and most are assumed eligible for the National Register until they are formally evaluated. Moreover, the CCFO's BLM lands exchange program was able to inventory approximately 86,000 acres for cultural resources, with negative findings on nearly 53,000 acres. The presence of cultural resources on the remaining 33,000 acres resulted in the BLM retaining approximately 1,340 acres of the proposed exchange land specifically because of its high cultural resource value. Pre-contact archaeological resources withheld from exchange included a prehistoric midden site containing human remains. The number of sites in these 1,340 acres is unknown.

Ethnographic Period Tribal Groups

Native California ethnographic tribal groups within the Planning Area include Northern and Southern Valley Yokuts, Salinan, Esselen, Costanoan/Ohlone, and Bay Miwok (Baumhoff, 1963; Bean, 1991; Breschini et al., 1983; Breschini and Haversat, 1993; Cook, 1955; Galvin, 1968; Hester, 1978; Jones et al., 2007; Kroeber, 1925, 1939; Levy, 1973, 1978; Milliken and Johnson, 2003; Wallace, 1978). Although no federally recognized tribal governments are based within the CCFO Planning Area boundary, the Tachi Yokuts Tribe of Santa Rosa Rancheria in Lemoore (Kings County) ranged within the foothills of the western San Joaquin Valley and the Diablo Range during the prehistoric and ethnographic periods. The CCFO consults with the Tachi tribe as undertakings or proposals have the potential to affect their ancestral lands. Several non-federally recognized tribes, groups, and individuals are recognized by the State of California with associations to the area, and the CCFO consults with these groups/individuals as BLM policy dictates. CCFO also contacts the California Native American Heritage Commission when projects have the potential to impact Native American archaeological sites, native material collection areas, or places of spiritual value.

Historic Era Resources

Spanish explorer Juan Rodriguez Cabrillo began exploring the Alta California coastline in 1542 and was the first to explore the bay he named La Bahia de los Pinos in Monterey. Juan Bautista de Anza explored the interior of California from Sonora, Mexico, to San Francisco from 1774 to 1776. Anza led approximately 240 persons from Mexico, through Arizona, and into central California. Anza's route has been designated as the Anza National Historic Trail (BLM, 2015a). The mission system was established by the Catholic Church in cooperation with the Spanish government as a program of settlement and development (colonization) that spread from Baja California to Alta California. The following missions are located within the CCFO Planning Area: San Miguel Arcángel; San Antonio de Padua; Nuestra Señora de la Soledad; San Carlos Borromeo de Carmelo; San Juan Bautista; Santa Cruz; Santa Clara de Asis; San José; San Francisco de Asis; San Rafael Arcángel; and San Francisco Solano (Ruscin, 1999). Mission Delores is also located within the Planning Area. The missions were situated 1-day's travel apart, and were connected by El Camino Real, or the "Kings Highway." The mission system ushered in many changes in indigenous demographics, land use patterns, traditional practices, and the resulting archaeological site types (Cook, 1943a, 1943b, 1960; Eargle, 1986; Jackson and Castillo, 1995; Kroeber and Heizer, 1970; Merriam, 1955). In addition to the missions, the Spanish government established pueblos and presidios to further colonization efforts in Alta California including the City of Monterey (City of Monterey, 2015). By the end of the nineteenth century, disease, and subjugation had decimated the Native American people.

The rancho land grant system, established in 1833, persisted in Alta California until the culmination of the Mexican-American War in 1848, when Mexico ceded California to the United States through the Treaty of Guadalupe Hidalgo (Robinson, 1948). A large gold deposit was discovered that year in the mountains east of Sacramento, resulting in a massive Euro-American population boom in California. In order for the U.S. government to claim ownership of the natural resources located within Alta California, California was established as a state in 1850. Prior to being granted statehood, California was divided into 27 counties. Many of these original counties are located within the CCFO Planning Area.

Subsequent Anglo settlement in the nineteenth century in the Planning Area focused on ranching based on cattle and sheep grazing, agricultural growth focused initially on grain production, shipping, and coal and mercury mining (Chasteen, 2010; Fowkes and Iddings, 2008; Starr, 2005). The subsequent twentieth century developments in petroleum production in the Planning Area such as from oil fields near Coalinga, Jacalitos Valley, San Ardo, and Vallecitos and large-scale row crop agriculture based on improved irrigation and road transportation were highly significant in shaping the economic development and demographic history of the Planning Area (BLM, 2013; Jackson and Armstrong, 2008:12; Latta, 1949; Rintoul, 1990). Historical period site types found in the region reflect these emphases, including oil field development as well as, agriculture and ranching.

In regard to ranching, the Taylor Grazing Act of 1934 was intended to stabilize the livestock industry dependent upon the public range and to prevent overgrazing and promote soil stabilization (BLM, 2015b). Portions of the CCFO Planning Area were located within District No.1 of the lands included in this act. The BLM was established in 1946 through the merger of the Government Land Office (GLO) and the U.S. Grazing Service. The GLO was created in 1812 to manage public lands (BLM, 2015c). Around 1976, a field station was established from the Folsom District Office, and was soon moved to Park Hill, Hollister. The CCFO is one of several BLM field offices in California, and manages energy, planning, fire, grazing, recreation, National Conservation Lands, minerals, abandoned mines lands, wildlife, and more in central California. The Fort Ord National Monument, the Coalinga Mineral Springs National Recreational Trail, the Juan Bautista de Anza National Historic Trail, and California Coastal National Monument were located within the CCFO's jurisdiction in 1996.

3.15.4 Current Conditions and Trends

To identify current issues and concerns regarding cultural resources in the CCFO Planning Area, letters were sent to the following government agencies and historical societies:

- California Historical Society
- Pacific Railroad Society
- Alameda County Historical Society
- Livermore Heritage Guild, Attn: Jeff Kaskey, President
- Contra Costa County Historical Society, Attn: Scott Saftler, President
- Clayton Historical Society
- Concord Historical Society
- Fresno City and County Historical Society
- R.C. Baker Memorial Museum, Inc.
- Monterey County Historical Society
- Boronda Adobe History Center
- Big Sur Historical Society
- San Benito County Historical Society
- San Juan Bautista Historical Society
- San Mateo County History Museum
- The Museums of Los Gatos, Attn: Amy C. Long, History Curator
- Morgan Hill Historical Society
- San Lorenzo Valley Museum
- Scotts Valley Historical Society
- Pajaro Valley Historical Association
- Alameda County, Planning Department
- Contra Costa County, Department of Conservation and Development, Attn: John Kopchik, Director
- Fresno County, Department of Public Works and Planning
- County of Madera, Building Division
- Merced County, Planning Department, Attn: Mark J. Hendrickson, Directory
- Monterey County, Planning Department
- San Benito County, Planning, Building Inspection Services, and Code Enforcement Department
- City and County of San Francisco, Planning Department
- San Joaquin County, Community Development Department
- San Mateo County, Department of Planning and Building
- Santa Clara County, Department of Planning and Development
- Santa Cruz County, Planning Department
- Stanislaus County, Planning and Community Development

Other sources consulted include the list of nominated historic properties in the National Register of Historic Places maintained by the California Office of Historic Preservation.

Also, a review of BLM records for the CCFO Planning Area and interviews with key staff was conducted at the BLM Central Coast Field Office in Hollister, California. The purpose of the visit was to perform an information search of any cultural, paleontological, and built environment resources the Field Office had for surface and split-estate BLM lands within the Planning Area. The review confirmed no built environment records exist for the BLM surface lands. All recent BLM cultural investigation reports for surface lands were reviewed in digital and/or hard copy form. The results of this research informed the following discussion of expected historical property types.

Since very few cultural resource investigations have occurred on BLM surface lands since 2009, 10 split estate areas were targeted for a California Historic Resources Information System (CHRIS) data search. Descriptions of the targeted split-estate lands were submitted to the Northwest Information Center at

Sonoma State as well as the Southern San Joaquin Valley Information Center at CSU Bakersfield. Submission materials included a 1:24,000 scale topographic USGS map with the requested search area outlined, location information, and county for each search map. Digital shapefiles of the search areas were also submitted to the Information Centers. Requested search areas were in Fresno, Contra Costa, San Benito, Monterey, San Mateo, and Santa Clara Counties.

Results of the CHRIS and BLM reviews within the CCFO Planning Area are provided below, organized by county. Included are results from the CHRIS searches by submitted map as well as reports and resources received from BLM.

Contra Costa County

A CHRIS records search conducted for a 575-acre parcel resulted in no known archaeological sites or investigations within the search area (see Map 1).

Monterey County

A CHRIS records search for a 795-acre parcel identified three previous investigations within the search area. One investigation, a field reconnaissance of less than an acre of land in Big Sur, was negative for prehistoric and historic resources (Doane and Breschini, 2008). The second investigation involved a survey after a wild fire on national wilderness and state park lands in the Big Sur area in 2008. No cultural resources were described or mapped during the investigation (Dallas, 2008). The third investigation involved a field survey of less than an acre of land in Big Sur California for the replacement of a cattle guard. Results were negative for prehistoric and historic resources (Doane and Breschini, 2014) (see Map 7).

A second CHRIS records search for a 1,550-acre parcel identified one previous investigation of approximately 160 acres in Rancho San Lucas with negative results for prehistoric and historic resources (Smith and Breschini, 1989) (see Map 8).

A third CHRIS records search for a 2,820-acre parcel resulted in no known archaeological sites or investigations within the search area (see Map 9).

In 2008, the Central Coast Field Office performed environmental assessments of 80 acres of public land in the Copperhead 1 and 2 areas and 40 acres of public land in the Portuguese Canyon area to assess the land for eligibility for public sale; no archeological or cultural resources were identified within the parcels (BLM, 2008).

Fresno County

A CHRIS records search for a 2,210-acre parcel identified recorded resources including one prehistoric temporary campsite with bedrock mortars and two discrete lithic scatters (CA-FRE-2523). No cultural resource investigations had been conducted within the search area (see Map 10).

Santa Clara County

A CHRIS records search conducted for a 1,310-acre parcel identified one previous investigation consisting of background research and a field survey of a road alignment area to be constructed identified no cultural resources within the investigation area (Busby, 2003) (see Map 4). A second CHRIS records search for a 575-acre parcel revealed one previous investigation, a cultural resources evaluation including archival research and a survey of 4 acres, that found no cultural resources (Cartier, 2005) (see Map 3).

To assess the eligibility of public land parcels for sale, the BLM conducted environmental assessments of 9.21 acres in the Loma Prieta area, 65.65 acres in the Upper Uvas area, 40 acres in the Waterman Creek area, 15.97 acres in the Pacheco Peak area, and 23.60 acres in the Uvas Creek area; the five assessments resulted in negative findings for significant cultural resources (BLM, 2008).

San Benito County

A CHRIS records search for a 1,460-acre parcel revealed one previous investigation which was a mixed strategy reconnaissance of approximately 2,000 acres in Monterey, San Benito, and Fresno Counties (Breschini and Haversat, 1991). Results were negative for prehistoric and historic resources within the current search area (see Map 5). A second CHRIS records search for a 1,120-acre parcel also resulted in no known archaeological sites or investigations within the search area (see Map 6).

In 2008, the Central Coast Field Office performed an environmental assessment of: 15.61 acres of public land in the San Benito River area to assess the land for eligibility for public sale; no archeological or cultural resources were identified within the parcel (BLM, 2008).

BLM records indicate one large scale archaeological reconnaissance investigation was performed on approximately 11,000 acres, 420 acres of which are BLM-administered surface lands. The inventory was to identify cultural resource locations which could be affected by drilling associated with seismic testing as part of the 3D Seismic Testing project in the Vallecitos area. Findings included two prehistoric sites, one historic residence with related machinery, and one historic isolate. One previously recorded prehistoric archaeological site (CA-SBN-128) and one previously recorded historic site (CA-SBN, 248H) were relocated (Jackson and Armstrong, 2008).

Santa Cruz County

An environmental assessment of 12.55 acres of public land by BLM in the Ramsey Gulch area to assess the eligibility of land for public sale revealed no known archeological or cultural resources within the parcel (BLM, 2008).

San Mateo County

A CHRIS records search for a 375-acre parcel identified two previous investigations within the search area. One investigation was an archaeological evaluation and assessment of a shell midden site referred to as the Redwood Chiton site, located within the Santa Cruz Mountains. The site was recommended significant (Dillon, 1992). The second investigation was an archaeological survey of 90 acres in San Mateo County resulting in no cultural resources being found (Reynolds, 2004) (see Map 2).

An environmental assessment of 40 acres of public land by BLM in the Butano Creek area to assess the land for eligibility for public sale indicated a negative occurrence of cultural resources.

Based upon the above search results, insufficient data is available to develop projections of potential archaeological and built environment site types including their densities and locations in the CCFO Planning Area.

Historic Era

In a further effort to identify built environment resources, a review of historical records was conducted including historical aerial photographs, historical and quadrangle maps, available literature, local historical information, and relevant historic context narratives pertaining to patterns of historic-era settlement. The following historic-era property types are expected to be located within the CCFO Planning Area. For purposes of this assessment historical architectural resources are any buildings or structures older than 45 years of age, or constructed in or before 1970.

- **Adobes.** Adobes constructed during the early agricultural period of California's history share one commonality: they were constructed using sun backed bricks made from mud, called adobe. The surviving examples of this building type are typically rectangular in plan with side-gabled roofs with deep overhangs to provide shade. Early examples had had window openings that were protected with animal hides. Glass was expensive, and glass windows were until the nineteenth century. The exposes adobe

brick walls were often whitewashed with lime to protect the bricks from insects. The interior of the buildings were open to maximize airflow. The early adobes were Cliff May's inspiration for designing the modern Ranch style populated throughout California and the nation in numerous real estate tract developments. Historic-period adobes are known to be located within the CCFO's jurisdiction. The Gutierrez (Candido) Adobe in San Pablo is noted under the government theme (DPR, 1976).

- **Homesteads.** Early examples of homesteads may contain residences, barns for storing animals, grains, or equipment, and other ancillary buildings, such as privies. It is likely this resource type is no longer inhabited, and may be considered an archaeological site.
- **Ranches.** Early examples of ranches often contain adobe residences. Other expected building types are barns for storing equipment, hay, and animals; cisterns for storing water; and wood fenced corrals and open fields for grazing animals. The residences on the ranches may reflect a variety of architectural styles including Craftsman or may be vernacular and reflect local trends and tastes instead of a defined style of architecture. Historic-period ranches are known to be located within the CCFO's jurisdiction. The Railroad Ranch in Oakwood is noted under economic and industrial themes (DPR, 1976).
- **Wineries.** Wineries and table grapes farms were and are common throughout this region of California. Early wineries may have been dry farmed, but cisterns for water storage for irrigation purposes are expected. Other expected elements of a winery are barns for storing equipment and casks of wine, other associated ancillary buildings, trellises for growing the grapes, and fencing to protect the vines from wildlife. A defined style of architecture is not associated with this property type. Historic-period wineries are known to be located within the CCFO's jurisdiction. An example of a historic winery is the Mt. Diablo Winery located on Marsh Creek Road (Northwest Information Center, 1989).
- **Depots.** The influx of stagecoach and rail lines is noted as an important event in the State of California, and depots were built throughout the State. Stagecoach depots could range from an established post office to a building designated for this purpose. Railroad depots are located adjacent to rail lines, and were often located in the center of towns. Railroad depots generally reflect the architectural styles that were popular during their period of construction, and can include Folk Victorian, Craftsman, and Moderne style buildings. Historic-period depots are known to be located within the CCFO's jurisdiction. The Pioneer Inn, Main Street, Clayton, is an example of a stagecoach stop on the route from Oakland to Stockton (Northwest Information Center, 1989). The ferry landing near Crockett is noted under economic and industrial themes (DPR, 1976).
- **Ferry Landings.** Prior to the construction of modern paved roads and bridges, ferries were necessary for crossing bodies of water. Tolls were paid for the use of this service, and towns often grew up around successful ferry landings. Ferry landings historically consisted of two docks facing each other on opposing banks of a river, stream, or other navigable body of water. Historic-period ferry landings are known to be located within the CCFO's jurisdiction, and include the ferry landing at the mouth of Alhambra Creek near Crockett in Contra Costa County (DPR, 1976).
- **Rail Lines.** Though active rail lines generally do not retain integrity because the gauge, ballast, and ties are replaced frequently, historically significant rail routes are known to be located in the footprint of the undertaking.
- **Roads.** Though actives roads generally do not retain integrity due to repaving, widening, or other modernization improvements, historically significant vehicular transportation routes are known to be within the boundary of this undertaking.
- **Canals and Irrigation Systems.** The California Aqueduct was previously found to appear eligible for listing in the National Register of Historic Places and is located within the Planning Area. Numerous historic-period feeder canals and irrigation ditches are also located within the area and may be significant.

- **Oil Wells.** Numerous historic-period oil wells are known to exist within the CCFO Planning Area. Abandoned or capped oil wells are considered to be archaeological resources.
- **Mines.** Numerous historic-period mines are known to exist within the CCFO Planning Area. Mining activities included extraction of precious metals, minerals, and mercury (quicksilver). Abandoned mines are considered to be archaeological resources. An example of a historic mine is the copper and silver mines located on Mitchell Canyon Road, Mt. Zion (Northwest Information Center, 1989).
- **Logging Camps.** Logging camps may include residential cabins, a company store, and buildings to house milling equipment. It is likely the historic-era logging camps are no longer and use, and would qualify as an archaeological site. The Moraga Lumber Mill Site in Moraga is noted under economic and industrial themes (DPR, 1976).
- **Residential/Commercial/Institutional Architecture.** Lastly, numerous historic-period residential buildings are known to be located within the CCFO's jurisdiction. The expected styles range from adobes to Queen Anne to Craftsman, and include post-war housing tracts with Ranch style residences. Numerous commercial and institutional buildings, such as schools, were also built in the Ranch style. The La Cocotte Restaurant, originally constructed as a residence, is an example of a turn-of-the-century early western with false parapet building (Northwest Information Center, 1989).

To evaluate historic-era cultural resources sensitivity within the CCFO Planning Area, an assessment was conducted to predict where significant built environment resources may be found and to estimate the density of historic period architectural resources for the Planning Area. No fieldwork was conducted as part of this analysis. The analysis focused on the identification and future evaluation of any previously identified historical architectural resources within the Planning Area, should they exist. The density of development was used as an indicator of the number of potential resources that would require field survey when specific surface disturbing projects are proposed.

The sensitivity assessment indicates the expected density of historical property types for these regions including homesteads, ranches, wineries, rail lines, roads, oil wells and mines, logging camps, and recreational cabins would be very low. In addition, the mineral leases subject to Settlement Agreement are largely located within forested and undeveloped mountainous areas. The records search did not identify resources specifically located on the 14 parcels subject to the Settlement Agreement. Because the lease areas, as well as the CCFO Planning Area in general, are less than 10 percent developed during the historic period, any future proposed undertakings have a low sensitivity for impacting historical architectural resources for all five alternatives.

3.16 Paleontological Resources

As described in the Bureau of Land Management's (BLM's) Manual and Handbook H-8270-1, General Procedural Guidance for Paleontological Resource Management (BLM, 1998a, 1998b, 2007a, 2008), the BLM's objectives for paleontological resource management is to manage scientific, educational, and recreational values, and to mitigate adverse impacts. These objectives are met through land use planning processes that include:

- Identifying areas and geological units (e.g., formations, members) containing paleontological resources;
- Evaluating the potential of areas to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils;
- Developing management recommendations (including mitigation measures in specific locations) to promote the scientific, educational, and recreational uses of fossils on public lands and mitigate resource conflicts; and
- Developing strategies to regularly monitor public lands where important paleontological localities have been identified (BLM, 2007b, 3-14.1).

3.16.1 Introduction

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 evidence of once-living organisms preserved in the rock record. They include the fossilized remains of ancient plants and animals and the traces thereof (e.g., trackways, imprints, burrows, etc.). In general, fossils are considered to be greater than 5,000 years old (middle Holocene) and are typically preserved in sedimentary rocks. Although rare, fossils can also be preserved in volcanic rocks and low-grade metamorphic rocks under certain conditions (Society of Vertebrate Paleontology [SVP], 2010, 2). Paleontological resources can provide important taphonomic, taxonomic, phylogenetic, paleoecologic, stratigraphic, or biochronological data (Scott and Springer, 2003, 6:8).

Approach to Data Collection

Paleontological resources are not found in "soil" but are contained within the geologic deposits or bedrock that underlies the soil layer. Therefore, in order to ascertain whether or not a particular study 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 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 the project area or within a particular rock unit, relevant scientific literature and published geologic maps were reviewed. In addition, a review of recent discoveries and paleontological localities identified in the CCFO Planning Area since 2007 was conducted using records on file with the BLM field office in Hollister, California.

Bureau of Land Management Significance Criteria

Emphasis for evaluation of the significance of fossils is placed on uniqueness, whether fossils are in stratigraphic context that contribute to the body of paleontologic knowledge, and whether fossil occurrences may individually have low significance but contribute individually or collectively to the body of data that allows resource management and resource preservation. In addition, the public benefits and public expectations arising from a fossil's scientific, recreational, and educational values are evaluated (BLM, 2007a, 3.14-1).

The BLM (2008) defines a significant paleontological resource as follows:

> *Any paleontological resource that is considered to be of scientific interest, including most vertebrate fossil remains and traces, and certain rare or unusual invertebrate and plant fossils. A significant paleontological resource is considered to be scientifically important because it is a rare or previously unknown species, it is of high quality and well-preserved, it preserves a previously unknown anatomical or other characteristic, provides new information about the history of life on earth, or has identified educational or recreational value. Paleontological resources that may be considered to not have paleontological significance include those that lack provenience or context, lack physical integrity because of decay or natural erosion, or that are overly redundant or are otherwise not useful for research* [1-18].

Bureau of Land Management Potential Fossil Yield Classification (PFYC)

Geologic units are considered to be "sensitive" if they are known to contain scientifically significant paleontological resources anywhere in their extent. The area of sensitivity is typically defined as the entire rock unit (formation or member thereof) and not limited to areas where surface fossils may be exposed. Using baseline information gathered during a paleontological resource assessment, the sensitivity of the geologic unit(s) underlying a project area can be assigned to one of five classifications (Classes 1 through 5) defined by the BLM (2007b, Attachment 1-1:1-4). These categories include very high, high, moderate or unknown, low, and very low potential for fossilized remains. The criteria for each sensitivity classification and the corresponding mitigation recommendations are provided in Table 3.16-1.

Table 3.16-1. Paleontological Sensitivity Categories

Potential Fossil Yield Classification (PFYC)	Criteria	Mitigation Recommendations
Class 1: Very Low	Rock units that are formed under or exposed to immense heat and pressure, such as high-grade metamorphic rocks and plutonic igneous rocks; volcanic rocks, excluding reworked ash deposits; Precambrian age or older rocks. The probability for impacting any fossils is negligible because significant fossils are non-existent or extremely rare.	Management concern for paleontological resources is usually negligible or not applicable. Mitigation not required, except under very rare or exceptional circumstances.
Class 2: Low	Sedimentary rock units that have yielded few, if any, vertebrate fossils or significant invertebrate 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; eolian deposits, rock units deposited less than 10,000 years before present; and deposits that exhibit a high degree of diagenetic alteration.	Management concern for paleontological resources is generally low. Mitigation is not typically required.
Class 3a: Moderate Class 3b: Unknown	A fossiliferous rock unit with moderate potential is a sedimentary deposit where the significance, abundance, and predictability of recovery of fossils vary. 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, the sensitivity is unknown and further study is needed to determine the unit's paleontological resource potential. Examples include, marine units with uncommon vertebrate fossils, such as sharks teeth or fish scales, or terrestrial units with inconsistent significant fossils or widespread and well-known plant remains	Management concern for paleontological resources is moderate or cannot be determined from existing data. Due to the unknown potential, and moderate or infrequent occurrence of fossils, surface-disturbing activities will require sufficient assessment to determine whether significant paleontological resources occur in the area of a proposed action. Management recommendations may include a preconstruction field survey, monitoring, or avoidance.

Table 3.16-1. Paleontological Sensitivity Categories

Potential Fossil Yield Classification (PFYC)	Criteria	Mitigation Recommendations
Class 4a: High; exposed Class 4b: High; covered	Geologic units with high potential for paleontological resources are those that have been 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; however, these units may vary in occurrence or predictability, may be obscured by vegetation cover or inaccessible from a road or trail, and may have been degraded by historical fossil-hunting. A unit with high sensitivity is susceptible to surface-disturbing activities and includes fossiliferous sedimentary deposits that are well exposed with little vegetative cover as well as those shallowly covered by soil, alluvium, or vegetation.	Management concern for paleontological resources in Class 4 is moderate to high, depending on the proposed action. Typically, a field survey as well as on-site construction monitoring will be required. Any significant specimens discovered will need to be prepared, identified, and curated in an approved museum. A final report documenting the significance of the finds will also be required.
Class 5a: Very High; exposed Class 5b: Very High; covered	Geologic units with very high potential for paleontological resources are those that consistently and predictably yield vertebrate or significant invertebrate, plant, or trace fossils. A unit with very high sensitivity is highly susceptible to surface disturbing activities and includes fossiliferous sedimentary deposits that are well exposed with little vegetative cover, as well as those shallowly covered by soil, alluvium, or vegetation.	Management concern for paleontological resources in Class 5 areas is high to very high. Typically, a field survey as well as on-site construction monitoring will be required. Any significant specimens discovered will need to be prepared, identified, and curated in an approved museum. A final report documenting the significance of the finds will also be required.

Source: BLM, 2007b.

The purpose of this RMPA/EIS, as described above, is to provide a description of paleontological resources that can inform on future BLM resource management decisions and mitigation strategies relating to oil and gas development for the CCFO Planning Area. Management concern for paleontological resources contained within geologic units designated PFYC Class 1 or PFYC Class 2 is generally low or negligible. Therefore, consistent with the purpose of this RMPA/EIS, only those geologic units with sufficient management concern and the potential to yield significant fossils are described in this analysis (i.e., PFYC Classes 3, 4, and 5).

3.16.2 Regulatory Framework

Paleontological resources (i.e., fossils) are considered non-renewable scientific resources because once destroyed, they cannot be replaced. As such, paleontological resources are afforded protection under the various Federal, State, and local laws and regulations. Federal laws and regulations apply only when undertakings are located on Federal lands or federally managed lands, or when they are federally funded. BLM actions on split-estate land where the "surface estate not owned or administered by BLM should be conditioned with appropriate paleontological mitigation recommendations to protect the interests of the surface owner; however, in most states, the surface owner may elect to waive these recommendations" (BLM, 1998b, III-4). The BLM has set forth guidelines for the management of paleontological resources in BLM Instruction Memorandum (IM) No. 2009-011 (2008, Attachment 1-1:1-19), Handbook (H) 8270 (BLM, 1998a, 01: 09F1b), and H-8270-1 (BLM, 1998b, I-1:v-2). This paleontological assessment complies with these guidelines as well as professional standards set forth by the SVP (2010, 1:6).

The Paleontological Resources Preservation Act

The Paleontological Resources Preservation Act (PRPA) (16 United States Code [USC] 470aaa et seq.) was enacted as a result of the passage of the Omnibus Public Lands Management Act (OPLA) of 2009 (Public Law 111-011, Title VI, Subtitle D). The OPLA-PRPA requires Federal land management agen-

cies to manage and protect paleontological resources on Federal lands and affirms the authority of existing policies and guidelines already in place (BLM, 2012, 2:3). As a result of the recent enactment of the OPLA-PRPA, Federal agencies will begin developing "appropriate plans for inventory, monitoring, and the scientific and educational use of paleontological resources in accordance with applicable agency laws, regulations, and policies" (OPLA Section 6302[a]). Specifically, implementation of the OPLA-PRPA shall include programs which increase public awareness of paleontological resources, govern collection of paleontological resources and curation, define illegal activities (e.g., unauthorized excavation, removal, false labeling, or damage to fossil resources), and set penalties for prohibited acts. Under the PRPA, casual or hobby collecting is allowable on some BLM lands, under certain conditions, consistent with existing policy (BLM, 2007b, Attachment 1-2).

The National Environmental Policy Act of 1969

The National Environmental Policy Act was enacted to promote "efforts which will prevent or eliminate damage to the environment (and)…preserve important historic, cultural, and natural aspects of our national heritage" (National Park Service [NPS], 2006, 101).

Section 102(2)(A) of the NEPA requires that all Federal agencies "utilize a systematic, interdisciplinary approach" to make informed, publicly supported decisions regarding environmental issues (NPS, 2006, 102). Section 102 also specifies the cooperation of agencies to:

> *(B) Identify and develop methods and procedures, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations;*
>
> *(C) Include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on —*
>
> *(i) The environmental impact of the proposed action,*
>
> *(ii) Any adverse environmental effects which cannot be avoided should the proposal be implemented,*
>
> *(iii) Alternatives to the proposed action,*
>
> *(iv) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and*
>
> *(v) Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.*
>
> *(E) Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources* [NPS, 2006, 102;103]

Federal Land Policy and Management Act of 1976 (43 USC 1701–1782)

The Federal Land Policy and Management Act requires that public lands be managed in a manner that will protect the quality of their scientific values. It was established as a public land policy to "provide for the management, protection, development, and enhancement of the public lands" (BLM and Office of the Solicitor, 2001, iii). The FLPMA requires Federal agencies to manage public lands so that environmental, historic, archeological, and scientific resources are preserved and protected, where appropriate. Although the FLPMA does not refer specifically to fossils, the law does protect scientific resources, which includes significant fossils, including vertebrate remains.

The FLPMA regulates the use and development of public lands and resources through easements, licenses, and permits. The law requires that public lands be inventoried so that the data can be used to make informed land-use decisions and requires permits for the use, occupancy, and development of the certain public lands, including the collection of significant fossils for scientific purposes.

Code of Federal Regulations, Title 43 (43 CFR 8365.1-5)

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 (GPO, 2014, 989).

The Archaeological and Historic Preservation Act of 1974 (16 USC 469-469c)

In 1974, this act amended and expanded the Reservoir Salvage Act of 1960; this law provides data preservation through the survey, recovery, and preservation of significant scientific, prehistoric, historic, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a Federal, federally licensed, or federally funded project (BLM, 2007a, 3.14-1).

The Mineral Leasing Act of 1920 (Section 30)

This law provides for protection of the interests of the United States. Natural resources, including paleontological resources, are generally considered as such interests. The BLM, as lead Federal agency for issuance of grants of right-of-way on Federal lands under Section 28 of the Mineral Leasing Act, also addresses requirements for protection of paleontological and other natural and cultural resources as conditions for these grants (BLM, 2007a, 3.14-2).

3.16.3 Regional Setting

Geologic Background of the Central Coast Field Office Planning Area

The CCFO Planning Area is situated within the Coast Ranges and Great Valley (i.e., Central Valley) geomorphic provinces of California. The geology of the Coast Ranges and Central Valley is exceptionally diverse, and although their geomorphology is distinctly different, the two provinces share a common geologic history. The region of the present-day Coast Ranges and Great Valley was covered by marine waters through the Mesozoic and into the Cenozoic. During this time, 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 coincident with the accretion of the Franciscan Assemblage onto the continental margin of North America during the subduction of the Farallon Plate (Bartow and Nilsen, 1990, 6). Through the Upper Cretaceous and much of the Cenozoic, unconformable marine continental shelf sedimentary rocks were deposited above the Great Valley Sequence within the actively subsiding Central Valley region. As of the Late Miocene to the Late Pliocene, most of the marine waters in the Great Valley were drained and an orogenic (i.e., mountain-building) episode occurred in the vicinity of the present-day Coast Ranges, resulting in their uplift above sea level (Weissmann et al., 2005, 169:172). Subsequently, from the Late Pliocene to Holocene, extensive deposits of terrestrial material, including alluvial fans and fluvial sediments, were deposited in the Great Valley and southern Coast Ranges (Norris and Webb, 1976, 2:3). Tectonic activity and extensive faulting continued to occur during the Quaternary period, further uplifting and deforming the Coast Ranges.

3.16.4 Current Conditions and Trends

Geology and Paleontology of the Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

The major significant fossil-bearing units underlying the CCFO Planning Area are described below and are listed in Table 3.16-2 (Graymer, 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand and Koenig, 1965; University of California Museum of Paleontology [UCMP], 2015).

Table 3.16-2. Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

Geologic Unit	Age	Typical Fossils	Preliminary[1] Potential Fossil Yield Classification
Franciscan Assemblage	Jurassic to Cretaceous	Reptile, invertebrate, plant	PFYC 3a
Panoche Formation (Great Valley Sequence)	Cretaceous	Reptile, invertebrate, plant	PFYC 3a to 4
Moreno Formation (Great Valley Sequence)	Cretaceous	Reptile, invertebrate, plant	PFYC 4 to 5
Laguna Seca Formation[2]	Late Paleocene to Early Eocene	Invertebrate, plant	PFYC 2*
Martinez Formation	Paleocene to Eocene	Vertebrate, invertebrate	PFYC 3a to 4
Lodo Formation	Late Paleocene to Early Eocene	Vertebrate, invertebrate, microfossil	PFYC 3a to 4
Domengine Formation	Middle Eocene	Shark, fish, invertebrate, microfossil	PFYC 3a
Avenal Sandstone	Early to Middle Eocene	Vertebrate, invertebrate, microfossil	PFYC 3a
Kreyenhagen Formation (including the Tumey Sandstone)	Eocene	Vertebrate, invertebrate, microfossil	PFYC 3a to 5
Markley Formation	Late Eocene	Fish, invertebrate, microfossil	PFYC 3a to 4
Temblor Formation	Oligocene to Early Miocene	Marine mammal, terrestrial mammal, shark, bony fish	PFYC 4 to 5
Vaqueros Formation	Early Miocene	Marine mammal, terrestrial mammal, shark, invertebrate	PFYC 4 to 5
Lompico Formation	Middle Miocene	Vertebrate, invertebrate	PFYC 3a
Monterey Group	Middle to Late Miocene	Marine mammal, terrestrial mammal, shark, bony fish, plant, microfossil	PFYC 5
Briones Formation (San Pablo Group)	Late Miocene	Large land mammals, reptile, fish, birds, sharks, invertebrates	PFYC 4
Cierbo Formation (San Pablo Group)	Late Miocene	Vertebrate, invertebrate	PFYC 3a
Neroly Sandstone (San Pablo Group)	Late Miocene	Vertebrate: beaver, deer, rodent, horse; invertebrate	PFYC 4

Table 3.16-2. Major Fossil-Bearing Units in the Central Coast Field Office Planning Area

Geologic Unit	Age	Typical Fossils	Preliminary[1] Potential Fossil Yield Classification
Oro Loma Formation	Late Miocene to Pliocene	Terrestrial mammal	PFYC 4
Santa Margarita Formation	Late Miocene	Marine mammal, terrestrial mammal, shark, bony fish, plant, bird, invertebrate	PFYC 4 to 5
Santa Cruz Mudstone	Late Miocene	Shark, fish, invertebrate, microfossil	PFYC 3a or 4
Jacalitos Formation	Miocene to Pliocene	Vertebrate, invertebrate, microfossil	PFYC 3a or 4
Purisima Formation	Early to Middle Pliocene	Vertebrate, invertebrate, microfossil	PFYC 4 to 5
Tehama Formation	Pliocene	Land mammal, fish, rodent	PFYC 3a
Etchegoin Formation	Pliocene	Vertebrate, invertebrate, microfossil	PFYC 4 to 5
San Benito Gravels	Pliocene to Pleistocene	Vertebrate	PFYC 3a or 4
Irvington Gravels	Pliocene to Pleistocene	Vertebrate, invertebrate	PFYC 4 or 5
Livermore Gravels	Pliocene to Pleistocene	Vertebrate	PFYC 3a
Paso Robles Formation	Late Pliocene to Early Pleistocene	Vertebrate, invertebrate	PFYC 3a or 4
Tulare Formation	Late Pliocene to Early Pleistocene	Mammal, bird, shark, fish, plant	PFYC 4
Merced Formation	Pleistocene	Mammal, bird, shark, fish, invertebrate, microfossil, plant	PFYC 4 to 5
Quaternary Older Alluvium	Pleistocene	Vertebrate	PFYC 3a

Sources: BLM, 2007a; Graymer, 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand, 1964

*Denotes low sensitivity; see Note 2.

1 - PFYC recommendation for this RMPA/EIS is preliminary and programmatic. During subsequent site-specific project-level evaluations, these PFYC recommendations may be refined based on local conditions (BLM, 2007b, Attachment 1-1; 1-4).

2 - Although the Laguna Seca Formation has no record of vertebrate localities in the UCMP or Paleobiology databases, the BLM (2007a, 3.14-5) assigned a moderate to high sensitivity to the unit (Condition 2) on the basis of Staebler (1981). Therefore, in accordance with the BLM (2007b, Attachment 2-2), this unit has been assigned a PFYC 3a to 4.

Franciscan Assemblage. The Franciscan Assemblage includes over 55,000 feet of greywacke, shale, greenstone, and bluestone metasedimentary rocks as well as ophiolite sequences, which were originally deposited on an ancient seafloor during the Jurassic to Cretaceous (Norris and Webb, 1976, 252:254). Rocks of the Franciscan Assemblage are exposed throughout the Coast Ranges and have yielded invertebrate and vertebrate specimens from numerous localities throughout the CCFO Planning Area in Alameda, Monterey, San Francisco, San Joaquin, San Mateo, Santa Clara, and Stanislaus Counties. Recovered fossils from the Franciscan Assemblage include the large marine reptiles, *Plesiosaurus* and *Ichthyosaurus*, as well as numerous burrow traces and invertebrate and plant fossils (UCMP, 2015).

Panoche and Moreno Formations of the Cretaceous Great Valley Sequence. The Panoche and Moreno Formations are members of the Great Valley Sequence, which is extensively exposed throughout the CCFO Planning Area. The Great Valley Sequence records a thick (10,000- to 30,000-foot) accumulation of Jurassic to Paleogene marine mudstone and sandstone deposited within a forearc basin flanked by the Sierra Nevada Batholith to the east and the Franciscan Complex to the west (Harden, 1998, 242:249). In the Diablo Range, the Cretaceous Panoche Formation rests unconformably on the Coast Range ophiolite and represents the base of the Great Valley Sequence. The Panoche Formation is up to 3,000 feet thick and consists of laterally variable deposits of gray to brown, moderately to well-bedded, and well-indurated mudstone and siltstone beds with local sandstone and boulder conglomerate lenses (Dibblee and Minch, 2007b and 2007d). The overlying Moreno Formation is up to 1,300 feet thick and was deposited conformably on the Panoche Formation during the Late Cretaceous to Paleocene epochs (Throckmorton, 1988, 5). The Moreno Formation consists of fine-grained sediments and is composed of commonly laminated, gray to brown micaceous shale with subordinate selenite gypsum, limestone lenses, and fine- to medium-grained grayish-tan arkose (Throckmorton, 1988, 9:12). An abundant Cretaceous age flora and fauna has been recorded within the deposits of the Great Valley Sequence (UCMP, 2015). Numerous localities have been recorded within the Panoche and Moreno Formations, which have yielded marine and terrestrial fossils, including specimens of mollusk, foraminifera, diatoms, ammonite, shark, fish, amphibian, large reptile, conifer wood, and the remains of flowering plants (BLM, 2014; Elder and Miller, 1993, 9-16; Haggart and Ward, 1984, 622:625). The remains of several large reptiles have been recovered within the Moreno Formation from within the Diablo Range, including mosasaur, plesiosaur, and dinosaur (Paleobiology Database, 2015). In the Panoche Hills, the nearly fully articulated holotype specimen of the plesiosaur *Morenosaurus stocki* was recovered from within the Moreno Formation. In addition, fossilized wood from the Moreno conifer (*Margeriella cretacea*) has been exceptionally well preserved within the Moreno Formation. Fossilized plant remains recovered from within the Moreno Formation include taxa of palm, elm, sycamore, magnolia, and shrub (BLM, 2014).

Laguna Seca Formation. The Late Paleocene to Early Eocene Laguna Seca Formation is exposed in the CCFO Planning Area and is unconformable with the underlying Moreno Formation and overlying Domengine Formation. The unit is composed of well-lithified, light gray to tan, massive fine-grained micaceous sandstone and siltstone, local red mudstone, and white kaolinitic sandstone (Bartow, 1996). In addition to well-preserved fossil plant material, the Laguna Seca Formation has yielded several Paleocene to Eocene age invertebrate localities from paralic deposits in the CCFO Planning Area (UCMP, 2015; Paleobiology Database, 2015).

Martinez Formation. The Paleocene to Eocene age Martinez Formation is locally exposed throughout the CCFO Planning Area. The fossiliferous marine unit consists of sandstone, pebble conglomerate, and siltstone and has yielded reptilian and other unspecified vertebrate specimens from localities in Contra Costa County. In addition, the Martinez Formation has yielded numerous invertebrate localities in San Mateo, Fresno, and Merced Counties (UCMP, 2015).

Lodo Formation. The Late Paleocene to Early Eocene age Lodo Formation is exposed within the CCFO Planning Area in Fresno, Merced, and San Benito Counties and is composed of bluish-gray, deep marine mudstone and claystone (Bartow, 1990, 6). The Lodo Formation contains abundant foraminifera microfossils as well as numerous mollusk invertebrate localities and at least one vertebrate locality within Fresno County, which yielded a specimen of Chimaera (cartilaginous fish) (UCMP, 2015).

Domengine Formation. The Middle Eocene age Domengine Formation is intermittently exposed throughout the CCFO Planning Area. The deposit is composed of massive, greenish-grey, medium-grained calcareous sandstone and well-indurated brown conglomeritic sandstone, with medium- to coarse-grained sand and well-rounded pebbles and cobbles (Oakeshott, 1958, 58-89). The Domengine Formation includes the white to light gray pebbly sandstone of the Yokut Sandstone member that forms the base of the unit and unconformably overlies older units, including rocks of the Great Valley Sequence (Prothero, 1991,

45-46). In central and northern California, the Domengine Formation has yielded hundreds of invertebrate and microfossil localities as well as one vertebrate locality in Fresno County, which yielded specimens of shark and bony fish (UCMP, 2015).

Avenal Sandstone. The Early to Middle Eocene Avenal sandstone is composed of massive sandstone and pebble conglomerate with interbedded siltstone and fine-grained, thinly bedded sandstone (National Geologic Map Database [NGMDB], 2015). Numerous mollusk and foraminifera localities have been recovered within the Avenal Sandstone. In addition, at least one vertebrate locality was documented within Fresno County near Coalmine Canyon in the CCFO Planning Area, which yielded unspecified vertebrate specimens (UCMP, 2015).

Kreyenhagen Formation. The Eocene Kreyenhagen Formation conformably overlies the Domengine Formation and is exposed in Contra Costa, Fresno, San Benito, Monterey, Stanislaus, and Merced Counties within the CCFO Planning Area (UCMP, 2015). The unit consists of deep marine sediments composed of white diatomaceous shale, porcelaneous mudstone, and brown argillaceous shale with subordinate interbeds of siltstone and limestone (NGMDB, 2015; Bartow, 1990, 5:7). The Tumey Sandstone Lentil member (previously recognized as the Tumey Formation) forms the stratigraphic top of the Kreyenhagen Formation and is composed of a gray to brown, friable to cemented, locally pebbly lithic sandstone with dominate volcanic clasts (Bartow, 1996). Numerous invertebrate, microfossil, and vertebrate localities have been recovered from within the Kreyenhagen Formation, which yielded unspecified vertebrate remains as well as echinoderm, mollusk, foraminifera, and diatom fossils (UCMP, 2015).

Markley Formation. The late Eocene Markley Formation is exposed in Contra Costa and San Mateo Counties and is composed of interbedded, shallow marine to terrestrial, argillaceous shale, mudstone, and sandstone (NGMDB, 2015). The Markley Formation has yielded an abundant microfossil assemblage and invertebrate fauna, including specimens of gastropod, bivalve, foraminifera, radiolarian, and diatom (Squires, 1988, 107). In addition, at least five vertebrate localities have been recorded within the Markley Formation, which yielded fossil specimens of bony fish (UCMP, 2015).

Temblor Formation. The Oligocene to Early Miocene Temblor Formation is exposed throughout the southeastern CCFO Planning Area and was named for exposures northwest of McKittrick in northwestern Kern County (NGMDB, 2015). The Temblor Formation is up to 500 feet and is composed of interbedded terrestrial and marine sandstone and shale deposits, including light gray to tan arkose, gray to red pebbly sandstone, and gray red claystone (Bridges and Castle, 2003, 275:285; Graham et al., 1989, 713:716). The Temblor Formation has yielded abundant fossils resources from more than 700 localities in central California. Of those localities, 38 yielded hundreds of vertebrate specimens including sea cows, gomphothere, mastodon, extinct horse, pinnipeds, fish, and sharks, among other taxa (UCMP, 2015).

Vaqueros Formation. The early Miocene age Vaqueros Formation is intermittently exposed throughout the CCFO Planning Area. The Vaqueros Formation is a brown-gray, massive to thickly bedded marine sandstone, with interbedded siltstone, shale, and subordinate nonmarine conglomerate (NGMDB, 2015). The deposit has yielded numerous vertebrate fossils in Monterey and San Benito Counties including specimens of whale, hippopotamus, and shark (UCMP, 2015).

Lompico Formation. The Middle Miocene Lompico Formation is exposed within the CCFO Planning Area in Santa Cruz County where it conformably underlies the Monterey Group. The Lompico Formation is up to 500 feet thick and is composed of yellowish-gray, massive to thickly bedded, medium- to fine-grained, moderately to well-sorted calcareous arkosic sandstone and a thin granitic basal conglomerate (Clark, 1981, 18). According to the UCMP (2015), the Lompico Formation has yielded numerous invertebrate localities of molluscan fauna from Santa Cruz County as well as one vertebrate locality, which yielded a specimen of whale.

Monterey Group. The Monterey Group (also referred to as the Monterey Formation) is intermittently exposed throughout the CCFO Planning Area. The Monterey Group is up to approximately 5,000 feet thick and is dominated by finely laminated fine-grained diatomaceous and siliceous mudrocks; limestone and dolomite; calcareous and phosphatic mudrocks; chert and porcelanite; and subordinate tuff, sandstone, and conglomerate (Bramlette, 1946, 1:3; MacKinnon, 1989, 13:16). Numerous vertebrate localities have been documented from within the Monterey Group in California, including specimens of large sea turtles, whales, dolphins, sea lions, shark bones and teeth, desmostylians, sea cows, fish, birds, rare terrestrial vertebrates, and many other fauna (Bramlette, 1946, 9:10; Harden, 1998, 395:397; Koch et al., 2004, 7:10; Murphey et al., 2007, 45:70). Typically, specimens from the Monterey Group have been recovered within diatomite and shale deposits at depth and at the surface; however, limestone and sandstone beds also have yielded abundant remains (UCMP, 2015). In many cases, fossil specimens recovered from within the Monterey Group, such as whale, Chondrichthyes (cartilaginous fish), and bony fish, are remarkably well preserved and have previously yielded fully articulated specimens (Koch et al., 2004, 1). In addition, the Monterey Group has yielded numerous species of scientifically significant invertebrates, foraminifera, and plants, such as kelps and other large soft-bodied seaweeds.

The Briones Formation, Cierbo Formation, and Neroly Sandstone of the San Pablo Group. The Miocene San Pablo Group is exposed in the CCFO Planning Area and extends throughout Contra Costa, Alameda, Stanislaus, and Santa Clara Counties (Graymer et al., 1996). The Briones Formation is the oldest member of the San Pablo Group, which includes the overlying Cierbo and Neroly formations (Carpenter et al., 1984, 35; NGMDB, 2015). The shallow marine Briones Formation is up to 2,300 feet thick near its type section and consists of indistinctly bedded fine-grained quartz sandstone, lithic wacke, gray to brown conglomerate, interbedded silty claystone, and resistant shell conglomerate (Chetelat, 1995, 8; Graymer et al., 1996; NGMDB, 2015). The Briones Formation has yielded an abundant and diverse fauna, including an extinct hippopotamus-like herbivorous mammal and taxa of reptile, fish, bird, shark, bivalve, gastropod, crustacean, echinoid, and brittle stars (UCMP, 2015).

The Miocene Cierbo Formation is up to 650 feet thick and consists of poorly to moderately consolidated white to pale yellow brown quartz sandstone interbedded with thin pebble conglomerate lenses and brown shale deposits (Carpenter et al., 1984, 35). The Cierbo Formation has yielded unnamed vertebrate fossils as well as abundant fossil specimens of invertebrate fauna, including mollusk, sea urchin, stony coral (Graymer et al., 1996; UCMP, 2015).

The Neroly Formation is up to 1,800 feet thick and is characterized by distinctive blue-gray sandstone derived from andesitic eruptions to the east (Bartow, 1984, A5; Throckmorton, 1988, 33). Numerous marine and terrestrial invertebrate, vertebrate, and plant fossils of have been recovered from within the Neroly Formation including well-preserved taxa of wolf, skunk, proboscidean, pronghorn, primitive beaver, and primitive New World mouse (Graymer et al., 1996; Throckmorton, 1988, 34). Additional fossil remains recovered within the Neroly Formation include horse, ground squirrel, eagle ray, gastropod, bivalve, scaphopod, coral, crab, sea urchin, and plants (UCMP, 2015).

Oro Loma Formation. The Miocene to Pliocene Oro Loma Formation is exposed within Alameda, Stanislaus, Merced, and San Joaquin Counties in the CCFO Planning Area and unconformably overlies the Briones Group (Graymer et al., 1996; NGMDB, 2015). The Oro Loma Formation is up to 300 feet thick and consists of unconsolidated to moderately consolidated red siltstone, sandstone, and pebble conglomerate interbedded with greenish-gray claystone. The Oro Loma Formation has yielded several fossil localities within the eastern Diablo Range, which yielded specimens of horse and camel (Kelly and Stewart, 2008, 2; Paleobiology Database, 2015; UCMP, 2015).

Santa Margarita Formation. The Late Miocene age Santa Margarita Formation is intermittently exposed throughout the CCFO Planning Area in Fresno, Monterey, Santa Cruz, San Benito, and Santa Clara Counties (Jennings, 1958; NGMDB, 2015; UCMP, 2015). The Santa Margarita Formation conformably overlies the Monterey Formation in the Diablo Range and consists of deep to shallow marine deposits com-

posed of buff, poorly indurated sandstone and biogenic shale and terrestrial sandy conglomerate. The Santa Margarita Formation has produced abundant fossil specimens of mastodon, artiodactyl, horse, rabbit, walrus, sea cow, pinniped, shark, fish, reptile, bird, bivalve, gastropod, bryzoa, and echinoderm (UCMP, 2015).

Santa Cruz Mudstone. The Late Miocene Santa Cruz Mudstone is exposed within the CCFO Planning Area in Santa Cruz County where it conformably overlies the Santa Margarita Formation. The Santa Cruz Mudstone is composed of yellowish-brown, thickly bedded to laminated, blocky siliceous mudstone (Clark, 1981). The Santa Cruz Mudstone has yielded pollen, foraminifera, and mollusks from Santa Cruz County as well as a number of rare vertebrate localities, which yielded fossil specimens of fish scales and a sea cow rib (Clark, 1981). In addition, the UCMP online database (2015) identifies two localities that record occurrences of bony fish and shark.

Jacalitos Formation. The shallow marine to nonmarine Jacalitos Formation of Miocene to Pliocene age is exposed in the CCFO Planning Area within Fresno, Monterey, and San Benito Counties. The unit consists of fluvial and nearshore quartzitic and andesitic sandstone, siltstone, and conglomerate (NGMDB, 2015). Several invertebrate and vertebrate localities have been recovered from within the Jacalitos Formation, which yielded specimens of horse, echinoderm, mollusk, and brachiopod (UCMP, 2015).

Purisima Formation. The Early to Middle Pliocene age Purisima Formation is exposed within the CCFO Planning Area in San Mateo, Santa Clara, and Santa Cruz Counties and consists of basal marine deposits composed of poorly consolidated, laterally variable, claystone, siltstone, and fine-grained sandstone that coarsen up into terrestrial sandstone and conglomerate (NGMDB, 2015). Numerous vertebrate and invertebrate localities have been documented within the Purisima Formation, including hundreds of specimens of birds, shark, bony fish, reptile, pinniped, dolphin, whale, sea cow, horse, rodent, crustacean, echinoderms, bivalve, gastropod, and foraminifera (UCMP, 2015).

Tehama Formation. The Pliocene age Tehama Formation is exposed in Contra Costa County and is composed of fluvially deposited, green-gray to tan quartzitic and tuffaceous sandstone, with lenticular siltstone deposits and crossbedded cobble conglomerate (Blake et al., 2000, 2; UCMP, 2015). Numerous vertebrate localities have been documented within the Tehama Formation outside of the CCFO Planning Area in adjacent counties, including specimens of mastodon, mammoth, horse, artiodactyl, dog, shrew, sloth, rodent, fish, and reptile (UCMP, 2015).

Etchegoin Formation. The Pliocene Etchegoin Formation is exposed in the CCFO Planning Area along the western margin of the San Joaquin Valley and into the eastern foothills of the Coast Ranges from Monterey County to San Benito County (NGMDB, 2015). Near the type section, the Etchegoin Formation overlies the Santa Margarita and Monterey Formations and is in turn overlain by the Tulare Formation. The Etchegoin Formation is composed of weakly lithified, light gray, well-bedded sandstone with interbeds of gray silty shale (Dibblee, 2005d). The unit has also yielded vertebrate specimens of whale, shark, dolphin, beaver, otter, mammoth, deer, mastodon, rhinoceros, fox, and horse, as well as an abundant molluscan fauna (NGMDB, 2015; UCMP, 2015).

San Benito Gravels. The Pliocene to Pleistocene age San Benito Gravels are exposed in San Benito County and consist of moderately consolidated conglomerate, sandstone, and argillaceous shale (NGMDB, 2015). At least eight vertebrate localities have been identified in the San Benito Gravels, which have yielded several fossil specimens of horse and mammoth (UCMP, 2015).

Irvington Gravels. The Pliocene to Pleistocene age Irvington Gravels are exposed in Alameda County within the CCFO Planning Area and consist of poorly to well-consolidated, distinctly bedded pebbles and cobbles, gray pebbly sand, and gray, coarse-grained, cross-bedded sand (Helley and Graymer, 1997). The UCMP online database (2015) lists four vertebrate localities for the Irvington Gravels, which yielded hundreds of fossil specimens, including taxa of horse, camel, ground sloth, mammoth, dire wolf, fox, coyote, saber-toothed cat, rabbit, rodent, as well as the type specimen for *Tetrameryx irvingtonensis* (pronghorn).

Livermore Gravels. The Pliocene to Pleistocene age Livermore Gravels are exposed within Alameda County and consist of loosely consolidated, massive to poorly bedded, gray to greenish-brown cobble conglomerate with a coarse arkosic matrix; conglomeritic sandstone; coarse-grained sandstone; and subordinate, interbedded greenish-blue siltstone and claystone (Helley and Graymer, 1997, 8). At least five vertebrate fossil localities within the Livermore Gravels have been recorded by the UCMP (2015) from various localities in central Alameda County, including specimens of bison, mammoth, horse, rodent, and turtle, and bird.

Paso Robles Formation. The Late Pliocene to Early Pleistocene nonmarine Paso Robles Formation extends from the Salinas Valley through the southern border of the CCFO Planning Area and is composed of grayish-red sandstone, claystone, limestone, and conglomerate with clasts of white siliceous shale and chert derived from the underlying Monterey Formation (NGMDB, 2015; Tennyson, 1992). The fluvial-lacustrine unit is more than 3,000 feet thick and is composed primarily of gravel and sand channel and floodplain deposits, and with subordinate silt, clay, and limestone representing short-lived lakes. The Paso Robles Formation has numerous localities in the CCFO Planning Area, including several localities identified in the Salinas Valley and in Monterey County that yielded fossil specimens of horse tooth, rodent bones, seal, gastropod, and ostracode (Addicott and Galehouse, 1973, 510; UCMP, 2015; Woodring and Bramlette, 1950, 96).

Tulare Formation. The Late Pliocene to Early Pleistocene Tulare Formation is exposed in Fresno, Stanislaus, San Joaquin, and Alameda Counties within the CCFO Planning Area. The unit is approximately 1,700 to 3,500 feet thick and is composed of moderately lithified, thickly bedded, white to tan marl, massive gray claystone, and local gypsum and other fresh water evaporates (Bartow, 1990, 6; Dibblee and Minch, 2007b, 2007d). Numerous vertebrate localities have been recovered from within the fine-grained sediments of the Tulare Formation within the CCFO Planning Area within Alameda and San Joaquin Counties, which yielded specimens of horse, bird, shark, fish, and rodent. In addition, the remains of several well-preserved plants, including taxa of giant sequoia, pine, manzanita, fir, and walnut, were recovered in Stanislaus County (UCMP, 2015).

Merced Formation. The Pliocene to Pleistocene age Merced Formation is exposed within the CCFO Planning Area in Santa Clara, San Mateo, and San Francisco Counties. The Merced Formation is composed of up to 5,000 feet of marine to nonmarine grayish-brown medium- to fine-grained sandstone and silty clay, with subordinate interbedded pebble conglomerate and local tuffaceous deposits (NGMDB, 2015). According to the UCMP (2015), the Merced Formation has yielded abundant microfossils, plants, mollusk, and echinoderm specimens as well as at least 24 vertebrate localities, which yielded fossil specimens of bird, shark, fish, mammoth, horse, ground sloth, deer, camel, whale, dolphin, seal, and mastodon.

Quaternary Older Alluvium. Quaternary age alluvial deposits are exposed throughout the CCFO Planning Area and are composed of variable lithology derived from diverse sources (Graymer, 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand and Koenig, 1965; UCMP, 2015). The deposits typically consist of unconsolidated to moderately consolidated, moderately dissected, locally variable compositions of silt, sand, gravel, and larger clasts deposited as alluvial fan and channel deposits, fluvio-lacustrine deposits, terrace deposits, and landslides. Quaternary alluvial, fluvial, and lacustrine deposits of Pleistocene age have proven to yield significant vertebrate fossil localities throughout the California Coast Ranges and the Central Valley. Recovered specimens include terrestrial mammals such as mammoth, horse, camel, bison, cat, bird, rodent, and reptile (UCMP, 2015). Some Pleistocene-age alluvial deposits are composed of coarse-grained material, which is not typically conducive to the preservation of fossils (e.g., alluvial fan deposits). For example, coarse-grained surficial Quaternary deposits derived from the local plutonic igneous rocks are unlikely to contain fossils; however, older, finer-grained alluvial sediments may contain significant paleontological resources.

Leases Subject to Settlement Agreement

Table 3.16-3 lists the geologic units underlying each of the 14 Leases Subject to Settlement Agreement.

Table 3.16-3. Major Fossil-Bearing Units within the Leases Subject to Settlement Agreement

Leases Subject to Settlement Agreement		Geologic Unit(s)
1	CACA 052959	Monterey Group
2	CACA 052960	Monterey Group, Paso Robles Formation
3	CACA 053824	Monterey Group
4	CACA 053825	Monterey Group
5	CACA 053826	Monterey Group
6	CACA 053827	Monterey Group, Paso Robles Formation
7	CACA 053828	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
8	CACA 053829	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, and Monterey Group
9	CACA 053830	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
10	CACA 053831	Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, and Oro Loma Formation
11	CACA 053832	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, and Monterey Group
12	CACA 053833	Laguna Seca Formation, Martinez Formation, and Lodo Formation
13	CACA 053834	Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, and Kreyenhagen Formation
14	CACA 053835	Panoche Formation, Moreno Formation, Laguna Seca Formation, Martinez Formation, Lodo Formation, Domengine Formation, Kreyenhagen Formation, Temblor Formation, Monterey Group, Oro Loma Formation, and Quaternary Older Alluvium

Sources: Dibblee and Minch, 2006, 2007a, 2007c; Graymer, 1996; Jennings, 1958; Jennings and Strand, 1958; Koenig, 1963; Strand, 1964

New Paleontological Resources Identified in the Central Coast Field Office Planning Area Since 2007

The 2007 Hollister Field Office Proposed RMP/Final EIS described the existing paleontological resources in the CCFO Planning Area and summarized important discoveries since 1937, when a nearly complete skeleton of a plesiosaur was recovered from within the Moreno Formation (BLM, 2007a, 3.14-2; Staebler, 1981). Subsequent to that discovery, hundreds of localities within the CCFO Planning Area have produced a diverse flora and fauna that spans the Upper Cretaceous through the Pleistocene Epochs. Most notably, the Upper Cretaceous Moreno Formation, Eocene Kreyenhagen Formation (including the Tumey Sandstone member), and Early Miocene Temblor Formation have been especially fossiliferous and have yielded thousands of vertebrate, invertebrate, microfossil, and plant specimens.

Since 2007, several additional significant fossil resources have been recovered from the CCFO Planning Area. During the 2008–2010 field seasons, BLM Natural Resource Specialist Ryan O'Dell along with Conservation and Land Management interns conducted intensive field surveys of the Moreno Shale in order to document and map fossils within this unit. In 2008, O'Dell documented a locality yielding large log and leaf impressions of the conifer *Margeriella cretacea* (BLM, 2010, 3). In the same field season,

O'Dell collected an indeterminate genus of sea turtle from the Moreno Shale in the Tumey Hills (BLM, 2010, 4). Also in 2008, field surveys conducted by BLM Heritage Resources Program Manager Erik Zaborsky and paleontologist Chad Staebler in the Panoche Hills yielded a mosasaur within the Moreno Shale that was subsequently excavated in 2010 with the help of a local Boy Scouts troop. Another field survey led by O'Dell within the Panoche Hills uncovered a plesiosaur identified as *Elasmosaurus* sp. in 2009 (BLM, 2010, 5). Excavation of the plesiosaur by Chad Staebler, interns, and students from the Riekes Center later in the same field season produced 34 vertebrae, several ribs and gastralia, both scapulae, both coracoids, one humerus, one ulna, and several phalanges of a single individual (BLM, 2010, 6).

Also in 2009, a team of students from the Webb School, led by Don Lofgren from the Raymond Alf Museum, returned to the Path 15 sites within the Temblor Formation to conduct the first excavation since it was originally discovered in 2004 (BLM, 2010). They also collected sediments to wash for the presence of microfossils (BLM, 2010). Their efforts produced macroscopic mammal bone fragments and thousands of gastropods through screen washing and picking including *Menetus micromphalus, Planorbula mojavensis, Hawaiia minuscula*, and *Lymnaea mohaveana* (Lofgren, Personal communication, 2011).

In addition, in March 2015, several fossil specimens were identified from an early Holocene age oil seep discovered in the vicinity of Oil Canyon just north of Coalinga, California (R. O'Dell, personal communication, 18 August 2015). Recovered specimens include Aves (bird), Squamata (scaled reptile), *Quercus* (oak), *Eriogonum* (wild buckwheat), *Typha* (cattail), and Poaceae (grass), as well as abundant insects (Odonata, Lepidoptera, Coleoptera, Orthopter),

The CCFO Planning Area has produced an abundance of significant flora and fauna representing extinct ecosystems unique to north-central coastal California. Since the first fossils were uncovered within the CCFO Planning Area, rare and unique taxa, including near complete specimens of conifer, flowering plants, mosasaurs, plesiosaurs, and type specimens of mammals have been found that provide a more complete understating of the ecosystem over time. Additionally, given the abundance of fossil material recovered from within the CCFO Planning Area, it is highly likely that this area will continue to produce significant resources in the future.

3.17 Social and Economic Conditions

3.17.1 Introduction

This chapter describes the laws and regulations that govern social and economic issues at a Federal level, including environmental justice. It should be noted that U.S. Bureau of Land Management (BLM) oil and gas management actions (e.g., lease stipulations or areas closed to leasing) affect the social and economic environment outside of lands solely under jurisdiction of the BLM. This is because the social and economic effects of an action like oil and gas development on lands under jurisdiction of the BLM can extend to populations and communities located outside BLM surface lands. Additionally, where Federal mineral estate occurs under private lands, social and economic factors related to oil and gas developments within the Central Coast Field Office (CCFO) Planning Area extend to populations and communities located outside BLM surface lands. Therefore, this section summarizes the existing environment regarding socioeconomics of the oil and gas industry and environmental justice (including data on existing minority and low-income communities) for each county contained within the CCFO Planning Area boundary.

3.17.2 Regulatory Framework

BLM Land Use Planning Handbook, Appendix D

Appendix D (Social Science Considerations in Land Use Planning Decisions) of the BLM Land Use Planning Handbook provides guidance on integrating social science information into the planning process for projects and actions within BLM lands (BLM, 2005). Any information gathered for planning purposes must be considered in the context of BLM's legal mandates. Appendix D provides guidance for effectively integrating social scientific data and methods into the entire planning process. Furthermore, Section IV (Environmental Justice Requirements) of Appendix D provides guidance for assessing potential impacts on population, housing, and employment as they relate to environmental justice. It also describes how variables such as lifestyles, beliefs and attitudes, and social organizations should be considered by the BLM with respect to evaluating potential impacts from a project or action on social and economic conditions, including environmental justice.

Executive Order 12898

In 1994 President Clinton issued the Executive Order (EO), Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, to focus Federal attention on environmental and human health conditions in minority and low-income communities. EO 12898 promotes nondiscrimination in Federal programs that substantially affect human health and the environment, and it provides information access and public participation relating to these matters. This order requires Federal agencies (and State agencies receiving Federal funds) to identify and address any disproportionately high or adverse human health or environmental effects of their programs, policies, and activities on minority and/or low-income populations. The Council on Environmental Quality (CEQ) oversees Federal compliance with EO 12898.

Executive Order 12866

Under Executive Order 12866, agencies are required, to the extent permitted by law, "to assess both the costs and the benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs." The purpose of estimating the "social cost of carbon" (SCC) is to allow agencies to incorporate the social benefits of reducing carbon dioxide (CO2) emissions into cost-benefit analyses of regulatory actions that impact cumulative global emissions (United States, 2015). Chapters 3.6 and 4.6 of this EIS discuss climate change and greenhouse gas emissions as they relate to the

proposed RMPA. While oil and gas activities under the proposed RMPA 2015 Reasonably Foreseeable Development Scenario would result in CO2 emissions, a cost-benefit analysis was not found warranted for the proposed RMPA under guidance provided in BLM Land Use Planning Handbook, Appendix D.

Council on Environmental Quality's Environmental Justice Guidance Under the National Environmental Policy Act

To ensure that environmental justice concerns are effectively identified and addressed according to EO 12898, the U.S. Council on Environmental Quality (CEQ), in consultation with the Environmental Protection Agency (EPA), has developed guidance to assist all Federal agencies with implementing procedures. According to the CEQ's "Environmental Justice Guidance Under NEPA," agencies should consider the composition of affected areas to determine whether minority or low-income populations are affected by a proposed action, and, if so, whether those environmental effects may be disproportionately high or adverse (CEQ, 1997).

3.17.3 Regional Setting

This section summarizes existing social and economic conditions within the CCFO Planning Area. The CCFO Planning Area boundary contains twelve California counties:

- Alameda
- Contra Costa
- Fresno
- Merced
- Monterey
- San Benito
- San Francisco
- San Joaquin
- San Mateo
- Santa Clara
- Santa Cruz
- Stanislaus

This section includes programmatic summaries of socioeconomic conditions for areas both inside and outside BLM surface lands within the CCFO Planning Area boundary. Areas outside BLM surface lands are included because social and economic factors related to oil and gas developments on BLM-administered lands within the CCFO Planning Area extend to population and communities located outside BLM surface lands. Therefore, the NEPA "affected environment" includes the overall socioeconomic conditions of communities affected by activities on BLM surface lands or by BLM management decisions. This section uses best-available recent data to establish the existing socioeconomic resource conditions in environmental justice populations at a programmatic level.

In presenting existing conditions of socioeconomic resources and environmental justice populations, unique considerations create differing "study area" boundaries. For example, a regional study area may include an entire county or larger metropolitan area. Meanwhile, a local study area may include communities proximate to an existing oil and gas field where employees and support businesses likely reside. Where applicable, in describing the social and economic conditions, study areas are defined and representative qualitative and quantitative data are presented.

Social Demographic Setting

Table 3.17-1 summarizes current and forecasted population trends, current minority and low-income population percentages, current housing data, and average household size and income statistics for all twelve counties within the CCFO Planning Area boundary. As shown, significant population growth is forecasted for all twelve counties. Alameda County and Santa Clara County provide the greatest number of housing units within the CCFO Planning Area. Merced County has both the highest housing vacancy rate and also the lowest median home price. Housing data is important when considering socioeconomics as changes in social structure of a community directly influence the housing market. Furthermore, proposed developments (particularly those expected to generate a specified number of low-wage jobs) can impact the community's current housing market and demand for more affordable housing. As expected, Bay Area counties have the highest median home values and household incomes.

Table 3.17-1. Demographic and Housing Statistics, by County

Category	Alameda	Contra Costa	Fresno	Merced	Monterey	San Benito	San Francisco	San Joaquin	San Mateo	Santa Clara	Santa Cruz	Stanislaus
Population (2014)	1,573,254	1,087,008	964,040	264,922	425,756	57,517	836,620	710,731	745,193	1,868,558	271,595	526,042
Minority population percentage	65.9%	52.2%	67.3%	68.2%	67.0%	62.0%	58.2%	64.1%	57.5%	64.8%	40.2%	53.3%
Low-income population percentage	12.0%	10.2%	24.8%	24.6%	16.1%	12.7%	13.2%	17.5%	7.4%	9.7%	14.4%	19.2%
2020 Projection	1,682,348	1,166,670	1,055,106	288,991	446,258	63,418	891,493	766,644	777,088	1,970,828	281,870	573,794
2030 Projection	1,835,340	1,281,561	1,200,666	337,798	476,874	73,459	967,405	893,354	822,889	2,151,165	295,538	648,076
2040 Projection	1,978,656	1,400,999	1,332,913	389,934	500,194	82,969	1,027,004	1,037,761	874,626	2,331,887	303,512	714,910
2050 Projection	2,115,824	1,512,940	1,464,413	439,075	520,362	90,802	1,081,540	1,171,439	925,295	2,482,347	307,606	783,005
2060 Projection	2,195,999	1,620,604	1,587,852	485,712	533,575	99,215	1,103,174	1,306,271	936,151	2,585,318	314,875	856,717
Housing Units (2014)	588,948	405,828	322,489	84,298	138,817	18,130	381,143	236,943	273,532	644,691	105,047	180,165
Vacant units	37,798 (6.4%)	25,266 (6.2%)	26,633 (8.3%)	8,108 (9.6%)	13,128 (9.5%)	1,079 (6.0%)	31,405 (8.2%)	18,987 (8.0%)	13,300 (4.9%)	28,233 (4.4%)	10,174 (9.7%)	14,375 (8.0%)
Average person per household	2.78	2.83	3.2	3.39	3.23	3.35	2.32	3.2	2.83	2.98	2.73	3.14
Median home price (2013)	$485,000	$392,500	$152,500	$148,000	$356,250	$355,000	$830,000	$215,000	$742,000	$645,000	$505,000	$175,000

Source: U.S. Census, 2015; DOF, 2014a; DOF, 2014b

Environmental Justice Demographics

Defining Environmental Justice Populations

According to the CEQ environmental justice guidelines, an environmental justice population would be identified if:

- A minority or low-income population percentage either exceeds 50% of the population of the affected area, or
- If the minority or low-income population percentage of the affected area is meaningfully greater than the minority or low-income population percentage in the general population or other appropriate unit of geographic analysis (e.g., a governing body's jurisdiction, the county or city in which the affected area is located within, neighborhood census tract, or other applicable unit).

The CEQ Environmental Justice Guidance defines "minorities" as individuals who are members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black not of Hispanic origin, or Hispanic (CEQ, 1997). The total minority population has been calculated by subtracting the white alone, not Hispanic or Latino, population from the total population. For this analysis, an environmental justice minority population is identified when the minority population of the potentially affected area is greater than 50%.

The CEQ Environmental Justice Guidance defines "low-income populations" as populations with mean annual incomes below the annual statistical poverty level. For this analysis, low-income population was determined by utilizing the U.S. Census data for persons "below poverty level." The CEQ and EPA guidance do not provide a discrete threshold for determining when a low-income population should be identified for environmental justice. For this analysis, an environmental justice low-income population is identified when the percentage of low-income population of the potentially affected area is equal to or greater than the low-income population of the greater geography. Because this programmatic analysis includes twelve California counties, the baseline (greater geography) low-income percentage for county comparison is that of California. To ensure a more regional robust comparison is also completed for environmental justice, each county within the CCFO Planning Area is compared against one another. For local communities (Section 3.17.4.2), the baseline (greater geography) low-income percentage for comparison is that of the county in which they are located within.

Regional Study Area Minority and Low-Income Populations

With respect to environmental justice and minority populations, Table 3.17-1 shows that only Santa Cruz County is not considered to have a disproportionate minority population (40.2%) within the CCFO Planning Area boundary. All remaining counties within the CCFO Planning Area contain a minority population exceeding 50%, with Merced County containing the highest (68.2%).

With respect to environmental justice and low-income populations, California contains an overall low-income percentage of 15.9% (U.S. Census, 2015). Considering this, Fresno, Merced, Monterey, San Joaquin, and Stanislaus Counties have a low-income population greater than California and are considered low-income areas of concern with respect to environmental justice. Furthermore, comparing each county against each other in Table 3.17-1 shows that Fresno and Merced Counties contain disproportionately high percentages of low-income population within the CCFO Planning Area.

3.17.4 Current Economic Conditions and Trends

The following provides a description of the current demographic and economic conditions at a localized level, while still being programmatic in nature. In addition to core demographic and economic indicators, this section also presents data on the oil and gas industry within the CCFO Planning Area, communities within areas designated with high oil and gas occurrence potential (refer to Figure 5-1), and areas identi-

fied as sensitive during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015). Please refer to Appendix F for the complete Workshop Summary Report.

3.17.4.1 RMPA Social and Economic Workshop

In order to develop the social and economic analysis for the EIS and RMPA, the BLM has undertaken a public involvement effort that includes a social and economic workshop. The Social and Economic Workshop (Workshop) was held on February 4, 2015. The purpose of the Workshop was to provide an opportunity for local government officials, community leaders, and other citizens to discuss regional economic conditions, trends, and strategies with BLM managers and staff.

The Workshop was held in Monterey County and 11 participants attended, which included local agency representatives, oil and gas industry representatives, and members of the general public. The workshop provided information on local and regional economic and social conditions and trends; assisted participants with identifying desired economic and social conditions; and identified ways to advance local economic and social goals through BLM's planning and policy decisions associated with the proposed RMPA. The major themes and issues identified during the workshop included:

- BLM-administered mineral estate designated as open on split estate leases can impact private land owners and hinder the local government economic goals and planning efforts should oil and gas surface activities be incompatible with surrounding land uses and long-term land use planning strategies;
- BLM planning and policy should consider consistency with local agencies' applicable plans and policies regarding oil and gas development; and
- The EIS should consider programmatic direct and indirect economic effects of continued oil and gas development within areas of the CCFO Decision Area where oil and gas occurrence potential is considered high.

3.17.4.2 Central Coast Field Office Planning Area

Table 3.17-2 summarizes current economic indicators for all twelve counties within the CCFO Planning Area boundary, including the most currently available data for the mineral extraction industry (which includes fossil fuels). As shown, Fresno County has the highest unemployment rate, with San Mateo County containing the lowest. Meanwhile, San Joaquin County is expected to see the greatest job growth through year 2019, with Monterey County expected to the see the least. Significant personal income growth is expected for all counties through year 2019.

As shown in Table 3.17-2, active oil and gas wells on BLM-administered mineral estate account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. With respect to the mineral extraction industry, Table 3.17-2 shows that Fresno, Monterey, and San Joaquin Counties contain the most active oil and gas wells within the CCFO Planning Area. Those counties, along with Contra Costa, Merced, and Santa Cruz Counties, have seen significant labor earning growth within the mineral extraction industry between years 2001 and 2012. While contributing significant labor earnings, the mineral extraction employment accounts for only a small percentage of the overall employment within each county (refer to Table 3.17-1).

Localized Communities of Interest

As described above, existing oil and gas leases within the CCFO Planning Area are primarily located within Fresno County, Monterey County, and San Benito County. Future oil and gas development is also likely to occur in these regions. These three counties comprise the local study area. Currently, each county receives substantial tax revenue from oil and gas fields as well as from employees' income taxes. Economic characteristics unique to each county include the following:

Table 3.17-2. Economic Indicators by County

Category	Alameda	Contra Costa	Fresno	Merced	Monterey	San Benito	San Francisco	San Joaquin	San Mateo	Santa Clara	Santa Cruz	Stanislaus
Median household income	$69,151	$74,815	$43,756	$42,741	$54,341	$63,613	$72,020	$50,168	$87,601	$88,478	$63,092	$44,053
Per capita income	$57,595 ranked 9th in CA	$65,106 ranked 5th in CA	$34,864 ranked 44th in CA	$31,293 ranked 56th in CA	$46,224 ranked 24th in CA	$39,422 ranked 37th in CA	$86,588 ranked 2nd in CA	$34,483 ranked 47th in CA	$79,021 ranked 3rd in CA	$70,772 ranked 4th in CA	$54,615 ranked 10th in CA	$35,434 ranked 45th in CA
Average salary per worker	$79,614	$77,456	$48,198	$45,813	$54,301	$49,593	$107,171	$51,179	$94,085	$113,951	$52,908	$50,993
Unemployment rate	5.7%	6.1%	12.1%	14.3%	9.3%	10.8%	4.4%	11.7%	4.2%	5.3%	9.0%	12.3%
Expected job growth (2014-2019)	7.9%	8.4%	10.7%	7.7%	6.3%	7.4%	8.4%	10.4%	9.4%	10.0%	6.8%	9.0%
Expected personal income growth (2014-2019)	15.7%	16.0%	16.3%	16.0%	13.5%	15.3%	19.2%	16.8%	19.1%	23.3%	17.2%	16.3%
MINERAL EXTRACTION INDUSTRY												
Active mines	8	4	13	18	13	11	3	11	3	4	4	7
Active oil and gas wells	93	663	11,550	195	3,596	388	0	1,225	196	112	65	146
Active oil and gas wells on Federal mineral estate[1]	0	2	35	0	14	56	0	0	0	0	3	0
Number of jobs	135	1,073	208	144	203	106	54	88	31	212	312	32
Average annual wage per worker	$94,191	$220,106	$83,449	N/A	$92,476	N/A	$126,335	$68,144	$82,040	$72,501	N/A	$51,826
Labor earning trends ($000)												
2001	68,122	539,630	22,062	1,691	28,062	12,733	30,530	17,092	13,342	57,980	4,763	3,668
2012	44,950	694,153	38,319	9,789	39,418	7,216	58,051	13,757	16,657	49,651	22,984	3,181

1 - Active well data provided by the California Department of Conservation, Division of Oil Gas and Geothermal Resources that intersected Federal mineral estate within the CCFO Planning Area.
N/A = Data Unavailable
Source: DOT, 2014; Headwaters, 2014; U.S. BEA, 2014

- **Fresno County.** An abundance and wide variety of mineral resources are present in this county. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other materials used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone). Aggregate and petroleum are the county's most significant extractive resources and play an important role in maintaining the county's overall economy (Fresno County, 2000).
- **Monterey County.** Large rural areas that are predominately used for agricultural purposes characterize this county. The majority of oil and gas-related activities occur within the southern portion of the county, which is generally characterized by an income level that is less than the county average due to the high number of agricultural workers. During the Social and Economic Workshop, representatives from Monterey County expressed that the southern portion of the county is of greatest concern regarding oil and gas development, with potential future areas for oil and gas leasing located along the travel routes to tourist destinations (e.g., lakes and missions) in southern Monterey County. The County also expressed that planning for this portion of the county is intended to enhance recreation and tourism in efforts to encourage residents and businesses to develop outside the existing agriculture and energy sectors that have shaped the southern portion of the County (BLM, 2015). Substantial oil reserves are believed to underlay parts of the Salinas Valley; the San Ardo oil field is the largest oil field in Monterey County. In 2006, the San Ardo oil field ranked 41st in the nation in terms of oil production (Monterey County, 2008).

  In addition, representatives from Monterey County Resource Management Agency have indicated that there may be a potential loss of tax revenue should split estate leases be limited or decreased within the County (BLM, 2015). Currently the county receives substantial tax revenue from oil and gas fields as well as from employees' income taxes. However, as shown in Table 3.17-2, the 14 active oil and gas wells on Federal mineral estate lands within Monterey County only account for 0.4% of the 3,596 active wells within the county.
- **San Benito County.** This County is largely rural, with over 90 percent of its land used for farming, ranching, forestry, or other public uses (San Benito, 2010a). San Benito County is not considered a major oil-producing region in California compared to other counties. Reserves within the county are estimated to be 101 million oil barrels (Mbbl) of oil and 63 million cubic feet (MMcf) of natural gas, while the top ten largest oil fields in the State contain up to 598,393 Mbbl of oil reserves and 329,109 MMcf of gas reserves (San Benito, 2010b).

Local Study Area Socioeconomics

Table 3.17-3 provides a summary of socioeconomic data for the incorporated communities within areas designated with high oil and gas occurrence potential within the CCFO Planning Area (refer to Figure 5-1). These local study area communities (Coalinga, Greenfield, King City, Bradley CDP, San Ardo CDP, and San Lucas CDP) were identified as sensitive areas related to oil and gas extraction during the Social and Economic Workshop held on February 4, 2015 (BLM, 2015). As shown in Table 3.17-3, the cities of Coalinga (Fresno County) and King City (Monterey County) are the largest communities within highly active areas of oil and gas production within the CCFO Planning Area. Both the cities of Coalinga and Greenfield contain the majority of oil and gas workers and those in the utilities industries.

Table 3.17-3. Socioeconomic Statistics for CCFO Planning Area Local Study Area Communities Within Areas Designated with High Oil and Gas Occurrence Potential

	Fresno County	Monterey County				
Category	**Coalinga**	**Greenfield**	**King City**	**Bradley CDP[1]**	**San Ardo CDP[1]**	**San Lucas CDP[1]**
Population	16,609	4,395	12,996	110	704	216
Minority population percentage	64.1%	66.8%	91.2%	28.2%	86.4%	97.7%
Low-income population percentage	22.8%	6.2%	20.5%	12.7%	20.3%	40.3%
Housing units (2014)	5,017	1,426	2,996	47	221	56
Vacant units	269 (5.4%)	107 (7.5%)	204 (6.8%)	6 (5.4%)	13 (5.4%)	6 (5.4%)
Median Household Income	$46,500	$47,759	$45,905	$51,750	$40,781	$47,500
Civilian Employed Workforce	6,141	1,853	4,500	37	183	61
Unemployment rate	8.6%	10.5%	21.1%	9.8%	51.6%	33.0%
Workforce in the mining, quarrying, and oil and gas extraction industries	154	102	0	0	9	3
Workforce in the construction industry	470	254	198	2	40	0
Workforce in the utilities industry	121	49	5	0	0	0

1 - A CDP (Census Designated Place) is a concentration of population identified by U.S. Census Bureau for statistical purposes. CDPs are populated areas that lack separate municipal government, but which otherwise physically resemble incorporated places.
Source: U.S. Census, 2015.

Local Study Area Economic and Fiscal Contribution of Oil and Gas Industry

BLM management decisions and policies affect many aspects of local and regional economy. Within the CCFO Planning Area, BLM administers approximately 284,000 acres of surface public land. BLM-administered lands within the CCFO Planning Area have the largest overarching influence on recreation and tourism aspects of local and regional economies. As shown in Table 3.17-2, active oil and gas wells on BLM-administered lands account for only 110 (0.6%) of the total 18,229 active wells within the CCFO Planning Area. However, all oil and gas leases issued by the BLM within the CCFO Planning Area generate revenue to the Federal Treasury. Because of the high oil and gas development and occurrence potential in the southern portion of the CCFO Planning Area, BLM management policy decisions on mineral estates does, at some level, influence the local economy and can contribute to, or affect, local governmental revenues.

Table 3.17-4 summarizes recent economic and fiscal contributions of the oil and gas industry within Monterey County, Fresno County, and San Benito County (regional study area). As shown, oil and gas production within these counties has beneficial economic and fiscal contributions. The average fiscal contribution per well is greatest in San Benito County and least in Fresno County. As shown earlier in Table 3.17-2, active wells within these county boundaries located on BLM-administered lands account for only a small portion of the total wells. Therefore, oil and gas wells on Federal mineral lands have a minor economic and fiscal contributions compared to the totals shown in Table 3.17-4.

Federal mineral estate that contains existing oil and gas leases, and likely to contain future oil and gas development, is primarily located within the southern region of the CCFO Planning Area. Resource development on public lands can produce employment and growth in the future. Assuming market conditions and regulatory conditions are attractive, and the BLM allows additional leasing and development of public lands, local job creation and continuation of the established oil and gas industry would continue at some level. Depending upon the level of development, County revenues can be sensitive to resource development pace and patterns and thus BLM decisions. Specifically, oil and gas leases on Federal mineral estate lands directly and indirectly produce county tax revenue, as shown in Table 3.17-4.

Severance taxes are often levied by state governments and are typically defined as taxes imposed distinctively on removal of natural products including oil and gas. However, there is no statewide severance tax on oil and gas production in California (DOC, 2015). There are ad valorem (property) taxes in California, administered by each county that would apply to split estate leases issued by the BLM. Furthermore, tax revenue is generated by direct spending on oil and gas infrastructure, worker wage spending and from secondary and indirect employment.

Local Study Area Minority and Low-Income Populations

With respect to environmental justice and minority populations, Table 3.17-3 shows that all communities with the exception of Bradley contain a minority population exceeding 50%. Of note, the communities of King City, San Ardo, and San Lucas contain exceptionally high concentrations of minority population.

With respect to environmental justice and low-income populations, Table 3.17-2 shows the community of Coalinga contains a low-income population slightly below that of Fresno County (refer to Table 3.17-2). However, this community is still considered to have a high percentage of low-income population for consideration of environmental justice. Within Monterey County, Table 3.17-3 shows the communities of King City, San Ardo, and San Lucas contain low-income populations greater than that of Monterey County (refer to Table 3.17-2) and are considered environmental justice communities. Of note, these communities have negligible numbers of people working in the oil and gas or utilities industries (refer to Table 3.17-2).

Table 3.17-4. Economic and Fiscal Contribution of Oil and Gas Industry – Monterey, Fresno, and San Benito Counties, 2012

MONTEREY COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	1,087	$109.7	$191.4	$257.4
Indirect Employment	161	$8.1	$16.6	$24.4
Induced Employment	402	$17.8	$34.3	$49.0
Total Contribution	1,651	$135.6	$242.4	$330.8
Average Contribution per Active Well ($ dollars)[2]	**—**	***$37,709***	***$67,408***	***$991,991***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	$136.6	$60.6	$197.2
Average Contribution per Active Well ($ dollars)[2]	***$37,987***	***$16,852***	***$54,839***

FRESNO COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	1,924	$124.9	$252.4	$371.1
Indirect Employment	410	$19.2	$33.3	$51.6
Induced Employment	648	$26.4	$53.2	$77.6
Total Contribution	2,982	$170.5	$338.9	$500.3
Average Contribution per Active Well ($ dollars)[2]	**—**	***$14,762***	***$29,341***	***$43,316***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	$290.1	$110.5	$400.6
Average Contribution per Active Well ($ dollars)[2]	***$25,117***	***$9,567***	***$34,684***

SAN BENITO COUNTY				
ECONOMIC CONTRIBUTION	**Employment**	**Labor Income ($ millions)**	**Value Added ($ millions)**	**Output ($ millions)**
Direct Employment[1]	197	N/A	N/A	N/A
Indirect Employment	N/A	N/A	N/A	N/A
Induced Employment	N/A	N/A	N/A	N/A
Total Contribution	268	$18.8	$34.4	N/A
Average Contribution per Active Well ($ dollars)[2]	**—**	***$48,454***	***$88,660***	***N/A***

FISCAL CONTRIBUTION	**State and Local ($ millions)**	**Federal ($ millions)**	**Total Taxes ($ millions)**
Total Tax Revenue[3]	N/A	N/A	$26.7
Average Contribution per Active Well ($ dollars)[2]	***N/A***	***N/A***	***$68,814***

Source: Los Angeles County Economic Development Corporation, 2014
N/A: Data Not Available
1 - Includes: Oil and gas extraction, support activities, natural gas distribution, oil and gas pipeline construction, petroleum refineries, petroleum and petroleum product wholesalers, gasoline stations, fuel dealers, pipeline transportation.
2 - Total divided by County well data provided in Table 3.17.2.
3 - Includes: Sales and excise taxes, property taxes, personal income taxes, corporate profits taxes, social insurance taxes, other taxes, and fees, fines, and permits,

Leases Subject to Settlement Agreement

As described in Chapter 1, the BLM-managed areas within the CCFO Planning Area contain 14 non-NSO leases, as identified in Case No. 11-06174 and Case No. 13-1749. These lease areas are located both in south Monterey County and central San Benito County (near the boundary with Fresno County). The nearest incorporated communities to these leases are Coalinga (Fresno County) and King City (Monterey County). A summary of the existing social and economic conditions for these communities is discussed earlier and shown in Table 3.17-3.

3.18 Transportation and Access

3.18.1 Introduction

This section addresses transportation and access on Bureau of Land Management (BLM) lands, including recreational motorized vehicle use. The lands managed by the Central Coast Field Office (CCFO) are highly dispersed. The regional transportation network, including highways, major roads, county roads, rail, and aviation is shown on Figure 3.18-1, although a detailed description of the regional network is not included here. The discussion of hazardous materials transport is in Sections 3.4 and 4.4 (Hazardous Materials and Public Safety).

This section focuses on BLM roads and trails that provide access to, and through, BLM public lands. Travel and transportation are integral parts of virtually every activity on public lands including recreation, livestock grazing, wildlife management, commodity resources management, rights-of-way (ROWs) for private inholdings, and public land management and monitoring. BLM's Comprehensive Travel and Transportation Management (CTTM) program encompasses the planning, management, and administration of motorized and non-motorized roads, primitive roads, and trails to ensure that public access, natural resources, recreational opportunities, and regulatory needs are considered.

3.18.2 Regulatory Framework

Executive Orders 11644 and 11989 contain guidelines for the controlled use of off-highway vehicle (OHVs) on public lands. These executive orders require that all BLM surface lands be designated as open, closed, or limited for OHV use (43 Code of Federal Regulations [CFR] 8340). In accordance with 43 CFR 8342.1, the BLM's regulations for OHV management, "the authorized officer shall designate all public lands as open, limited, or closed to [OHVs]." As such, all public lands within the CCFO Planning Area have been designated in one of three OHV designation categories.

In 2006, the BLM issued Instruction Memorandum No. 2006-173, which established policy for the use of terms and definitions associated with the management of transportation-related linear features. It also set a data standard and a method for storing electronic transportation asset data. According to the memorandum, all transportation assets are defined as follows:

- **Road:** A linear route declared a road by the owner, managed for use by low-clearance vehicles having four or more wheels, and maintained for regular and continuous use.
- **Primitive Roads:** A linear route managed for use by four-wheel drive or high-clearance vehicles. Primitive roads do not normally meet any BLM road design standards.
- **Trails:** A linear route managed for human-powered, stock, or off-highway vehicle forms of transportation or for historical or heritage values. Trails are not generally managed for use by four-wheel drive or high-clearance vehicles.

3.18.3 Regional Setting

BLM's CTTM program addresses all resource use aspects, such as recreational, traditional, casual, agricultural, commercial, and educational, and the accompanying modes and conditions of travel on public lands, not just motorized or off-highway vehicle (OHV) activities. Traditionally, the BLM's travel management program focused primarily on motor vehicle use. Within the framework of CTTM, all forms of travel, including travel by foot, horseback and other livestock, mechanized vehicles (such as bicycles), motorized vehicles (such as two-wheeled motorcycles and four-wheeled OHVs, cars, and trucks), and motorized and non-motorized boats.

Current vehicle management is based on the existing Hollister Resource Management Plan (RMP). This plan addressed a variety of concerns related to vehicle use, roadways, and resource protection, and provided guidelines for future road improvements, maintenance activities, and management decisions.

3.18.4 Current Conditions and Trends

Central Coast Field Office Planning Area

A network of Federal, State, and county roads provide access to the CCFO Planning Area. Figure 3.18-1 shows major public roads that provide regional access throughout the CCFO Planning Area boundary and surface transportation links between major population centers and BLM surface lands. Figure 3.18-1 also shows rail facilities within the CCFO Planning Area boundary.

BLM Roads and Trails

The BLM manages over 600 miles of roads and trails in the CCFO Planning Area for motorized and non-motorized use. Whenever possible, the BLM makes the public lands accessible, whether by foot, motorcycle, bicycle, horse, or car. Reasonable access is made available to persons engaged in valid uses such as mining claims, mineral leases, livestock grazing, and recreation.

Vehicle use within the Fort Ord, Joaquin Rocks, Panoche, and Tumey Hills areas is closed to casual public use. The remaining public lands managed by the field office limit motorized vehicle use to existing routes, except where closed by closure notices, and/or by activity level planning decisions. Within the CCFO Planning Area, the BLM manages approximately 502 miles of motorized roads and trails and 112 miles of non-motorized trails. This network ranges from two-wheel drive accessible routes, four-wheel drive "two-track" roads, and "single-track" motorized trails.

Existing roads and trails in the Planning Area are categorized based on the type of use and maintenance they receive as shown in Table 3.18-1.

Table 3.18-1. Miles of BLM Roads and Trails in the CCFO Planning Area

Road Class	Characteristics	Miles
2	Secondary and connecting roads – hard surface, concrete or asphalt, usually undivided with single lane characteristics.	32
3	Local, neighborhood, rural, and light-duty – hard surface, gravel or dirt, constructed, regularly maintained.	367
4	Unimproved – primitive, constructed, sedan clearance, not regularly maintained.	0
5	Four-wheel drive, primitive (two-track), constructed, high clearance required, not regularly maintained. All-terrain vehicle trail (less than 52 inches wide) or single-track motorized (dirt bike, horse).	113
6	Non-motorized trail (less than 52 inches wide).	112

Source: BLM, 2007.

Currently, public lands in the area are generally accessible by motorized vehicles to agency personnel (for resource management), to commercial enterprise (for use or extraction of public resources), and to the general public (for recreation and enjoyment of public lands). Road system management has focused on maintaining major access roads, which generally receive most of the recreation traffic. Corrective maintenance occurs as problems are identified and funds permit. Road construction has been limited to improving or upgrading road segments to improve access or to alleviate maintenance or environmental problems.

As shown in Table 3.18-1, there are more than 113 miles of primitive roads and trails for vehicles to access BLM public lands managed by the CCFO. While these roads and trails are open for OHV use, no designated OHV areas are located within the CCFO Planning Area (BLM, 2015).

Recreation (non-OHV) Access

Recreation activities such as equestrian riding, hunting, and rock hounding often require some level of motorized vehicle access. There are 16 key access points to recreation areas in the CCFO Planning Area. These currently have information boards or kiosks that identify the sites. These include Stockdale Mountain Access, Curry Mountain Access, Short Fence, Coalinga Mineral Springs, Condon Peak, Griswold Hills, Tumey Hills, and Panoche Hills.

Leases Subject to Settlement Agreement

The 14 non-NSO leases are located in the following two counties within the CCFO administrative boundary: eight leases in San Benito County and six leases in Monterey County. In San Benito County, the non-NSO leases are in a mountainous area that is less than 0.5 miles north of the San Benito Mountain Research Natural Area and approximately 4 miles south of the Panoche Hills South Wilderness Study Area. These leases are within the active Vallecitos oil and gas field or within approximately 7 miles of the field boundary. There would be no open roads within or near these leases.

In Monterey County, the non-NSO leases are located across two mountainous areas with the first area approximately 4 miles west of the City of San Ardo and 4 miles north of Lake San Antonio, and the second area approximately 9 miles south of the City of San Ardo and 1.5 miles east of Lake San Antonio. The Monterey County leases are within approximately 10 miles of the active San Ardo oil and gas field, which is generally located east of the non-NSO leases in Monterey County. Some open roads are located within these leases within the Williams Hill Recreation Area described below.

The following BLM-designated land use is located in the Monterey County non-NSO lease area:

- **Williams Hill Recreation Area.** This BLM-managed recreation area allows dispersed and developed camping, hunting, mountain biking, horseback riding, and Off-Highway Vehicle recreation. Off-Highway Vehicle access is limited to approximately 11 miles of designated open routes (BLM, 2013).

3.19 Lands and Realty

3.19.1 Introduction

The Bureau of Land Management (BLM) has established a number of natural resource management programs in order to address the large spectrum of natural resource values within its jurisdiction (BLM, 2013a). One of these resource management programs is for Lands and Realty. The Central Coast Field Office (CCFO) Lands and Realty program is aimed at managing the underlying land base that hosts and supports all BLM resources and management programs within its administrative area. The BLM works cooperatively to execute the CCFO Lands and Realty program with Federal agencies, the State of California, counties and cities, and other public and private landholders. Management actions (e.g., lease stipulations or areas closed to leasing) are incorporated in the Draft RMPA alternatives, and are fully described in Chapter 2.

3.19.2 Regulatory Framework

The Federal Land Policy and Management Act of 1976 (FLPMA) established BLM land use planning requirements, which serve as the basis for every on-the-ground action the BLM undertakes (BLM, 2005, pg. 1). As required by Section 202(c)(9) of the FLPMA, an RMPA and EIS must discuss State, local, and tribal land use plans that are germane in the development of land use plans for public lands. Therefore, Table 3.19-1 provides a listing of regulations and policies that may be applicable to the CCFO Planning Area. Additional State and local regulations may also apply to split-estate lands. State and local regulations and plans are subject to change and are listed for information purposes only. The application and enforcement of any applicable State and/or local agency regulations, plans, and policies lies with the State or local agencies with responsibility over the resources. BLM only has jurisdiction for enforcement of applicable Federal regulations.

Table 3.19-1. Applicable Plans, Policies, and Legal Authorities in the CCFO Planning Area

Plan	Policy / Statute / Regulation	Summary
Federal		
Code of Federal Regulations: Leases Permits, and Easements	43 CFR 2920	Establishes procedures for processing proposals for non-Federal use of public lands.
Recreation and Public Purposes Act	43 CFR 2912	Describes the terms and conditions of BLM leases and lease renewals.
	43 CFR 2740	Describes where and under what circumstances BLM authorizations for use, occupancy, and development (such as major leases and land use permits) may be granted.
Federal Land Policy and Management Act of 1976, as Amended	Section 302(b)	In managing public lands, the BLM must regulate the use, occupancy, and development of these lands through easements, permits, leases, licenses, published rules, or other appropriate instruments.
	Section 701(d)	Establishes that this Act does not permit oil shale recovery on any Federal land, other than Federal land that has been leased for the recovery of shale oil under the Act of February 25, 1920. The BLM is responsible for responding to requests regarding development on BLM-administered lands in a manner that balances diverse resource uses
Mineral Leasing Act of 1920, as Amended	Sections 13 through 21	Establishes the authority of the BLM to oversee oil and gas operations on Federal land.
Onshore Orders	Orders 1 through 7	Onshore Oil and Gas Orders implement and supplement the oil and gas regulations found at 43 CFR 3160 for conducting oil and gas operations on Federal and Indian lands.

Table 3.19-1. Applicable Plans, Policies, and Legal Authorities in the CCFO Planning Area

Plan	Policy / Statute / Regulation	Summary
BLM Instruction Memorandum	IM 2010-117	Establishes a process for ensuring orderly, effective, timely, and environmentally responsible leasing of oil and gas resources on Federal lands. The policy applies to the leasing of Federal minerals under BLM-administered surface, State-owned surface, and private surface estates.
State of California		
California Public Resources Code	Chapter 3, Sections 6801 through 6819	Provides the provisions relating to all State lands for oil, gas and mineral leases.
Local		
Alameda County General Plan	No policies pertaining to oil and gas were identified.	
Contra Costa County General Plan	Conservation Element	Policies in this section intend to ensure the continued viability of mineral extraction operations, to protect mineral resources from incompatible land uses, and to minimize and buffer the impact of mineral extraction on surrounding land uses and the natural environment.
Fresno County General Plan	Open Space & Conservation Element	Policies in this section intend to preserve the future availability of the county's mineral resources. Policies also seek to promote the orderly extraction of mineral resources while minimizing the impact of these activities on surrounding land uses and the natural environment.
Merced County General Plan	Natural Resources Element	Policies in this section intend to facilitate orderly development and extraction of mineral resources while preserving open space, natural resources, and soil resources and avoiding or mitigating significant adverse impacts.
Monterey County General Plan	Conservation & Open Space Element	Policies in this section provide for the conservation, utilization, and development of the county's mineral resources.
San Benito County Draft General Plan[1]	Geology, Soils, & Mineral Resources Element	Policies in this section intend to protect and support economically viable mineral resource extraction while avoiding land use conflicts and environmental impacts from current and historical mining activities.
San Benito County Fracking Ban, Measure J	In November 2014, a San Benito County Fracking Ban Initiative was approved by voters. The measure was designed to prohibit hydraulic fracturing and related gas and oil extraction activities, including acid well stimulation and cyclic steam injection. Measure J also banned any new gas or oil drilling activity in areas of the county zoned for residential or rural land use.	
San Francisco County/City General Plan	No policies pertaining to oil and gas were identified.	
San Joaquin County General Plan	Resources Element	Policies in this section intend to protect extractive resources from urban development or encroachment, and provide for the production of these resources while protecting people, property, and the environment from hazards caused by resource extraction.
San Mateo County General Plan	Mineral Resources Chapter	Policies in this section intend to protect the availability of mineral resources, encourage their extraction in a manner that minimizes adverse environmental impacts, and plan for the rehabilitation and reuse of mineral extraction areas.
Santa Clara County General Plan	Resource Conservation Chapter	Policies in this section intend to ensure continued availability of mineral resources, mitigate environmental impacts of extraction and transport, and reclaim sites for appropriate subsequent uses.
Santa Cruz County General Plan	Conservation and Open Space Chapter	Policies in this section allow for the orderly economic extraction of minerals with a minimal adverse impact on environmental and scenic resources and surrounding land uses.

Table 3.19-1. Applicable Plans, Policies, and Legal Authorities in the CCFO Planning Area

Plan	Policy / Statute / Regulation	Summary
Santa Cruz General Plan	Amendment to Policy 5.18.4	In April 2014, the San Cruz Board of Supervisors approved a resolution prohibiting oil and gas exploration and development in Santa Cruz County.
Stanislaus County General Plan	Conservation & Open Space Element	Policies in this section intend to manage extractive mineral resources to ensure an adequate supply without degradation of the environment.

1 - The proposed San Benito County General Plan Update includes policies specific to mineral resource extraction. No applicable policies were identified in the 1985 County General Plan.

Sources: Alameda County, 1994; BenitoLink, 2015; BLM, 1990, 2001, 2010; California Public Resources Code, Sections 6801 to 6819; Contra Costa County, 2005; Fresno County, 2000; Merced County, 2013; Monterey County, 2010; San Benito County, 2015; San Francisco County, 1996; San Joaquin County, 1992; San Mateo County, 1986; Santa Clara County, 1994; Santa Cruz County, 1994 and Santa Cruz County, 2014; Stanislaus County, 1995.

3.19.3 Regional Setting

The CCFO Planning Area is located in west-central California and encompasses 12 counties either in part or in full. Within the CCFO Planning Area, the BLM manages approximately 247,000 acres of subsurface mineral estate underlying Federal surface land and 546,000 acres of subsurface mineral estate underlying privately owned land, otherwise referred to as "split estate" lands (BLM, 2015). The public lands and mineral interests are primarily concentrated in the southern planning areas of Fresno, Monterey, and San Benito Counties. Adjacent landowners include private holdings and Federal, State, county, or local governments. An estimate of Federal mineral estate acreage in the planning and decision area is provided in Table 3.19-2.

Table 3.19-2. Estimate of Federal Mineral Estate within CCFO Administrative Boundary

County	BLM-Administered Surface Estate (acres)	Split Estate (acres)
Alameda	0	3,587
Contra Costa	0	1,880
Fresno	118,981	88,617
Merced	3,941	35,419
Monterey	46,160	202,080
San Benito	75,003	143,725
San Francisco	0	0
San Joaquin	0	1,969
San Mateo	0	400
Santa Clara	887	34,060
Santa Cruz	6	300
Stanislaus	1,320	33,803
Total	247,051	545,848

Source: BLM, 2015

3.19.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Current oil and gas development is concentrated within a limited area of the CCFO Planning Area. In the last decade, nearly all well development occurred in the Coalinga and Jacalitos oil fields (Fresno County), and the San Ardo and Lynch Canyon oil fields (Monterey County). The Federal share of mineral estate in these fields is approximately one percent, and as such, the BLM administers very little of the mineral estate in this area. Likewise, the Vallecitos oil fields located in San Benito County have very little production that occurs on BLM-administered mineral estate (BLM, 2014). Exploratory oil wells are not common in the CCFO Planning Area, and historically have been drilled on less than five percent of the leases issued on BLM-administered lands (BLM, 2014).

As described above, existing oil and gas leases within the CCFO Planning Area are primarily located within Fresno County, Monterey County, and San Benito County. Future oil and gas development is also likely to occur in these regions. Characteristics unique to each county include the following:

- **Fresno County.** An abundance and wide variety of mineral resources are present in this county. Extracted resources include aggregate products (sand and gravel), fossil fuels (oil and coal), metals (chromite, copper, gold, mercury, and tungsten), and other materials used in construction or industrial applications (asbestos, high-grade clay, diatomite, granite, gypsum, and limestone). Aggregate and petroleum are the county's most significant extractive resources and play an important role in maintaining the county's overall economy (Fresno County, 2000, pg. 5-9).
- **Monterey County.** This county is characterized by large rural areas that are predominately used for agricultural purposes. Substantial oil reserves are believed to underlay parts of the Salinas Valley; the San Ardo oil field is the largest in Monterey County. In 2006, the San Ardo oil field ranked 41st in the nation in terms of oil production (Monterey County, 2008, pg. 4.5-5).
- **San Benito County.** This county is largely rural, with over 90 percent of its land used for farming, ranching, forestry, or other public uses (San Benito, 2010a, pg. 1-5). San Benito County is not considered a major oil-producing region in California compared to other counties. Reserves within the county are estimated to be 101 million oil barrels (Mbbl) of oil and 63 million cubic feet (MMcf) of natural gas, while the largest oil fields in the State contain up to 598,393 Mbbl of oil reserves and 329,109 MMcf of gas reserves (San Benito, 2010b, pg. 8-68).

Leases Subject to Settlement Agreement

The 14 non-NSO leases are located in the following two counties within the CCFO Planning Area: eight leases in San Benito County and six leases in Monterey County. In San Benito County, the non-NSO leases are proposed in a mountainous area that is approximately 2.5 miles north of the San Benito Mountain Research Natural Area and approximately 5.6 miles south of the Panoche Hills South Wilderness Study Area; some of these leases would be located within active oil and gas fields. In Monterey County, the non-NSO leases are located across two mountainous areas with the first area approximately 3 miles west of the City of San Ardo and 4.5 miles north of Lake San Antonio, and the second area approximately 9.4 miles south of the City of San Ardo and 1 mile northeast of Lake San Antonio. Active oil and gas fields are located to the north and east of the non-NSO leases in Monterey County. The following BLM-designated land use is located in the Monterey County non-NSO lease area:

- **Williams Hill Recreation Area.** This BLM-managed recreation area allows dispersed and developed camping, hunting, mountain biking, horseback riding, and Off-Highway Vehicle recreation. Off-Highway Vehicle access is limited to approximately 11 miles of designated open routes (BLM, 2013b).

3.19.5 BLM Management Considerations for Lands and Realty

Management challenges identified for lands and realty in the CCFO Planning Area are based, in part, on historic activities and trends, as well as on current and future needs of public resources. Management challenges include managing BLM surface lands to adequately meet the needs of multiple uses per the FLPMA; improving the management of natural, public, and historic resources; bringing into public ownership lands with high public resource values; consolidating land and mineral ownership patterns for more streamlined management of resources and BLM programs; and disposing of lands identified for disposal. In order to accommodate multiple uses in a manner consistent with CCFO management objectives and plans, the BLM must identify public lands or resources for which the following management tools apply: (1) land use authorizations (e.g., leases, permits, Right-of-way (ROW) grants); (2) land tenure adjustments (e.g., sales, exchanges, donations, purchases); and (3) classifications and withdrawals.

Land Use Authorizations

Section 302 of the FLPMA provides the BLM's authority to issue leases and permits for the use, occupancy, and development of public lands. Leases and permits are issued for purposes such as ROWs and utility corridors, construction equipment storage sites, assembly yards, oil rig stacking sites, and water pipelines and well pumps related to irrigation and non-irrigation facilities (BLM, 2009).

As described in Chapter 1, the Draft RMPA/EIS discusses management of oil and gas resources in the CCFO Planning Area consistent with the 2015 RFD Scenario. Management actions considered in this RMPA/EIS include areas that would be closed to oil and gas leasing as identified for each alternative (see Sections 2.6 through 2.10). Areas that are open to oil and gas leasing may be subject to one of three types of stipulations: Controlled Surface Use, Timing Limitation, or No Surface Occupancy. These stipulations are fully described in Chapter 2.

Land Tenure Adjustments

Land ownership (or land tenure) adjustment refers to those actions that result in the retention of public land, disposal of public land, or the acquisition by the BLM of nonfederal lands or interests in land. The FLPMA requires that public land be retained in public ownership unless, as a result of land use planning, disposal of certain parcels is warranted. Tracts of land that are designated in BLM land use plans as potentially available for disposal are more likely to be conveyed out of Federal ownership through an exchange rather than a sale. During an exchange, the BLM may accept title to any non-Federal land in exchange for land under Federal ownership, which allows for more efficient and better management of resource values on BLM lands with contiguous ownership. This preference toward exchange over sale is established in BLM policy. Acquisition of and interests in lands are important components of the BLM's land tenure adjustment strategy, and can be accomplished through several means, including exchange, purchase, donation, and condemnation. Lands and interests in lands are acquired for the following actions:

- Improve management of natural resources through consolidation of Federal, State, and private lands;
- Secure key property necessary to protect endangered species, promote biological diversity, increase recreational opportunities, and preserve archeological and historical resources; and
- Implement specific acquisitions authorized or directed by acts of Congress.

Management of land tenure adjustments (e.g., acquisitions and disposal areas) is discussed in Section 3.18 of the 2007 HFO RMP. None of the Draft RMPA alternatives would include adjustments to land tenure in the CCFO Planning Area.

Classifications

Land classification is a process required under specific laws to determine the suitability of public lands for certain types of disposal or lease, or suitability for retention and multiple use management. Most land classifications also segregate public lands from operation of some or all of the public land laws and mineral laws. Public land laws refer to the body of laws governing land disposal (e.g., sales, exchanges). None of the alternatives analyzed in this EIS would alter the land classifications within the CCFO Planning Area, as adopted in the 2007 HFO RMP.

Withdrawals

A withdrawal is a formal action that sets aside, withholds, or reserves Federal lands for public purposes. Withdrawals accomplish one or more of the following:

- Transfer total or partial jurisdiction of Federal land between Federal agencies;
- Dedicate Federal land to a specific purpose
- Segregate (close) Federal land from operation of some or all of the public land laws and (or) mineral laws. All the existing withdrawals segregate from operation of the public land laws, unless the surface estate is in nonfederal ownership.

Current management of withdrawals is discussed in Section 3.18 of the 2007 HFO RMP. None of the alternatives analyzed in this EIS would require withdrawals in the CCFO Planning Area.

3.20 Utility Corridors and Communication Sites

This section describes the existing utility corridors and communication sites within the CCFO Planning Area boundary that would be applicable to the Proposed RMPA. Transportation corridors within the CCFO Planning Area are discussed in Section 3.18 (Transportation and Access).

3.20.1 Introduction

In 2009, the BLM amended its land use plans in 11 contiguous western states in order to designate corridors for oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities on Federal land (BLM, 2009). Designated energy corridors on Federal lands provide pathways for future pipelines as well as long-distance electrical transmission lines that are expected to help relieve congestion, improve reliability, and enhance the national electric grid.

As part of this designation process, the BLM also adopted interagency operating procedures to provide coordinated, consistent interagency management procedures for permitting rights-of-way (ROWs) within the corridors. A ROW grant is an authorization to use a specific piece of public land for certain projects, such as developing roads, pipelines, transmission lines, and communication sites. The ROW grant authorizes rights and privileges for a specific use of the land for a specific period of time.

The BLM manages ROWs through its system of designated corridors and has encouraged the placement of new facilities within established corridors. Deviations from designated corridors may be permitted based on the type and need of the proposed facility, and lack of conflicts with other resource values and uses. Overlapping or adjacent ROWs are issued whenever possible. Generally, the use of designated ROW corridors for ROW grants is actively encouraged by the BLM; however, the presence of a designated ROW corridor or a system of ROW corridors does not preclude the granting of a ROW on public land outside the designated corridor, if appropriate.

3.20.2 Regulatory Framework

The following regulations and policies are applicable to utility corridors and communication sites in the CCFO Planning Area.

Energy Policy Act of 2005 – Section 368 Energy Right-of-Way Corridors

Section 368 of the Energy Policy Act (42 USC 15801 et seq.) authorizes the following actions for the secretaries of the departments of Commerce, Defense, Energy, and the Interior: (1) designate corridors for oil, gas, and hydrogen pipelines, and electricity transmission and distribution facilities on Federal land in the 11 contiguous western states; (2) perform any environmental reviews that may be required to complete the designation of such corridors; and (3) incorporate the designated corridors into the relevant agency land use and resource management (or equivalent) plans.

In November 2008, the Department of Energy, the BLM, U.S. Forest Service, Department of Defense, and U.S. Fish and Wildlife Service issued a final West-Wide Energy Corridor Programmatic Environmental Impact Statement (PEIS) that evaluated issues associated with the designation of energy corridors on Federal lands in 11 western states. Based upon the information and analyses developed in that PEIS, the Federal agencies could amend their respective land use plans by designating as an energy corridor one or more of the proposed energy corridors identified in the document (DOE and BLM, 2008).

In order to comply with the 2005 Energy Policy Act, the BLM amended 92 land use plans in the 11 contiguous western states to designate corridors on BLM-administered public lands (BLM, 2009, pg. 1). The BLM's Approved RMP Amendments/ROD for Designation of Energy Corridors (2009) includes documentation of the BLM's decisions in identifying these energy corridors.

In July 2012 the BLM, U.S. Forest Service, and Department of Energy entered into a settlement agreement with various nongovernmental organizations to resolve a lawsuit brought by the nongovernmental organizations after the agencies approved the corridors designated per Section 368. One of the requirements of the agreement was that the BLM and the U.S. Forest Service make future recommendations for revisions, deletions, and additions to the Section 368 corridor network consistent with applicable law, regulations, and agency policy and guidance and that they would consider the following general principles in future siting recommendations:

- Corridors are thoughtfully sited to provide maximum utility and minimum impact to the environment.
- Corridors promote efficient use of the landscape for necessary development.
- Appropriate and acceptable uses are defined for specific corridors.
- Corridors provide connectivity to renewable energy generation to the maximum extent possible while also considering other sources of generation, in order to balance the renewable sources and to ensure the safety and reliability of electricity transmission.

43 CFR 2806 – Corridor Designation

Part 2800 (Rights-of-Way, Principles and Procedure) of the Code of Federal Regulations establishes the Department of Interior's management procedures for ROWs. In accordance with Subpart 2806 (Designation of Right-of-Way Corridors), the BLM may designate ROW corridors to include any existing utility corridor that is capable of accommodating an additional compatible ROW. ROW grants would generally be confined to designated corridors, although the BLM may grant separate ROWs outside of a designated corridor if deemed appropriate by the authorized officer.

Pipeline and Hazardous Materials Safety Administration

The U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) develops and enforces regulations for the safe, reliable and environmentally sound operation of the nations' pipeline transportation system. In PHMSA, the Office of Pipeline Safety ensures safety in the design, construction, operation and maintenance, and spill response planning of oil, natural gas and hazardous liquid transportation per the duties regarding pipeline safety set forth in 49 USC Section 60101 et seq. and 49 CFR Section 190.1. The regulations apply to the owners and operators of the facilities and cover the design, installation, inspection, emergency plans and procedures, testing, construction, extension, operation, replacement, and maintenance of pipeline facilities transporting oil, gas, and hazardous liquid. The regulations require operators of gas pipelines to participate in a public safety program, such as a one-call system that would notify the operator of any proposed demolition, excavation, tunneling, or construction that would take place near or affect the facility.

3.20.3 Regional Setting

The location of electricity, natural gas, and communication facilities is typically dependent upon the location of demand and utility service areas. Areas of greater population require a more extensive utility supply network. As summarized in the BLM's RMP/ROD for Designation of Energy Corridors (BLM, 2009, pg. 12), the western states have a critical need for long-distance energy transport infrastructure due in part to these states' unique geography and population distribution, where fuel sources and energy generation facilities are often remotely located and large population centers are spread far apart. These factors result in an electricity transmission grid characterized by high-voltage transmission lines spanning very long distances. Transmission system congestion can lead to rapid rises in electricity prices, and severe congestion may lead to loss of electricity supplies and blackouts in some areas.

3.20.4 Current Conditions and Trends

Central Coast Field Office Planning Area

Figure 3.20-1 shows the location of existing transmission lines, pipelines, and pipeline facilities that constitute utility corridors within the CCFO Planning Area. As discussed in Section 3.17 (Social and Economic Conditions), the concentration of utility infrastructure (i.e., pipeline facilities, pipelines, transmission lines) around the San Francisco Bay areas of Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco Counties is consistent with the greater population size of this region relative to other communities within the CCFO Planning Area. Existing utility infrastructure within the CCFO Planning Area is also clustered in northern Monterey County (due to a greater population density than in the southern area) as well as in southeastern Fresno County (due to active oil and gas wells).

The electricity and natural gas utility providers in the CCFO Planning Area primarily include investor-owned utilities, which are private utility providers regulated by the California Public Utilities Commission. Some publicly owned utilities (i.e., municipal districts, city departments, irrigation districts, or rural cooperatives) also provide services to communities within the CCFO Planning Area. Publicly owned utilities are subject to local public control and regulation. Electricity providers in the CCFO Planning Area include Pacific Gas and Electric, Silicon Valley Power, Merced Irrigation District, Turlock Irrigation District, and Lodi Electric Utility. Natural gas utility providers include Pacific Gas and Electric, City of Palo Alto Utilities, and Southern California Gas (DOC, 2015).

Communication facilities on public lands include broadcast uses (e.g., radio, broadcast translator, cable television, or television broadcast) and non-broadcast uses (cellular telephone, commercial mobile radio service, facility manager, local exchange network, microwave, private communication uses, passive reflector, private mobile radio service, wireless internet service provider, Wi-Fi, or WiMAX) (BLM, 2012). Existing communication sites are located in the San Benito Management Area (i.e., Call Mountain), Central Coast Management Area (i.e., Fort Ord National Monument, Carmel Valley, and Stockdale Mountain), Salinas Management Area (i.e., Priest Valley), and San Joaquin Management Area (BLM, 2006).

Leases Subject to Settlement Agreement

The 14 non-NSO leases are located within or adjacent to active oil and gas fields in San Benito County, and approximately 2 miles to the south and west of active oil and gas fields in Monterey County. Existing pipelines and pipeline facilities are located in the region to provide service to existing oil and gas facilities.

3.21 Wild and Scenic Rivers

3.21.1 Introduction

The Bureau of Land Management (BLM) applies planning and management guidance for special designations within the National System of Public Lands created by presidential proclamations or acts of Congress. The Wild and Scenic Rivers Act of 1968 (Public Law 90-542) was passed by Congress to preserve riverine systems that contain outstanding features. The law was enacted during an era when many rivers were being dammed or diverted, and is intended to balance this development by ensuring that certain rivers and streams remain in their free-flowing condition. The BLM is mandated to evaluate stream segments on public lands as potential additions to the National Wild and Scenic Rivers System during the Resource Management Plan (RMP) process under Section 5(d) of the Act. Formal designation as a National Wild and Scenic River (NWSR) requires Congressional legislation, or designation can be approved by the Secretary of Interior if nominated by the governor of the state containing the river segment.

In 2014, the BLM considered waterways within the Central Coast Field Office (CCFO) Planning Area boundary for potential inclusion in the Wild and Scenic Rivers System during its analysis for the Clear Creek Management Area RMP/EIS (BLM, 2014; Appendix VI). This section describes the eligible river segments that would be applicable to the Proposed RMPA. Impacts to eligible river segments managed by the BLM within the CCFO Planning Area boundary are discussed in Section 4.21.

3.21.2 Regulatory Framework

The Wild and Scenic Rivers Act of 1968 established a NWSR System to protect outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values and to preserve the river or river section in its free-flowing condition. The Act purposefully strives to balance dam and other construction at appropriate sections of rivers with permanent protection. To accomplish this, it prohibits Federal support or approval for actions such as the construction of dams or other instream activities that would harm the river's free-flowing condition, water quality, or "outstanding remarkable values." The Act designated a number of river segments for immediate inclusion in the system and prescribed the methods and standards by which other rivers may be added to the system.

Rivers are generally designated by Congress and administered by either a Federal or State agency. Designated segments need not include the entire river and may include tributaries. For federally administered rivers, the designated boundaries generally average one-quarter mile on either bank in the lower 48 states and one-half mile on rivers outside national parks in Alaska in order to protect river-related values (NWSRS, 2015a).

Once a river or river segment is designated, it is added to the NWSR System. The NWSR System consists of three types of rivers:

- **Recreation –** rivers or sections of rivers that are readily accessible by road or railroad, that might have some development along their shorelines, and that might have undergone some impoundments or diversion in the past.
- **Scenic –** rivers or sections of rivers free of impoundments with shorelines or watersheds still largely undeveloped, but accessible in places by roads.
- **Wild –** rivers or sections of rivers free of impoundments and generally inaccessible, except by trails, with essentially primitive watersheds or shorelines, and unpolluted waters.

Regardless of classification, rivers are administered with the goal of protecting and enhancing the outstanding remarkable values that lead to their designation and maintaining their free-flowing character-

istics. Designation does not, however, affect existing water rights or the existing jurisdiction of states and the Federal government over waters as determined by established principles of law. Designation places no additional Federal authority over private lands within the corridor.

Wild and Scenic River Evaluation Process

In accordance with its policy and program direction for Wild and Scenic Rivers (BLM Manual 6400), the BLM identifies and evaluates "all rivers on BLM-administered lands to determine if they are appropriate for addition to the Wild and Scenic Rivers System" (BLM, 2012; Section 1.6). In this process, streams and rivers are first evaluated for their eligibility as potential additions to the NWSR System, followed by a determination of the suitability of eligible streams (i.e., suitability being a higher standard than eligibility). Ultimately, inclusion in the NWSR System requires action by Congress. Until Congress makes a final decision regarding designation, protective management is afforded to all eligible river segments as necessary to ensure that the existing qualities upon which their eligibility is based are not degraded.

The NWSR System study process includes the following steps:

- **Eligibility Determination.** In order to be eligible for inclusion in the NWSR System, a river segment must be free flowing and contain at least one river-related outstanding remarkable value. Eligible segments are preliminarily classified as wild, scenic, or recreational and then carried forward and studied in more detail to determine if they are suitable for inclusion in the NWSR System.
- **Suitability Determination.** All eligible waterways are reviewed to determine if they are suitable for inclusion in the NWSR System. The Wild and Scenic Rivers Act and BLM Manual 6400 list a number of factors that should be considered when assessing the suitability of waterways for inclusion in the NWSR System (e.g., status of land and mineral ownership along the river corridor; reasonably foreseeable uses to be enhanced, foreclosed or curtailed; cost of acquiring the lands and administering the area; and identifying the Federal agency with future oversight of the area).

All river segments found to be eligible for inclusion in the NWSR System are placed under protective management by the BLM. Subject to valid existing rights, the BLM is required to protect the free-flowing characteristics and outstanding remarkable values in the stream corridors. The BLM must also protect the corridor from modifications that would impact the tentative river classification (i.e., change the classification potential from Wild to Scenic, or from Scenic to Recreational). These management restrictions apply only to public lands. Protective management remains in effect until Congress makes a final decision regarding designation.

3.21.3 Regional Setting

In 2014, the BLM completed a Wild and Scenic River Inventory as part of its Record of Decision and Approved Resource Management Plan for the Clear Creek Management Area (Appendix VI). The Wild and Scenic River Inventory identified 11 river segments in the CCFO Planning Area as eligible for inclusion in the NWSR System (BLM, 2014; Appendix VI). Figure 3.21-1 shows the location of these eligible segments within the CCFO Planning Area, and Table 3.21-1 summarizes the information for each segment.

Table 3.21-1. Eligible Wild and Scenic Rivers in Central Coast Field Office Planning Area

River Name / Segment	BLM Length (miles)	Segment / Reach Identification	Outstanding Remarkable Value
Picacho Creek	2.0	Coalinga SM, T18S., R12E., SEC 19, 30, T18S., R11E., SEC 25	Recreational, other
White Creek	2.8	Coalinga SM, T19S., R13E., SEC 4, 8, 9, 17	Historical, cultural
Larious Creek	2.5	Coalinga SM, T17S., R11E., SEC 26, 35, 36	Historical, cultural

Table 3.21-1. Eligible Wild and Scenic Rivers in Central Coast Field Office Planning Area

River Name / Segment	BLM Length (miles)	Segment / Reach Identification	Outstanding Remarkable Value
East Fork of San Carlos Creek	1.4	Coalinga SM, T18S., R12E., SEC 2, T17S., R12E., SEC 22, 26, 35	Geological
San Carlos Creek	1.0	Coalinga SM, T18S., R12E., SEC 4, 5	Geological, historical
San Benito River (1)	0.8	Coalinga SM, T18S., R12E., SEC 32, 5	Scenic, geological, other
San Benito River (2)	0.5	Coalinga SM, T18S., R12E., SEC 25, 26	Scenic, geological, other
San Benito River (3)	0.3	Coalinga SM, T17S., R10E., SEC 16, 17	Scenic, geological, other
Cantua Creek	3.8	Coalinga SM, T18S., R12E., SEC 1, 12, 13, 24 T18S., R13E., SEC 5, 6	Scenic, recreational
Clear Creek and Tributaries	7.0	Coalinga SM, T18S., R12E., SEC 8, 9, 17 T18S., R11E., SEC 1, 11, 12, 15, 16	Scenic, recreational, fish & wildlife, geological, historical, cultural, other
Sawmill Creek	1.5	Coalinga SM, T18S., R12E., SEC 1, 4, 15, 22	Fish & wildlife, historical, other

SM= BLM Surface Management Map
"Other" Outstanding Remarkable Value includes Ecological values
Source: BLM, 2014; Appendix VI

2014 Suitability Determination by BLM

The eligible river segments listed in Table 3.21-1 were reviewed by the BLM to determine if any are suitable for inclusion in the NWSR System. The suitability study report that was included in the BLM's 2014 Wild and Scenic River Inventory describes the characteristics that do or do not make the stream segment a worthy addition to the system, the current status of land ownership and use in the area, as well as the reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the system (BLM, 2014; Appendix VI). None of the eligible river segments within in the CCFO Planning Area listed in Table 3.21-1 were recommended for inclusion in the NWSR System. The BLM found that many of the watersheds have been substantially modified through past mining and logging activities and the associated construction of roads and trails, and concluded that the resulting landscapes would not broaden the representation of key ecosystems within the NWSR System (BLM, 2014; Appendix VI).

As described in BLM Manual 6400, Section 3.5, the BLM's policy goal for eligible rivers is to manage their free-flowing condition, water quality, tentative classification, and any outstandingly remarkable values until Congress designates the river or releases it for other uses. Section 3.5 also states that BLM has broad discretionary authority, on a case-by-case basis through project-level decisionmaking and the NEPA processes, in regards to management of eligible river segments.

3.21.4 Current Conditions and Trends

Central Coast Field Office Planning Area

There is one designated NWSR that is within the CCFO Planning Area boundary but is not located on land administered by the BLM. The Big Sur River was designated in 1992 and is managed by the U.S. Forest Service. Classified as a "Wild" river, it extends 19.5 miles through the Los Padres National Forest to the boundary of the Ventana Wilderness (NWSRS, 2015b). The Big Sur River would not cross or be located in the vicinity of Federal mineral estate (see Figure 3.21-1).

Leases Subject to Settlement Agreement

There are no designated NWSR within the leases subject to settlement agreement.